



Course Outcomes

(UG Programmes)

SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)

Sree Sainath Nagar, A.Rangampet – 517 102 (A.P.)

(AFFILIATED TO JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU)

I B. Tech. - I Semester
(16BT1BS02) ENGINEERING PHYSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.
- CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
- CO3: Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
- CO4: Develop problem solving skills in engineering context.
- CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Lasers.

I B. Tech. – I Semester
(16BT1BS03) MATRICES AND NUMERICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire basic **knowledge** in
 - (a) Finding the rank of matrices and analyzing them.
 - (b) Solving algebraic and transcendental equations by various numerical methods.
 - (c) Fitting of various types of curves to the experimental data.
 - (d) Estimating the missing data through interpolation methods.
 - (e) Identification of errors in the experimental data
 - (f) Finding the values of derivatives and integrals through various numerical methods.
 - (g) Solving differential equations numerically when analytical methods fail.
- CO2: Develop skills in **analyzing** the
 - (a) methods of interpolating a given data
 - (b) properties of interpolating polynomials and derive conclusions
 - (c) properties of curves of best fit to the given data
 - (d) algebraic and transcendental equations through their solutions
 - (e) properties of functions through numerical differentiation and integration
 - (f) properties of numerical solutions of differential equations
- CO3: Develop skills in **designing** mathematical models for
 - (a) Fitting geometrical curves to the given data
 - (b) Solving differential equations
 - (c) Constructing polynomials to the given data and drawing inferences.
- CO4: Develop numerical skills in **solving the problems** involving
 - (a) Systems of linear equations
 - (b) Fitting of polynomials and different types of equations to the experimental data
 - (c) Derivatives and integrals

- (d) Ordinary differential equations
- CO5: Use relevant numerical **techniques** for
- (a) Diagonalising the matrices of quadratic forms
 - (b) Interpolation of data and fitting interpolation polynomials
 - (c) Fitting of different types of curves to experimental data
 - (d) obtaining derivatives of required order for given experimental data
 - (e) Expressing the functions as sum of partial fractions

I B. Tech. - I Semester

(16BT1BS04) MULTI - VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire knowledge in
- (a) Higher order Differential equations
 - (b) Maximum and minimum values for the functions of several variables
 - (c) Double and triple integrals
 - (d) Differentiation and integration of vector functions.
 - (e) Line and surface volume
 - (f) transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2: Develop skills in analyzing the
- (a) methods for differential equation for obtaining appropriate solutions,
 - (b) Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - (c) The variations in the properties of functions near their stationary values
 - (d) Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3: Develop skills in designing mathematical models for
- (a) R-C and L-R-C oscillatory electrical circuits
 - (b) Heat transfer and Newton's law of cooling
 - (c) Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces
- CO4: Develop analytical skills in solving the problems involving
- (a) Newton's law of cooling
 - (b) non homogeneous linear differential equations
 - (c) maximum and minimum values for the functions
 - (d) lengths of curves, areas of surfaces and volumes of solids in engineering
 - (e) transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5: Use relevant mathematical techniques for evaluating
- (a) various types of particular integrals in differential equations
 - (b) stationary values for multi variable functions
 - (c) multiple integrals in change of variables
 - (d) integrations of vector functions.

I B. Tech. - I Semester

(16BT10241) NETWORK ANALYSIS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES: --

COURSE DESCRIPTION: Basic concepts of electric circuits; Voltage - Current relationship of basic circuit elements; Mesh and Nodal analysis; Network theorems; AC circuits; Two-port network parameters; Transient analysis.

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1: Demonstrate knowledge in

- voltage and current relationships for various electric elements.
- network reduction techniques.
- concepts of AC fundamentals and single phase circuits.
- concepts of two-port networks.
- various network theorems.
- transient behavior of the circuits.

CO2: Analyze

- a circuit using conventional, mesh and nodal concepts.
- a two-port network for various network parameters.
- various types of two-port networks.
- the transient behavior of the circuits.

CO3: Design circuits to meet the required specifications

CO4: Evaluate

- electrical circuits for voltage, current and power using conventional circuit analysis methods and network theorems.
- transient response.
- two-port networks.

I B. Tech. - I Semester

(16BT10501) PROGRAMMING IN C

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1: Demonstrate knowledge in:

- o Elements of C Language
- o Selection and Repetition statements.
- o Arrays, Strings and Functional statements.
- o Derived data types, Files and Pointers

CO2: Analyze complex engineering problems to develop suitable solutions

CO3: Design algorithms for specified engineering problems

CO4: Use appropriate 'C' language constructs for solving engineering problems

CO5: Write programs using 'C' language to implement algorithms

I B. Tech. I-Semester

(16BT1BS32) ENGINEERING PHYSICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer,

magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3: Develop skills in designing electronic circuits using semiconductor components.

CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.

CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B. Tech. - I Semester

(16BT10232) ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: NIL

COURSE DESCRIPTION: Identification and specifications of various Electric and Electronic devices; analysis of various series, parallel and series-parallel electrical circuits; develop various electrical circuits for domestic and industrial applications.

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1: Demonstrate knowledge on various Electrical and Electronic Devices.

CO2: Analyze various series and parallel electrical circuits.

CO3: Design and develop various electrical circuits for domestic and industrial applications.

CO4: Function effectively as individual and as a member in a team.

CO5: Communicate effectively both oral and written forms

I B. Tech. - I Semester

(16BT10251) NETWORK ANALYSIS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: NIL

COURSE DESCRIPTION: Verification of KVL, KCL and network theorems; analysis of AC and DC circuits; determination of resonant frequency in series and parallel RLC circuits; evaluation of transients

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1: Demonstrate knowledge in

- Identification of various circuit elements and their values.
- Concepts of electric circuits and two-port networks.

CO2: Analyze and relate physical observations and measurements in electric circuits to theoretical perception.

CO3: Design circuit parameters to meet the required specifications.

CO4: Demonstrate skills in evaluating and interpret

- Various circuit parameters using conventional and network theorems
- Network parameters

CO5: Function effectively as individual and as a member in a team.

CO6: Communicate effectively in oral format and prepare laboratory reports.

I B. Tech. - I Semester **(16BT10531) PROGRAMMING IN C LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:-

A course on "Programming in C"

COURSE DESCRIPTION:

Hands on practice in developing and executing simple programs using C Programming constructs— Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1: Demonstrate practical knowledge of using C language constructs:

- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2: Analyze problems to develop suitable algorithmic solutions

CO3: Design Solutions for specified engineering problems

CO4: Use appropriate 'C' language constructs for solving engineering problems

CO5: Implement and execute programs using 'C' language

CO6: Document programs and communicate effectively while conducting Professional transactions.

I B. Tech. - II Semester **(16BT1HS01) Technical English**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

CO1: Demonstrate knowledge in

- ◆ Process of communication
- ◆ Modes of listening
- ◆ Paralinguistic features
- ◆ Skimming and Scanning
- ◆ Elements of style in writing

CO2: Analyze the possibilities and limitations of language for understanding

- ◆ Barriers to Communication
- ◆ Barriers to Effective Listening
- ◆ Barriers to Speaking
- ◆ Formal and metaphorical language

CO3: Design and develop functional skills for professional practice.

CO4: Apply writing skills in preparing and presenting documents

CO5: Function effectively as an individual and as a member in diverse teams.

CO6: Communicate effectively with the engineering community and society in formal and informal situations.

I B. Tech. - II Semester

(16BT1BS01): ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
- CO2: Develop analytical skills in:
 - a. Determination of hardness of water.
 - b. Determination of viscosity, flame and fire points, cloud and pour points.
- CO3: Develop designing skills in:
 - a. Synthesis of engineering plastics.
 - b. Chemical methods for the synthesis of Nano materials.
- CO4: Develop skills for providing solutions through:
 - a. Mitigation of hardness of water.
 - b. Newer Nanomaterials and engineering plastics for specific applications
- CO5: Acquire awareness to practice engineering in compliance to modern techniques such as:
 - a. Nalgonda technique for defluoridation of water
 - b. Electroplating technique for control of corrosion.
- CO6: Acquire awareness to societal issues on:
 - a. Quality of water.
 - b. Bio-diesel
 - c. Chemical materials utility and their impact.

I B. Tech. - II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z – transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

- CO1: Acquire basic knowledge in
 - (a) Fourier series and Fourier transforms
 - (b) Fourier integrals
 - (c) Laplace transforms and their applications
 - (d) z- transforms and their applications
 - (e) solving partial differential equations
- CO2: Develop skills in analyzing the
 - (a) Properties of Fourier series for a given function
 - (b) Partial differential equations through different evaluation methods
 - (c) Difference equations through z – transforms
 - (d) Engineering systems and processes involving wave forms and heat transfer
- CO3: Develop skills in designing mathematical models for
 - (a) Problems involving heat transfer and wave forms
 - (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

- CO4: Develop analytical skills in solving the problems involving
- Fourier series and Fourier transforms
 - Laplace transforms
 - Z-transforms and difference equations
 - Heat transfer and wave motion
- CO5: Use relevant transformation techniques for
- Obtaining Fourier transforms for different types of functions
 - Laplace transforms
 - Z-transforms
 - Partial differential equations

I B. Tech. - II Semester

(16BT20401) ELECTRONIC DEVICES AND CIRCUITS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Engineering Physics.

COURSE DESCRIPTION:

Characteristics of general and special purpose electronic devices; Rectifiers; filters and regulators; Biasing and small signal analysis of BJT and FET.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

CO1: Demonstrate knowledge in

- p-n junction diode and its characteristics
- Zener diode and its characteristics
- Rectifiers, Filters and Regulators
- Characteristics of BJT, FET, MOSFET and special purpose electronic devices.

CO2: Analyze numerical and analytical problems in

- Rectifiers using Filters
- Regulated Power Supplies
- Transistor biasing circuits and stabilization
- Transistor amplifiers
- FET biasing circuits and amplifiers

CO3: Design electronic circuits such as

- Rectifiers with and without filters
- Voltage regulators
- BJT and FET biasing circuits
- BJT and FET amplifiers

CO4: Solve engineering problems and arrive at solutions pertaining to electronic circuits.

CO5: Select appropriate technique for transistor modeling.

I B. Tech. - II Semester

(16BT20541) Foundations of Data Structures

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A course on "Programming in C"

COURSE DESCRIPTION:

Concepts of sorting: sorting by exchange, sorting by distribution, sorting by merging and data structures: stacks, queues, linked lists, trees, graphs, and hash table.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

CO1: Gain knowledge in Sorting techniques, Linear and Non-linear Data Structures.

- CO2: Analyze the performance of sorting techniques and their relationship to Data Structures.
 CO3: Design appropriate hashing function for a given application and develop programs to implement Linear and Non-Linear data structures
 CO4: Apply appropriate data structure to provide solutions for real time problems using C Language.

I B. Tech. - II Semester **(16BT1HS31) ENGLISH LANGUAGE LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

CO1: Demonstrate knowledge in

- Phonetics
- Information Transfer

CO2: Analyze the situations in professional context by using

- Vocabulary
- Grammar

CO3: Design and develop functional skills for professional practice.

CO4: Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.

CO5: Function effectively as an individual and as a member in diverse teams through

- Extempore talk and
- Role Play

CO6: Communicate effectively in public speaking in formal and informal situations.

CO7: Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I B. Tech. - II Semester **(16BT1BS31): ENGINEERING CHEMISTRY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.

CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.

CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.

CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.

CO5: Provide solutions for environmental issues through determination of quality of water.

I B. Tech. - II Semester

(16BT10331) COMPUTER AIDED ENGINEERING DRAWING

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	1	6	3

PRE-REQUISITES: None

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B. Tech. - II Semester

(16BT20551) FOUNDATIONS OF DATA STRUCTURES LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE-REQUISITES:

A course on "Foundations of Data Structures"

COURSE DESCRIPTION:

Hands on programming to implement data structures - Linked lists, Stacks, Queues, Trees, Search trees, Sorting, and Hashing in C Language.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1: Gain practical knowledge on stacks, queues, trees, graphs and Hashing Techniques
- CO2: Identify suitable data structure to solve engineering problems.
- CO3: Design solutions for complex engineering problems using linear and non-linear data structures.
- CO4: Develop algorithms leading to multiple solutions by conducting investigations of complex problems.
- CO5: Apply 'C' language as a tool for implementing linear and non linear data structures
- CO6: Communicate effectively by writing Programs and document practical work.

II B.Tech. - I semester

(16BT3HS01) ENVIRONMENTAL STUDIES

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	-	-	3

PREREQUISITES: A Course on Engineering Chemistry

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. Develop strategies for environmental pollution control and natural resource management.
- CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. Understand the impact of social issues and population on environment.
- CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. Follow environmental protection laws for sustainable development.
- CO9. Communicate effectively on environmental issues in the form reports.

II B.Tech. - I semester

(16BT3BS02) SPECIAL FUNCTIONS AND COMPLEX ANALYSIS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Intermediate/senior secondary Mathematics

COURSE DESCRIPTION: Beta, Gamma functions and their properties; Limits continuity and analyticity of complex functions; Integration, power series, singularities, residues; conformal mapping.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Acquire knowledge in
 - Beta and Gamma functions
 - Expressing complex functions in power series
 - Differentiation and integration of complex functions
 - Conformal mappings and bilinear transformations
 - Expressing complex functions in terms of graphs and power series
- CO2. Develop skills in analyzing the
 - The properties exhibited by complex functions in Argand plane
 - Properties of real integrals through complex variable techniques
 - The properties of improper integrals through residue theory
 - Conformal transformations of complex valued functions for inferences
 - The properties of complex functions by expressing them in power series and graphs
- CO3. Develop skills in designing mathematical models involving
 - Integrals of complex variable functions
 - Improper integrals using beta and gamma functions
 - Residue theory of complex functions
 - Power series expansions of complex variable functions
 - Transformations of complex variable functions
 - Fluid flow patterns and flux functions.
- CO4. Develop analytical skills in providing solutions for problems involving
 - Fluid, Electrical and Magnetic Potential functions
 - Integration of complex functions
 - Improper real integrals
- CO5. Use relevant Complex variable techniques for
 - Residues and integrals of complex functions.
 - Improper real integrals through complex functions
 - Techniques of Beta and Gamma functions to improper integrals

II B.Tech. - I Semester

(16BT30401) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: A course on Electronic Devices and Circuits

COURSE DESCRIPTION:

Single Stage Amplifiers; Multi-Stage amplifiers; Frequency Response; Feedback Amplifiers; Oscillators; Large Signal Amplifiers; Tuned Amplifiers.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in

- Single Stage Amplifiers
- Multi Stage Amplifiers.
- BJT Frequency Response.
- Feedback Amplifiers.
- Power Amplifiers.
- Tuned Amplifiers.

CO2. Perform analysis of electronic circuits for meeting defined specifications.

CO3. Design and develop electronic circuits such as Feedback Amplifiers, Oscillators and Power amplifiers with given specifications.

CO4. Solve problems pertaining to electronic circuit design.

CO5. Select an Amplifier circuit for a specific electronic sub-system.

CO6. Apply course knowledge to assess societal issues and understand the consequent responsibilities relevant to the professional engineering practice using electronic circuits.

II B.Tech. - I Semester

(16BT30402) SIGNALS AND SYSTEMS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: A course on transformation techniques and partial differential equations.

COURSE DESCRIPTION:

Analysis of signals and systems; Representation of signals using Fourier series and Fourier transforms; Time-Domain and Frequency-Domain aspects of signals and systems; concept of convolution and correlation; Sampling and types of sampling; Laplace transform of signals; Z-Transform of sequences.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in

- Representation of signals and systems.
- Fourier series representation of periodic signals
- Fourier transform of signals
- Convolution and correlation of functions
- Laplace transform
- Sampling Process
- Z-Transform

CO2. Analyze various continuous and discrete time signals and systems in time and frequency domains.

CO3. Develop solutions to stable and causal systems.

CO4. Solve problems pertaining to transforms and signal processing.

CO5. Select and apply appropriate transformation techniques for understanding of the frequency content of signals at the input and output of the systems.

II B.Tech. - I Semester (16BT30403) SWITCHING THEORY AND LOGIC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Number system and Boolean algebra; Minimization; Analysis and synthesis of digital circuits; Asynchronous Sequential Logic & Programmable Memories.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate the knowledge in
 - Conversion of number systems, Binary Codes.
 - Basic theorems, properties and postulates of Boolean algebra.
 - Minimization of switching functions using Map method and Tabular method.
 - Combinational and sequential circuits.
 - Realization of Boolean functions using PLDs.
- CO2. Analyse combinational and sequential circuits.
- CO3. Design and develop various combinational, sequential circuits and PLDs.
- CO4. Solve problems and arrive at solutions pertaining to Digital Electronics.
- CO5. Apply minimization techniques to asynchronous and synchronous designs and suggest appropriate design for engineering solutions.
- CO6. Apply appropriate logic functions to obtain optimized designs useful for the society.

II B.Tech. - I semester (16BT30241) ELECTRICAL TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Network Analysis and Engineering Physics.

COURSE DESCRIPTION:

Analysis of phase & line quantities and measurement of power in three phase system; Constructional details, operation, performance evaluation and applications of DC& AC machines; Testing of DC machines and Transformers; Special machines and single phase transformers.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
 - Construction and operation of various electrical machines
 - Measurement of power in three-phase system
 - Applications of various types of electrical machines
- CO2. Analyze
 - The operation and performance of various electrical machines
 - The polyphase circuit for measurement of power
- CO3. Design suitable accessories / controllers for various machines to meet the nominal specifications
- CO4. Solve engineering problems pertaining to various machines and provide feasible solutions
- CO5. Select appropriate control techniques for various electrical machines used in domestic and industrial applications
- CO6. Apply the conceptual knowledge of various electrical machines in relevance to industry and society

II B.Tech. - I semester (16BT30251) ELECTRICAL TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Network Analysis and Network Analysis lab.

COURSE DESCRIPTION:

Construction, operation, types, performance evaluation of DC& AC machines and transformers; Necessity of starter for DC motors; Three phase power measurement.

COURSE OUTCOMES:

On successful completion of course, students will be able to:

- CO1. Demonstrate knowledge on
- Construction, operation of DC& AC machines and transformers.
 - Starting and speed control of DC motors.
 - Testing of DC& AC machines and transformers.
 - Characteristics of DC& AC machines and transformers.
 - Measurement of three phase power.
 - Applications of DC& AC machines and transformers.
- CO2. Analyze the operation and performance of DC& AC machines, transformers and three phase system for various operating conditions.
- CO3. Design the circuit with suitable accessories / controllers for desired operation conditions of DC & AC machines.
- CO4. Interpret and synthesize the data obtained from experimentation on DC& AC machines, transformers and three phase system and provide valid conclusions.
- CO5. Select and apply appropriate technique for testing and control of DC& AC machines and transformers useful in industry.
- CO6. Apply the conceptual knowledge of electrical machines in relevance to industry and society.
- CO7. Commit to ethical principles and standards while exercising the practical investigations on electrical machines.
- CO8. Work individually or in a group while exercising practical investigations in the field of electrical machines.
- CO9. Communicate effectively in verbal and written form in relevance to electrical machines.

II B.Tech. - I semester (16BT30431) BASIC ELECTRONICS AND DIGITAL DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Electronic Devices and Circuits & Switching Theory and Logic Design.

COURSE DESCRIPTION: Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Combinational Circuits; Realization of Flip-flops; Sequential Circuits; Demonstration on VHDL Programme.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in different electronic devices, analog and digital circuits
- CO2. Analyze the characteristics of different electronic devices and circuits like
- Diodes-PN Junction Diodes, Zener Diodes, SCR
 - Transistors-BJT, FET, UJT
 - Combinational Circuits-HA, FA
 - Flip Flops-JK FF, D FF
 - Sequential Circuits -Counters
- CO3. Design electronic circuits like FET Amplifiers, Combinational Circuits and Sequential Circuits.
- CO4. Solve engineering problems with better Electronic circuits.
- CO5. Work individually and also in a group in the area of Analog and Digital circuits.
- CO6. Communicate verbally and in written form in the area of Electronic Devices and circuits.

II B.Tech. - I semester

(16BT30432) SIGNALS AND SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on Signals and Systems.

COURSE DESCRIPTION:

Generation of various signals and sequences; convolution and correlation; verification of linearity and time invariance properties; sampling theorem verification.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Operations on Matrices.
 - Generation of Various signals and Sequences.
 - Convolution and Correlation of signals and Sequences
 - Weiner-Khinchin relation and Sampling Theorem
 - Fourier Transform , Laplace Transform and Z-Transform
- CO2. Analyze the simulation results for a written program.
- CO3. Design MATLAB programs for the given list of exercises.
- CO4. Solve problems and obtain the required results to the given list of experiments.
- CO5. Apply MATLAB tools for writing the programs.
- CO6. Work individually or in group in the area of signals and systems.
- CO7. Communicate orally and in written form in the area of signals and systems.

II B.Tech. - II semester

(16BT40401) ANALOG COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Electronic Devices and circuits, Signals and Systems.

COURSE DESCRIPTION:

Continuous wave modulations; Modulators and De-Modulators; Transmitters; Receivers; Noise performance; Pulse modulations; Multiplexing.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Elements of communication systems.
 - Amplitude, Frequency, and Phase Modulations and De-Modulations.
 - Noise
 - Multiplexing.
- CO2. Analyze Noise Performance in different modulation systems, calculation of total power and bandwidth.
- CO3. Design Transmitters and Receivers with high signal to noise ratio.
- CO4. Solve problems pertaining to modulation schemes, transmitters and receivers considering noise effects.
- CO5. Select, and apply appropriate techniques for different modulation schemes understanding power and bandwidth limitations.
- CO6. Follow standards while designing transmitters and receivers.

II B.Tech. - II semester **(16BT40402) DIGITAL IC APPLICATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Switching Theory and Logic Design & Electronic Devices and Circuits.

COURSE DESCRIPTION:

Logic Families – CMOS, Bipolar and its Interfacing; Verilog HDL Language Elements and Modelling; Combinational and Sequential Logic Design using ICs; Memories - ROM, SRAM, DRAM, FPGA.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in:

- Classification of Integrated Circuits.
- Characteristics of Integrated Circuits.
- MOS, TTL and ECL Logic Families.
- Interfacing Between Different Logic Families.
- Digital Integrated Circuits.
- Memories.

CO2. Perform analysis of CMOS Circuits.

CO3. Design, develop and model combinational and sequential circuits.

CO4. Solve problems using relevant ICs to synthesize digital integrated circuits.

CO5. Select appropriate source code model to optimize the design of digital ICs.

CO6. Assess and propose cost effective digital IC solutions to meet design constraints to address societal needs.

II B.Tech. - II semester **(16BT40403) ELECTROMAGNETIC THEORY AND TRANSMISSION LINES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Engineering Mathematics and Engineering Physics.

COURSE DESCRIPTION:

Static Fields; Maxwell's Equations; Electromagnetic Wave Characteristics; Transmission Lines.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Apply fundamental knowledge in characterizing

- Electrostatic Fields
- Magnetostatic Fields
- Boundary Conditions
- Electromagnetic Waves
- Transmission Lines

CO2. Analyze Problems in different medium conditions by using Maxwell's Equations.

CO3. Design and Develop various impedance transformation techniques.

CO4. Provide valid solutions to solve critical problems for Electromagnetic Wave Propagation in different media.

CO5. Understand limits of Electromagnetic Wave Propagation and apply appropriate technique to arrive at feasible solutions.

CO6. Create solutions to compensate impedance mismatch in real time applications for societal needs.

II B.Tech. - II semester (16BT40404) LINEAR IC APPLICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Network Analysis & Pulse and digital Circuits.

COURSE DESCRIPTION:

Operational Amplifier (Op-Amp) basics and its characteristics; Op-Amp Linear and Non- Linear Applications; Voltage Regulators and Analog filter Design; study of internal functional blocks and the applications of special ICs like IC 555 Timer; PLL circuits; DAC and ADCs; DAC and ADC Specification.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate the knowledge of

- operational amplifiers
- Regulators and filters
- 555 timer and PLL
- D-A and A-D convertors

CO2. Analyze Operational Amplifier circuits and evaluate parameters of Operational Amplifier circuits.

CO3. Using linear ICs, design and develop

- V to I and I to V convertors
- Integrators and Differentiators
- Multivibrators
- Triangular wave generators.

CO4. Solve engineering problems and arrive at solutions using electronic circuits designed using linear ICs.

CO5. Select appropriate technique for operating op amp and 555 timer in different modes of operation based on applications.

II B.Tech. - II semester (16BT40405) PROBABILITY AND STOCHASTIC PROCESS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Engineering Mathematics.

COURSE DESCRIPTION:

Probability theory; The Random Variable; Operations on Single and Multiple Random Variables; Temporal Characteristics of Stochastic Processes; Noise analysis.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Apply knowledge of

- Concepts in Probability
- Single and multiple random variables
- Operations on Single and multiple random variables
- Random processes and their characteristics
- Noise

CO2. Analyze operations on single and multiple random variables and processes.

CO3. Formulate solutions for engineering problems involving probability and random processes.

CO4. Model random processes for the analysis of communication Systems.

II B.Tech. - II semester **(16BT40406) PULSE AND DIGITAL CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Electronic Devices and Circuits & Network Analysis.

COURSE DESCRIPTION:

Linear and non-linear Wave shaping circuits; Switching characteristics of Diode and Transistor; Design of multivibrators; Sweep circuits; Sampling and logic gates.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Apply the knowledge in
- Responses of High-pass and low-pass RC circuits for different inputs
 - Clipping and clamping operations.
 - Multivibrators.
 - Methods of generating the Time-base waveforms
 - Operating Principles of Sampling gates
 - Realization of logic gates using Diodes and Transistors
- CO2. Analyze the performance of Linear and non-linear Wave shaping Circuits.
- CO3. Design and develop different Multivibrator Circuits, Sweep circuits, clipper and clamper circuits.
- CO4. Solve engineering problems pertaining to pulse and Digital circuits to provide valid conclusions.
- CO5. Apply appropriate techniques to obtain optimum solution in the field of pulse and digital circuits.
- CO6. Apply contextual knowledge in pulse and digital circuits to assess propagation delay and power dissipation parameters to the Professional engineering practice for societal use.

II B.Tech. - II semester **(16BT40431) ANALOG COMMUNICATIONS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on Analog Communications.

COURSE DESCRIPTION:

Simulation and study of various modulation schemes and analog Communications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in different analog communications.
- CO2. Analyze the characteristics of different communication circuits like
- Pre-emphasis & De-emphasis.
 - Mixer.
 - Radio Receiver.
- CO3. Design and simulate various modulation systems for communication needs.
- CO4. Solve problems pertaining to modulation schemes and communication systems.
- CO5. Use MATLAB tools for simulation of modulation schemes.
- CO6. Function effectively as an individual and as a member in a group in the area of analog communications.
- CO7. Communicate in verbal and written form in the area of analog communications.

II B.Tech. - II semester

(16BT40432) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:

A Course on Electronic Circuit Analysis and Design.

COURSE DESCRIPTION:

Design, Simulation and Implementation of Single stage, Multistage Amplifiers, Feedback Amplifiers and Oscillators, Power Amplifiers, Tuned BJT Amplifiers.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in different electronic circuits and PSPICE tool.
- CO2. Analyze amplifiers, Oscillator and Tuned circuits.
- CO3. Design and develop single stage, multistage & Power amplifiers and Oscillator circuits.
- CO4. Conduct of experiments, analysis and interpretation of data, and synthesis of the information to provide valid solutions.
- CO5. Model an electronic circuit using simulation tools.
- CO6. Function effectively as an individual and as a member in a group in the area of electronic circuits.
- CO7. Communicate in verbal and written form in the area of electronic circuits.

II B.Tech. - II semester

(16BT40433) PULSE AND DIGITAL CIRCUITS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A course on Pulse and Digital Circuits

COURSE DESCRIPTION:

Linear and non-linear Wave shaping circuits; Transistor switching times; UJT relaxation oscillator; sampling and logic gates; Design of Multivibrator circuits.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Apply the knowledge in different Pulse and digital circuits.
- CO2. Analyze the characteristics of different Circuits like
 - RC Low Pass and High pass Circuits
 - Clipping and Clamping Circuits
 - Sampling and Logic Gates
- CO3. Design the circuits like Multi-vibrators, Sampling Gates, UJT Relaxation Oscillator, Bootstrap sweep circuit, Constant Current Sweep Generator using BJT.
- CO4. Provide valid conclusions through the design and conduct of experiments, analysis and synthesis.
- CO5. Apply conversion techniques for design of multivibrators.
- CO6. Function effectively as an individual and as a member in a group in the area of pulse and digital circuits.
- CO7. Communicate effectively to write report and design documentation in the area of pulse and digital circuits.

III B.Tech. - I semester

(16BT3HS02) **MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Acquire Knowledge in

- Tools and concepts of Micro Economics.
- Basic Principles and concepts of Accountancy.
- Provides life skills for effective utilization of scarce resources.
- Financial Accounting.
- Significance of Economics and Accountancy

CO2. Develop skills in managerial decision making of an organization.

CO3. Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.

CO4. Develop effective communication in Business and Accounting transactions.

CO5. Ascertain the profitability and soundness of an organization.

CO6. Practice Financial Accounting

III B.Tech. - I semester

(16BT50201) **CONTROL SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Multivariable Calculus and Differential Equations, Transformation Techniques and Partial Differential Equations.

COURSE DESCRIPTION:

Concepts of control system, transfer function of various physical systems, time response analysis, frequency response analysis, controller design, state space analysis.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- The concepts of open and closed loop control systems.
- Stability analysis in time and frequency domain.
- Controllers and compensators to meet the desired specifications.
- State variable techniques.

CO2. Analyze

- Time and frequency response of second order systems.
- Stability analysis using root-locus, bode and Nyquist plots.
- Controllers and compensators to meet the desired response.
- State space representation from transfer function.

CO3. Design a compensator to meet the design specifications of control system.

CO4. Solve problems pertaining to control systems to provide feasible solutions in real time environment.

CO5. Select appropriate techniques to solve control system problems in relevance to industry.

CO6. Apply the conceptual knowledge of control systems in domestic and industrial applications.

III B.Tech. - I semester (16BT50401) DIGITAL COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Signals and Systems, Analog Communications & Probability and Stochastic Processes.

COURSE DESCRIPTION: Digitization techniques - PCM, DPCM, Delta modulation and Adaptive Delta Modulation; Digital Baseband and Passband signal transmission; Detection of Baseband and Passband signals and error probability; Information Theory - Source and channel coding techniques.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply knowledge in
- Elements of Digital Communication systems.
 - Digitization techniques such as PCM, DPCM, DM and ADM
 - Digital carrier modulation techniques
 - Error Probability and detection of Baseband and Bandpass modulated signals
 - Measure of information
 - Source and Error Control Coding techniques.
- CO2. Analyze different types of digital modulation schemes based on bit error probability.
- CO3. Design methods for digital communications systems according to the required specifications like transmission power, bandwidth and SNR.
- CO4. Solve problems using different coding techniques to improve error performance of Digital communication system.
- CO5. Select appropriate coding techniques to improve transmission rates.
- CO6. Apply the knowledge and skills to meet societal needs relevant to communication systems.

III B.Tech. - I semester (16BT50402) MICROPROCESSORS AND MICROCONTROLLERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Switching Theory and Logic Design.

COURSE DESCRIPTION:

Architecture, Instruction set and programming of 8086; Programmable interfacing devices - architecture and programming; Interfacing Memory and I/O devices with 8086; 8051 Microcontroller - Architecture, programming, interrupts and applications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Internal hardware details of Intel 8086, 8051 and programmable devices like 8255, 8251, 8259, 8257.
 - Interfacing various peripherals to build standalone systems.
- CO2. Critically analyze the requirements to meet the specifications of microprocessors and microcontrollers based systems.
- CO3. Design and develop suitable interfaces for real time applications.
- CO4. Exhibit programming skills, choose suitable hardware and program the devices to solve Engineering problems.
- CO5. Apply appropriate techniques, resources to complex engineering activities for modeling microcomputer and microcontroller based systems with understanding of limitations.
- CO6. Apply concepts of microprocessors and microcontrollers for solving societal problems.

III B. Tech. I Semester (16BT50403) VLSI DESIGN

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES:

A Course on Digital IC Applications.

COURSE DESCRIPTION:

CMOS Technology; Stick Diagrams and Layouts; Subsystem design; Programmable Interconnect structures; Synthesis and Test Principles.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Understanding the Fabrication Process of MOS Transistors
 - Electrical properties of CMOS Circuits
 - Designing Static Combinational and Sequential logic at transistor level, including Mask layout.
 - Estimating and optimizing combinational RC Circuit delay using RC delay models and logical effort.
 - Design methodology and tools.
 - Test Principles.
- CO2. Analyze characteristics and performance of CMOS Circuits.
- CO3. Design solutions for subsystems to compensate tradeoff between area, speed and power requirements.
- CO4. Synthesize and extract information from designs and layouts for optimum solutions.
- CO5. Select and apply appropriate designs to overcome the limitations of CMOS devices for high speed applications.
- CO6. Assess test strategies for design and development of Integrated Circuits for societal needs.

III B.Tech. - I semester (16BT50404) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Measurements and Measuring Systems; Signal Analyzers and Oscilloscopes; Transducers; Display Devices and Recorders; Data Acquisition Systems and Telemetry.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Working of measuring instruments
 - Operating principles of various display and recording devices
 - Various measurement techniques
 - Errors in measurements and their rectification
 - Transmitting techniques of various electrical and non-electrical quantities
 - Application of digital techniques in development of instrumentation systems
- CO2. Analyse and compare the performance of various measuring systems based on the response to the given inputs.
- CO3. Design of basic electronic instruments according the required specifications.
- CO4. Solve engineering problems using different transducers for measurement of an electrical or non-electrical quantity and establish the drawbacks of instruments.
- CO5. Create effective and suitable techniques to overcome limitations of the instruments and display devices in measuring systems.
- CO6. Apply the instrumentation technology to provide wide range of solutions for the problems of Societal, Health and Safety issues in real time world.

III B.Tech. - I semester **(16BT50501) COMPUTER NETWORKS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sub layer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
- Functionalities of Various OSI and TCP/IP layers
 - 3G Mobile phone networks, 802.11
 - TCP,UDP and SMTP
- CO2. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.
- CO3. Design and compute subnet masks and addresses for networking requirements.
- CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.
- CO5. Apply Network Standards - 802.3 and 802.11 for developing computer Networks.
- CO6. Assess the impact of wired and wireless Networks in the context of legal, safety, health and societal issues.

III B.Tech. - I semester **(16BT30501) COMPUTER ORGANIZATION**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Basic structure and operation of a digital computer; Organization and functional principles of the arithmetic and logic unit, control unit, memory unit and I/O unit; Concepts of pipelining and parallel processing techniques;

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
- Computer Arithmetic units
 - Register Transfer Language and Computer Instructions
 - Design of Control Unit
 - Input Output Organization and Memory system
 - Pipelining and Multiprocessing.
- CO2. Analyze the functional units of a digital computer.
- CO3. Design the functional modules in a digital computer - Arithmetic Units, Memory and I/O.
- CO4. Investigate the performance of memory, I/O, and pipelined processors.
- CO5. Select appropriate techniques of I/O, Pipelining and Multiprocessing to solve computing problems.
- CO6. Apply contextual knowledge of computer systems development to societal applications.

III B.Tech. - I semester (16BT51241) OBJECT ORIENTED PROGRAMMING

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
 - Packages, interfaces, multithreading, exception handling, event handling.
- CO2. Analyze complex engineering problems using object oriented concepts.
- CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
- CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.
- CO5. Use advanced programming languages to develop web applications.
- CO6. Build Java Applications suitable for societal requirements.

III B.Tech. - I semester (16BT50431) LINEAR AND DIGITAL IC APPLICATIONS LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: Courses on Linear IC Applications and Digital IC Applications.

COURSE DESCRIPTION: Design and verification of Op-Amp applications; Timers; Voltage regulator; ADC and DAC; Simulation and synthesis of combinational and sequential circuits; XILINX tools.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in different Linear and Digital integrated circuits applications and XILINX tools.
- CO2. Analyze different circuits built with linear and digital ICs.
- CO3. Design different multivibrator circuits, filters and digital circuits.
- CO4. Conduct of experiments, analysis and interpretation of data, and synthesis of the information to provide valid solutions.
- CO5. Model a Linear and Digital integrated circuits using HDL tools.
- CO6. Function effectively as an individual and as a member in a group in the area of IC applications.
- CO7. Communicate in verbal and written form in the area of IC applications.

III B.Tech. - I semester (16BT50432) MICROPROCESSORS AND MICROCONTROLLERS LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: A course on Microprocessors and Microcontrollers.

COURSE DESCRIPTION:

Assembly language Programming for Intel 8086 & 8051; Interfacing standard peripherals & Programming-DAC, Stepper Motor, ADC, Logic Controller, Keyboard, Seven Segment Display.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in various aspects of microprocessors, microcontrollers and interfaces.

- CO2. Analyze various programming alternatives, interfacing methods & usage of various on-chip resources like Timers, Interrupts, ADC, DAC, and Stepper Motor to build standalone systems.
- CO3. Design and develop microcomputer based systems to suit to market requirements.
- CO4. Solve engineering problems by proposing potential solutions using microprocessors and microcontrollers.
- CO5. Apply appropriate techniques, resources, and tools for modeling microcomputer based systems with understanding of limitations.
- CO6. Apply concepts of microprocessors and microcontrollers to solve societal problems.
- CO7. Work individually and in a group to develop microcomputer based systems.
- CO8. Communicate effectively in oral and written form in the field of microprocessors and microcontrollers.

III B.Tech. - I semester **(16BT4HS31) SOFT SKILLS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:

English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION:

This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Acquire knowledge in
 - Goal Setting
 - Creative Thinking
 - Leadership Skills and
 - Team Work
- CO2. Analyse the situations and develop skills for
 - Body Language
 - Personality Development and
 - Stress Management
- CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal forums.

III B.Tech. - II semester **(16BT5HS01) MANAGEMENT SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial context.
- CO2. Identify and analyse management problems in the business organizations reaching substantiated conclusions using principles of management.

- CO3. Design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
- CO4. Competently employ broad based analytical tools for decision making, system design, analysis and performance.
- CO5. Provide solution to organizations for sustainable development.
- CO6. Apply knowledge of engineering and management principles to manage the projects in multidisciplinary environments.

III B.Tech. - II semester **(16BT60401) ANTENNAS AND WAVEGUIDES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Electro Magnetic Theory and Transmission Lines.

COURSE DESCRIPTION:

Waveguides, Antenna Parameters; Wire antennas; Antenna Arrays; VHF, UHF and Microwave antennas; Antenna Measurements.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply the knowledge of fundamentals in antenna theory and waveguides.
- CO2. Analyze the characteristics and performance of different antennas and waveguides.
- CO3. Design and develop various antennas.
- CO4. Provide solutions through different antenna designs.
- CO5. Apply appropriate techniques, resources to complex engineering activities in the field of antennas.
- CO6. Apply contextual knowledge for design of antennas with required radiation levels for communication needs meeting the public health and safety conditions.

III B.Tech. - II semester **(16BT60402) DIGITAL SIGNAL PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Signals and Systems.

COURSE DESCRIPTION:

Continuous and discrete signals and sequences; systems; DFT and FFT algorithms for the analysis of discrete sequences; design and realization of Digital IIR and FIR filters; DSP processors and architectures.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply the knowledge of fundamentals in
 - Frequency analysis of signals and systems.
 - DFT and FFT transforms.
 - Analog & Digital Filter Design.
 - Digital Filter Realization.
 - DSP Processors.
- CO2. Analyze numerical and analytical problems of discrete time signals and systems in frequency domain using Transforms.
- CO3. Design and develop digital filters to optimize system performance and their realization.
- CO4. Interpret and synthesize the response of Digital filters to validate their characteristics.
- CO5. Apply appropriate techniques and algorithms to design digital signal processing systems with an understanding of limitations.

III B.Tech. - II semester **(16BT40502) DATABASE MANAGEMENT SYSTEMS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on Data models and Database Languages

- Database design
- Normal forms
- Storage and Indexing

CO2. Analyze databases using normal forms to provide solutions for real time applications.

CO3. Design solutions for database problems using database design, views design and framing queries.

CO4. Use database techniques for designing databases, managing databases and its security.

CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.

CO6. Apply contextual knowledge to develop database applications related to societal issues.

III B.Tech. - II semester **(16BT71205) CRYPTOGRAPHY AND NETWORK SECURITY**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Principles and Practice of Cryptography and Network Security; Classical Systems; Symmetric Block Ciphers; Public-key Cryptography; Hash Functions; Authentication; Key Management; Key Exchange; Signature Schemes; E-mail; Web Security; Malicious Software; Intrusion Detection; Phishing and Identity Theft.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Cryptographic algorithms and their mathematical models
- Message Authentication
- Digital Signatures
- Malicious Software
- Intrusion Detection
- Phishing and Identity Theft

CO2. Analyze vulnerabilities and threats on information systems based on various security parameters

CO3. Apply security and privacy methods to protect and prevent cyber crimes

CO4. Solve information privacy issues using encryption and digital signatures

CO5. Use firewall and PGP to protect network and e-mail respectively

CO6. Follow standards in implementation of network security

III B.Tech. - II semester **(16BT31501) OPERATING SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

COURSE OUTCOMES:

On Successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.
- CO2. Identify the functionality involved in process management concepts like scheduling and synchronization.
- CO3. Design models for handling deadlock and perform memory management.
- CO4. Synthesize and apply programming API's to perform Process management.
- CO5. Use appropriate protection tools to provide access control to Operating system users.

III B.Tech. - II semester **(16BT61241) WIRELESS SENSOR NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: WSN architecture, types; Physical Layer; MAC protocols; Routing related Protocols; QoS in WSNs.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Wireless Sensor Networks
 - Physical layer
 - Data link layer
 - Network layer
 - Transport layer
- CO2. Analyze various design issues related to Data link, network and transport protocols of wireless sensor network architectures.
- CO3. Solve complex engineering problems pertaining to the field of wireless sensor networks.
- CO4. Design and develop feasible and optimal wireless sensor networks based solutions for societal use.

III B.Tech. - II semester **(16BT60403) ANALOG IC DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Electronic Circuits analysis and design.

COURSE DESCRIPTION:

MOS & CMOS Devices and Modeling; Current mirrors and biasing techniques; Single stage amplifiers; Sample and Hold Circuits; Bandgap Reference Circuits and Comparators.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
 - MOS device modeling
 - Current Mirrors
 - Single stage amplifiers

- Bandgap Reference Circuits.
- Sample and hold circuits
- Comparators.

CO2. Analyze analog integrated circuits suitable for real time applications.

CO3. Design and Develop Analog Integrated Circuits using MOS Transistor.

CO4. Use different styles of CMOS Circuit modelling to synthesize analog ICs.

CO5. Apply appropriate biasing techniques to improve performance of analog circuits.

CO6. Assess the performance of sample and hold circuits and Bandgap reference circuits in analog ICs suitable for societal use.

III B.Tech. - II semester **(16BT60404) IMAGE PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Digital signal processing and Digital communications.

COURSE DESCRIPTION:

Fundamentals of image processing; Image transforms; Image enhancement techniques in spatial and frequency domains; Restoration techniques; Image segmentation techniques; Image compression techniques.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in

- Image Fundamentals
- Image Enhancement & Restoration Techniques
- Image Segmentation & Compression Techniques
- Color image processing

CO2. Analyze different images using various processing techniques.

CO3. Design and develop various image processing algorithms to process the images in Real Time Applications.

CO4. Solve problems related to images for feasible and optimal solutions in the core area of Image Processing.

CO5. Apply appropriate techniques to complex engineering problems in the field of image processing.

CO6. Understand the impact of the image processing for societal needs.

III B.Tech. - II semester **(16BT60405) RADAR ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Antennas and Wave propagation & Microwave Engineering.

COURSE DESCRIPTION:

Radar equation; Targets; classification of radars; MTI and pulsed radar; Tracking with radar; radar receivers; Echo signal detection in the presence of noise; Navigational Aids.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in

- Principle of working of radars
- MTI and Pulse Doppler radars
- Tracking and detection of radar signals
- Radar displays and duplexers
- Radar receivers.
- Navigational Aids.

CO2. Analyze to detect radar echo signals, range and Doppler measurement.

CO3. Design and develop optimum matched filters, radar receivers and radar system components.

- CO4. Solve engineering problems to detect radar signals for range prediction and detectable signal in the presence of noise
- CO5. Apply appropriate techniques for signal detection, tracking and global positioning in the field of radar systems and navigational aids.
- CO6. Provide wide range of feasible solutions for accurate echo detection and study of Navigational aids useful in real time applications.

III B.Tech. - II semester

(16BT60406) TELECOMMUNICATION SWITCHING SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Analog and Digital Communications.

COURSE DESCRIPTION:

Overview of telecommunication switching systems; telephone networks; signaling techniques in telephone networks; ISDN; DSL technology and SONET.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in:
 - Switching systems.
 - Subscriber loop systems, numbering plan, charging plan and transmission plan.
 - Signaling techniques and traffic in the context of telecommunication network.
 - Integrated Services Digital Network (ISDN).
 - Frame relay and ATM.
 - DSL technologies and SONET networks.
- CO2. Perform analysis of traffic load parameters like blocking probability and grade of service.
- CO3. Solve engineering problems pertaining to implementation of communication networks.
- CO4. Apply appropriate Signaling techniques, networks and topologies of Telecommunications systems with understanding of limitations.
- CO5. Understand the probabilistic methods and statistics to solve communication network problems related to societal issues.
- CO6. Use standards to meet the responsibilities and norms of the engineering practice in the area of telecommunication switching systems.

III B.Tech. - II semester

(16BT60407) DIGITAL CMOS IC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Courses on VLSI Design.

COURSE DESCRIPTION:

Design styles and characteristics of CMOS digital circuits; Layout design rules; Memory design; Interconnect strategies; Design Methodologies.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply knowledge in
 - CMOS Circuits
 - MOS Layouts
 - Memories
 - Interconnects
 - Methodologies
- CO2. Analyze Problems in Interconnect Design.
- CO3. Design optimized CMOS Circuits and develop the corresponding Stick Diagrams and Layouts.
- CO4. Provide valid solutions to critical problems in CMOS Design.
- CO5. Understand the limitations of techniques applied in CMOS design.
- CO6. Create Solutions to reduce the power dissipation in CMOS devices for societal needs.

III B.Tech. - II semester (16BT60408) INFORMATION THEORY AND CODING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Digital Communications.

COURSE DESCRIPTION:

Information theory; Channel capacity; Linear block codes; Cyclic codes; Convolutional codes; Reed-Solomon and Turbo codes.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in Information Theory, Channel Capacity and various error control coding technique.
- CO2. Analyze complex engineering problems critically in the domain of information theory, source encoding techniques, channel capacity and error control coding.
- CO3. Design various types of channel encoders, syndrome circuits and channel decoders.
- CO4. Solve problems pertaining to entropy, source coding and channel coding.
- CO5. Use appropriate source and channel coding techniques.
- CO6. Apply source and channel coding techniques for providing optimal communication systems for societal use.

III B.Tech. - II semester (16BT60409) LIGHT WAVE COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Engineering physics, Electronic devices and Circuits, Digital communications.

COURSE DESCRIPTION:

Ray theory; Single mode fibers; Fiber materials; Fiber losses; Optical sources and detectors; Power launching in to the fiber; Optical links; WDM.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply knowledge to understand
 - Mode theory of optical communication.
 - Losses in optical fibers.
 - Optical sources and detectors.
 - Power Launching and coupling techniques.
 - Optical links.
 - WDM concepts.
 - Optical Networks.
- CO2. Analyze Problems in analog and Digital Links.
- CO3. Design and Develop Optical Sources, Detectors and Links.
- CO4. Provide valid solutions to overcome losses in optical fibers.
- CO5. Select appropriate optical components to suit advanced optical communications and Networks.
- CO6. Assess and propose cost effective solutions to minimize the radiation hazards caused by wireless links.

III B.Tech. - II semester **(16BT60410) NANO ELECTRONICS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:

Courses on Basic Engineering Physics, Basic Engineering Chemistry and Electronic Devices.

COURSE DESCRIPTION:

Basics of Nanoelectronics; Crystal structure of materials; Fabrication techniques and measurement of nanostructures; Nanoelectronic devices.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate the basic knowledge in

- Nanoelectronics
- Crystal structure of semiconducting material
- Various techniques for fabrication and measurement of nanostructure,
- Semiconducting nano electronic devices.

CO2. Analyze

- Crystal lattices and energy band diagram of semiconducting hetero structures of nanomaterials
- Energy states in nanomaterials.

CO3. Design and develop new semiconducting nano structures with the knowledge of density of states and electron transport.

CO4. Solve the problems related to fabrication of nanoelectronic devices.

CO5. Apply techniques of fabrication and measurement to create nanostructures.

CO6. Apply the ethical standards and legal issues while using chemical substances in fabricating nano device structures.

III B.Tech. - II semester **(16BT60431) DIGITAL COMMUNICATIONS LAB**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: Courses on Signal and Systems & Digital Communications .

COURSE DESCRIPTION:

Simulation and study of various Digital modulation and Demodulation schemes.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in different Digital Communications.

CO2. Compare the characteristics of various Digital modulation schemes and analyze their performance.

CO3. Design various digital modulation and demodulation circuits and study their characteristics.

CO4. Solve problems pertaining to development of modulation schemes.

CO5. Use MATLAB tools for simulation of modulation schemes.

CO6. Function effectively as an individual and as a member in a group in the area of digital communications.

CO7. Communicate in verbal and written form in the area of digital communications.

III B.Tech. - II semester **(16BT60432) DIGITAL SIGNAL PROCESSING LAB**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: A Course on Digital Signal Processing.

COURSE DESCRIPTION:

Implementation of Convolution; DFT and FFT; Design of Analog, Digital FIR and IIR filters.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate Knowledge in transforms, FFT algorithm, FIR and IIR filters.
- CO2. Analyze the characteristics of Digital and Analog filters such as IIR, FIR and signals using various techniques.
- CO3. Design the FIR and IIR filters for feasible and optimal solutions in the core area of signal processing.
- CO4. Solve engineering problems using filters in communication and allied areas.
- CO5. Use CCS and MATLAB tools, techniques and resource for design of analog and digital filters with understanding of limitations.
- CO6. Work individually and in a group effectively in the area of digital signal processing.
- CO7. Communicate effectively in oral and written form in the area of digital signal processing.

III B.Tech. - II semester (16BT60433) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PREREQUISITES: All the courses of the program up to III B. Tech. – I Semester.

COURSE DESCRIPTION:

Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES:

Completion of the seminar work enables a successful student to demonstrate:

- CO1. Knowledge on the seminar topic.
- CO2. Analytical ability exercised during the seminar work.
- CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.
- CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.
- CO5. Ability to function effectively as an individual as experienced during the seminar work.
- CO6. Ability to present views cogently and precisely on the seminar topic.
- CO7. Ability to engage in life-long learning as experience during the seminar work.

IV B.Tech. - I semester (16BT70401) CELLULAR AND MOBILE COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Analog and Digital Communications & Antennas and waveguides.

COURSE DESCRIPTION: Concepts of cellular systems; Lee-model for cellular coverage; Desired C/I; Interference and reduction techniques; Frequency management in cellular systems; Handoff techniques; Various modulation techniques and Multiple Access techniques; 2G Systems - GSM - IS-95; 3G systems - WCDMA - CDMA 2000.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate fundamental knowledge in
 - Cellular systems
 - Interference and cell coverage in Cellular systems
 - Handoffs and Dropped calls
 - Modulation techniques for cellular systems
 - 2G and 3G Wireless communication systems
 - Introduction to 4G
- CO2. Analyze low interference cellular systems.
- CO3. Design omni-directional and directional antenna systems.
- CO4. Provide appropriate solution for various scenarios to overcome interference problems.

- CO5. Select appropriate antennas to suit the requirements of advanced communication systems.
 CO6. Assess and propose cost effective solutions for societal use and minimize the radiation hazards caused by wireless links.

IV B.Tech. - I semester **(16BT70402) EMBEDDED SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Switching Theory and Logic Design, Microprocessors and Microcontrollers.

COURSE DESCRIPTION:

Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Apply knowledge in
- MSP430 Architecture, Pin out, Instruction set
 - High level programming
 - Usage of On-chip resources like ADC, DAC, Timers
 - Internet of Things related issues
- CO2. Analyze various design issues regarding
- Usage of on chip resources
 - Low power modes
 - Communication support
- CO3. Design embedded systems using MSP430 series microcontrollers to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.
- CO5. Apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.
- CO6. Reason out and practice professional engineering to deliver efficient and cost effective embedded based products to society.

IV B.Tech. - I semester **(16BT70403) MICROWAVE ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Electromagnetic Theory and Transmission Lines.

COURSE DESCRIPTION: Wave Propagation; Waveguide components; Microwave tubes; Microwave solid state devices; and Microwave measurements.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Wave Propagation
 - Microwave Components
 - Microwave Tubes
 - Microwave Measurements
- CO2. Analyze the Performance of Microwave components and Microwave Tubes.
- CO3. Design microwave components such as hybrid junctions, ferrite devices, and phase shifters.
- CO4. Solve problems pertaining to microwave junctions and waveguide components.
- CO5. Use appropriate resources to solve the problems related to microwave communication systems.
- CO6. Use various microwave components like phase shifters, attenuators and tubes to model a communication system for societal needs.

IV B.Tech. - I semester

(16BT70404) ADVANCED DIGITAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Digital Signal Processing

COURSE DESCRIPTION:

Digital filter banks; Parametric and Non-Parametric Power Spectrum Estimation methods; Computationally efficient algorithms; Applications of DSP.

COURSE OUTCOMES: On successful completion of the course, students will be able to :

- CO1. Apply knowledge in
 - Filter banks and Wavelets
 - Linear Prediction
 - Efficient power Spectral Estimation Techniques.
 - Applications of Multirate signal processing
- CO2. Analyze complex engineering problems in the Power Spectrum Estimation, Sampling rate conversion and Linear Prediction.
- CO3. Design optimum filters, multirate DSP systems and computationally efficient DSP algorithms.
- CO4. Solve Engineering problems pertaining to Digital Signal Processing.
- CO5. Apply DSP Algorithms, and algorithms related to Forward and Backward Prediction in digital system design with an understanding of the limitations.
- CO6. Apply computationally efficient DSP Algorithms, Optimum Filters and perfect reconstruction filters to address societal issues in multirate signal processing and communications.

IV B.Tech. - I semester

(16BT70405) MIXED SIGNAL DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on VLSI Design.

COURSE DESCRIPTION:

Switched Capacitor Circuits; PLLs; Nyquist Rate Data Converters.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
 - Switched Capacitor Circuits
 - PLL
 - Data Converters – ADC and DAC.
- CO2. Analyze non-ideal effects of switched capacitor circuits and PLLs.
- CO3. Design and Develop Switched Capacitor Circuits, PLLs and Data Converters.
- CO4. Solve problems by using alternate data converters to compensate performance limitations.
- CO5. Apply appropriate techniques to improve the performance of data converters.
- CO6. Understand the impact of mixed signal design for societal needs.

IV B.Tech. - I semester

(16BT70406) SATELLITE COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Analog Communications and Digital Communications.

COURSE DESCRIPTION: Orbital Aspects; Satellite Subsystems; Satellite Link Design; Earth Station Technology; Multiple Access; Orbit Considerations; Global Positioning System.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- Basic concepts of satellite communications
 - Satellite Orbits and Sub-Systems
 - Satellite link design
 - Earth station subsystems
 - FDMA, TDMA, CDMA
 - Geostationary and non-geostationary satellite systems
 - Satellite navigation and global positioning system.
- CO2. Identify and analyze critical engineering problems in the field of satellite subsystem design.
- CO3. Design efficient uplink and downlink satellite subsystems.
- CO4. Solve engineering problems with feasible and economical solutions during satellite systems link design.
- CO5. Apply appropriate and efficient techniques of multiple accessing and spread spectrum while designing satellite subsystems.
- CO6. Develop solutions following IEEE, ITU and FCC standards in the field of satellite communications.

IV B.Tech. - I semester

(16BT70407) WIRELESS COMMUNICATIONS AND NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Computer Networks.

COURSE DESCRIPTION:

Multiple Access techniques; Concepts of Wired and Wireless networks; operation of Mobile IP; Wireless Application Protocol; Architecture of Wireless LAN; Layered architecture of Bluetooth; High speed data networks.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply knowledge to understand
- Routing in wireless networks.
 - Various protocols for Wireless networks.
 - Various wireless LAN technologies.
 - Bluetooth
 - Architectures of various Wireless Data Networks.
- CO2. Analyze various protocols related to wireless networks.
- CO3. Design and Develop innovative techniques for implementation of high performance networking.
- CO4. Provide valid solutions to overcome challenges in wireless networks.
- CO5. Apply appropriate techniques to solve complex engineering problems in wireless networking domain.
- CO6. Apply standards in area of wireless networking.

IV B.Tech. - I semester

(16BT70408) LOW POWER CMOS VLSI DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on VLSI Design.

COURSE DESCRIPTION:

Basic Principles; Methodologies and techniques of CMOS Circuit Designs; Need For Low Power VLSI Design; Principles Of Low Power Circuit Design; Simulation Analysis of Low Power; Logic and Circuit Analysis; Special Techniques Of Low Power Design; Performance Management in Architecture or System level.

COURSE OUTCOMES:

On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Design of logic Circuits for low power Requirements
 - Power Estimation
 - Low power architecture & systems
 - Low Power Methodologies & Techniques.
- CO2. Analyze complex problems in the domain of low power devices, CMOS Circuits, effects and related issues.
- CO3. Design low power circuits to negotiate various constraints such as area, speed and power.
- CO4. Solve problems using relevant methods to synthesize Low power CMOS Circuits.
- CO5. Apply special techniques in evaluating the performance of low power CMOS devices.
- CO6. Contribute positively towards societal issues and responsibilities in designing and developing Low Power Integrated Circuits.

IV B.Tech. - I semester **(16BT70409) RF ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Basic Electronics and Wave Theory

COURSE DESCRIPTION:

Concepts of transmission line theory; RF Electronics; high frequency circuit behavior; design of tuning and matching networks; RF Passive and active components; RF Transistor amplifier design; Oscillators and RF Mixers.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Understand basics of RF Electronics and transmission lines.
- CO2. Analyze Transmission lines, Matching and biasing networks.
- CO3. Design Matching and biasing networks, RF passive and active components, and RF transistor amplifiers.
- CO4. Solve problems in transmission lines, filters, oscillators and Mixers.
- CO5. Apply appropriate Oscillators, Mixers and components to RF Circuit design.
- CO6. Apply RF electronics in the field of wireless communication systems and allied areas for societal use.

IV B.Tech. - I semester **(16BT70410) SPEECH PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Signals and Systems & Digital Signal Processing

COURSE DESCRIPTION:

Acoustic Theory of speech production; model for speech signals and speech processing systems; Mathematical analysis of speech signal - Homomorphic and LPC models; Speech and Speaker recognition systems.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate fundamental knowledge in
- Digital Model representation of speech signal
 - STFT analysis
 - LPC analysis
 - Homomorphic models.
- CO2. Analyze speech signal using homomorphic and linear predictive techniques.
- CO3. Design efficient algorithms for feasible and optimal solutions in speech processing.

- CO4. Synthesize features of speech signals to solve the problems in designing of speech and speaker recognition system.
- CO5. Apply appropriate techniques and approaches to analyze and synthesis speech signals with an understanding of limitations.
- CO6. Use speaker recognition system for societal needs.

IV B.Tech. - I semester

(16BT70411) SPREAD SPECTRUM COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Digital Communications.

COURSE DESCRIPTION: Fundamentals of spread spectrum systems; Analysis of spread spectrum systems; Detection of spread spectrum signals; Applications of spread spectrum to communications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in various types of spread spectrum techniques, generation and detection of spread spectrum signals and their applications in communications.
- CO2. Analyze problems in direct sequence and avoidance-type spread spectrum systems.
- CO3. Consider design and development issues in spread spectrum communication systems.
- CO4. Solve engineering problems pertaining to spread spectrum communications.
- CO5. Apply spread spectrum techniques to communications.
- CO6. Apply engineering standards to meet the responsibilities and norms of engineering practice.

IV B.Tech. - I Semester

(16BT6HS01) BANKING AND INSURANCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate Knowledge in Banking and Insurance.
- Basic Principles and concepts of Insurance and Banking.
 - e-fund transfers, e-payments and e-business models.
- CO2. Develop skills in providing solutions for
- Online banking and e – payments...
 - Risk Management through insurance benefits the society at large.
 - Money management by leveraging on technology, banking and insurance services.
- CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to More employment opportunities.
- CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

IV B.Tech. - I Semester

(16BT6HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Nature and scope of communication; Corporate communication; Writing business documents; Careers and resumes; Interviews.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
 - Corporate Communication
 - Main Stages of Writing Messages
 - Career Building
- CO2. Analyze the possibilities and limitations of language in
 - Communication Networks
 - Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

IV B.Tech. – I Semester

(16BT6HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Scope, Objectives and Elements of cost Accounting; Cost Sheet and Tender quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: concept of Risk and Return on Investment.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire Knowledge in
 - Elements of Costing.
 - Basic concepts of Financial Management.
 - Risk and Return
 - Significance of Cost Accountancy
 - Behavioral Finance
- CO2. Develop skills in
 - Material, Labor, Overheads control.
 - Excellence and ability to minimize the cost of the organization
- CO3. Develop effective Communication in Cost control and Financial Management.
- CO4. Provide solutions for effective investment decisions.

IV B.Tech. – I Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire Knowledge in
 - Schemes and institutions encouraging entrepreneurship.
 - Basic Principles and concepts of Accountancy.
 - Significance of entrepreneurship.
- CO2. Develop skills in providing solutions for
 - Personal excellence through financial and professional freedom.
 - Women entrepreneurship serving as contrivance in societal development
- CO3. Develop critical thinking and evaluation ability.
- CO4. Widens knowledge and build up attitude towards trouble shooting.
- CO5. Demonstrate business acumen

IV B. Tech. – I Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Oral communications; Basic grammar; advanced grammar; basic writing; Business French (La Francais Commercial)

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand French culture and civilization.
- CO6. Communicate effectively with the native French in day to day situation.

IV B.Tech. - I Semester

(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand German culture and civilization.
- CO6. Communicate effectively with the native German in day to day situation.

IV B.Tech. - I Semester

(16BT6HS07) INDIAN CONSTITUTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Elements, functions and functionaries according to Indian Constitution, understanding for better professional practice and good citizenry.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Gain knowledge in
 - Parliamentary proceedings, laws, legislature, administration and its philosophy
 - Federal system and judiciary of India
 - Social problems and public services like central civil services and state civil services
 - Indian and international political aspects and dynamics
- CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen

IV B.Tech. - I Semester
(16BT6HS08) INDIAN ECONOMY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

- CO1. Acquire the knowledge in
- Micro and Macro Economics.
 - Traditional and Modern methods of Capital Budgeting.
 - Five year plans and NITI Aayog.
- CO2. Analyze
- Capital Budgeting.
 - Value Analysis and Value Engineering.
 - Economic analysis
 - Law of supply and demand
- CO3. Understand the nuances of project management and finance

IV B.Tech. - I Semester
(16BT6HS09) INDIAN HERITAGE AND CULTURE

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquaint knowledge in
- Human aspirations and values in Vedic culture.
 - Cultural aspects of Buddhism and Jainism
 - Unification of our country under Mourya's and Gupta's administrations
 - Socio Religious aspects of Indian culture
 - Reform movements and harmonious relations.
- CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts

IV B.Tech. - I Semester
(16BT6HS10) INDIAN HISTORY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Gain knowledge on evolution and history of India as a nation
- CO2. Analyze social and political situations of past and current periods
- CO3. Practice in career or at other social institutions morally and ethically

IV B.Tech. - I Semester
(16BT6HS11) PERSONALITY DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
 - Self-Management
 - Planning Career
- CO2. Analyze the situations based on
 - Attitudes
 - Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

IV B.Tech. - I Semester
(16BT6HS12) PHILOSOPHY OF EDUCATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire knowledge in
 - Philosophy of Engineering education.
 - Philosophical Methods.
 - Knowledge acquiring methods.
 - Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational outcomes
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

IV B.Tech. - I Semester
(16BT6HS13) PUBLIC ADMINISTRATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire knowledge in
 - Public Policy.
 - Good Governance.

- E-governance.
 - Development Administration.
- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance modelsto find and provide opportunities in e-governance.
- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing
- Bureaucracy.
 - Role of civil society.

IV B.Tech. - I Semester

(16BT60112) BUILDING MAINTENANCE AND REPAIR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. Analyze failures, repair and rehabilitation techniques.
- CO3. Solve complex building maintenance problems through proper investigations and interpretation.
- CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. Provide solutions for building maintenance and repair problems considering health and safety.
- CO6. Consider environmental sustainability in building maintenance and repair.
- CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

IV B.Tech. - I Semester

(16BT60113) CONTRACT LAWS AND REGULATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. Analyze contracts and tenders.
- CO3. Address the legal issues in contracts and tenders.
- CO4. Follow laws and regulations in the preparation of contracts and tenders.
- CO5. Prepare contract and tender documents as per the standards.
- CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

IV B.Tech. - I Semester

(16BT60114) DISASTER MITIGATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of course, students will be able to:

- CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. Analyze disasters and their vulnerability.
- CO3. Design strategies for effective disaster mitigation.
- CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. Use appropriate methods in disaster mitigation and management.
- CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. Solve disaster related issues considering environment.
- CO8. Consider economical issues in disaster management.

IV B.Tech - I Semester

(16BT60115) ENVIRONMENTAL POLLUTION AND CONTROL

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.
- CO6. Encourage sustainable development through implementation of pollution control measures.
- CO7. Maintain IS Codes for environmental quality control.

IV B.Tech - I Semester

(16BT60116) PLANNING FOR SUSTAINABLE DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.

- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

IV B.Tech. - I Semester **(16BT60117) PROFESSIONAL ETHICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.
- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

IV B.Tech. - I Semester **(16BT60118) RURAL TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Rural technology; Non conventional energy; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of bio-fertilisers and usage of agro machinery in agriculture.

IV B.Tech - I Semester

(16BT60308) GLOBAL STRATEGY AND TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES:

On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on Strategic management, Research & development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

IV B.Tech - I Semester

(16BT60309) INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES:

On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

IV B.Tech. - I Semester**(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—**COURSE DESCRIPTION:**

Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3. Develop a comprehensive and well planned business structure for a new venture.
- CO4. Conduct investigation on complex problems, towards the development of Project.
- CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6. Apply ethics in constructive innovation framework.
- CO7. Exhibit professionalism by employing modern project management and financial tools.

IV B.Tech. - I Semester**(16BT60311) MATERIALS SCIENCE**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—**COURSE DESCRIPTION:**

Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semiconductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on concepts of fundamental science and engineering principles relevant to materials.
- CO2. Analyze the structures of various types of Ferrous, Non-ferrous alloys influencing various engineering applications.
- CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.
- CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
- CO5. Consider health and safety issues while providing materials to real time applications.
- CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

IV B.Tech. - I Semester **(16BT70412) GREEN TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
- CO2. Analyze various green technologies for engineering practice.
- CO3. Provide green solutions to engineering problems.
- CO4. Apply various green techniques in the engineering practice.
- CO5. Consider health and safety issues while providing green solutions to the society.
- CO6. Understand issues related to environment sustainability.
- CO7. Apply ethical standards for environmental sustainability in the engineering practice.

IV B.Tech. - I Semester **(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
 - Nanoscale technology.
 - Difference between micro and nanotechnology
 - Classification of Nanostructure and Nanomaterial
 - Fabrication of various nanomaterials and nanostructures.
- CO2. Analyze numerical and analytical problems in
 - Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
- CO3. Design and fabricate devices based on nanostructures like
 - Nano solar cell
 - Nano cantilever
 - Nano bio-sensor
- CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.
- CO5. Select appropriate technique for fabrication of nanostructures and Nano composites.
- CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

IV B.Tech. - I Semester **(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Systems Process and System Design
 - Systems Analysis and Modeling
 - System Development Life Cycle
 - Design Management and Maintenance Tools.
- CO2. Analyze system Process and estimate the given models by using case tools.
- CO3. Design and develop a model to the organizational systems.
- CO4. Solve complex problems related to engineering systems and produce accurate results
- CO5. Apply object oriented techniques for modeling dynamic systems.
- CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

IV B.Tech.- I Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators
- CO2. Analyze the properties of materials and identify its suitability for MEMS devices.
- CO3. Design MEMS devices that meet desired specifications and requirements.
- CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
- CO5. Use modern techniques in micro manufacturing process.
- CO6. Develop efficient and cost effective MEMS based products for society.

IV B.Tech. – I Semester

(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in Cyber security, Cybercrimes and its related laws in Indian and Global Act.
- CO2. Analyze the legal perspectives and laws related to cybercrimes in Indian context.
- CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cybercrimes.
- CO4. Solve Cyber security issues using privacy policies.
- CO5. Use antivirus tools to minimize the impact of cyber threats.
- CO6. Follow security standards for the implementation of Cyber Security and laws.

IV B.Tech. - I Semester
(16BT61505) BIO-INFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.

CO2. Analyze biological sequences for Homology Modeling.

CO3. Apply clustering methods for Phylogenetic trees.

CO4. Solve bio sequencing problems using dynamic programming.

CO5. Select and apply appropriate techniques and tools to structure Prediction.

IV B.Tech. - I semester
(16BT70431) ANTENNAS AND MICROWAVE ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on EM theory, Antennas and Microwave Engineering.

COURSE DESCRIPTION:

Design and verification of various antennas; Study of Microwave components' characteristics; Power supplies.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Apply the knowledge of antennas and microwaves to understand the working of various devices.

CO2. Analyze the characteristics of different microwave components like

- Attenuators
- Directional Couplers
- Horn antennas etc.,

CO3. Design various antennas for different communication needs.

CO4. Solve problems using different antenna designs and microwave devices.

CO5. Apply appropriate tools to design and analyze various antennas.

CO6. Understand the working of various antennas and microwave components and provide engineering solutions for societal use.

CO7. Commit to ethical principles in the design of antennas and microwave components.

CO8. Work individually or in a group in the field of antennas and microwaves.

CO9. Communicate effectively in verbal and written form in the area of antennas and microwaves.

IV B.Tech. - I semester
(16BT70432) EMBEDDED SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Embedded systems, C Programming.

COURSE DESCRIPTION:

IDE for Embedded System Design using MSP430; Interfacing Switch & LED; Timers-WDT, Configuring, Programming; ADC-usage; Power down modes; DAC; PWM Generator; Networking – SPI, Wi-Fi.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in designing complex energy efficient embedded systems.

CO2. Analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC, Comparator, SPI.

- CO3. Design embedded systems to suit market requirements.
- CO4. Solve engineering problems by proposing potential solutions using industry choice advanced Microcontrollers.
- CO5. Apply appropriate techniques, resources, and CCSV6 based IDE for modeling embedded systems with understanding of limitations.
- CO6. Provide embedded system solutions for societal needs.
- CO7. Work individually and in a group to develop embedded systems.
- CO8. Communicate effectively in oral and written form in the field of embedded systems.

IV B.Tech. - I semester **(16BT70433) COMPREHENSIVE ASSESSMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION:

Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES:

Comprehensive Assessment enables a successful student to demonstrate:

- CO1. Knowledge in the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Ability to engage in life-long learning in the courses of the program.

IV B.Tech. - II semester **(16BT80431) PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES:

Completion of the project work enables a successful student to demonstrate:

- CO1. Knowledge on the project topic.
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex engineering problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.

- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the engineering practice as applied in the project work.
- CO9. Ability to function effectively as an individual as experienced during the project work.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO11. Ability to engage in life-long learning as experience during the project work.

Program: B.Tech. ELECTRICAL AND ELECTRONICS ENGINEERING

I B. Tech. - I Semester (16BT1BS02) **ENGINEERING PHYSICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. demonstrate basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.
- CO2. analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
- CO3. demonstrate skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
- CO4. develop problem solving skills in engineering context.
- CO5. use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser

I B. Tech. – I Semester (16BT1BS03) **MATRICES AND NUMERICAL METHODS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. demonstrate basic knowledge in
 - Finding the rank of matrices and analyzing them.
 - Solving algebraic and transcendental equations by various numerical methods.
 - Fitting of various types of curves to the experimental data.
 - Estimating the missing data through interpolation methods.
 - Identification of errors in the experimental data
 - Finding the values of derivatives and integrals through various numerical methods.
 - Solving differential equations numerically when analytical methods fail.
- CO2. develop skills in analyzing the
 - methods of interpolating a given data
 - properties of interpolating polynomials and derive conclusions
 - properties of curves of best fit to the given data
 - algebraic and transcendental equations through their solutions
 - properties of functions through numerical differentiation and integration
 - properties of numerical solutions of differential equations

- CO3. develop skills in designing mathematical models for
- Fitting geometrical curves to the given data
 - Solving differential equations
 - Constructing polynomials to the given data and drawing inferences.
- CO4. develop numerical skills in solving the problems involving
- Systems of linear equations
 - Fitting of polynomials and different types of equations to the experimental data
 - Derivatives and integrals
 - Ordinary differential equations
- CO5. use relevant numerical techniques for
- Diagonalising the matrices of quadratic forms
 - Interpolation of data and fitting interpolation polynomials
 - Fitting of different types of curves to experimental data
 - obtaining derivatives of required order for given experimental data
 - Expressing the functions as sum of partial fractions

I B. Tech. - I Semester

(16BT1BS04) **MULTI - VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. demonstrate knowledge in
- Higher order Differential equations
 - Maximum and minimum values for the functions of several variables
 - Double and triple integrals
 - Differentiation and integration of vector functions.
 - Line and surface volume transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2. develop skills in analyzing the
- methods for differential equation for obtaining appropriate solutions,
 - Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - The variations in the properties of functions near their stationary values
 - Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3. develop skills in designing mathematical models for
- R-C and L-R-C oscillatory electrical circuits
 - Heat transfer and Newton's law of cooling
 - Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces
- CO4. develop analytical skills in solving the problems involving
- Newton's law of cooling
 - non homogeneous linear differential equations
 - maximum and minimum values for the functions
 - lengths of curves, areas of surfaces and volumes of solids in engineering
 - transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5. use relevant mathematical techniques for evaluating
- various types of particular integrals in differential equations
 - stationary values for multi variable functions
 - multiple integrals in change of variables
 - integrations of vector functions.

I B. Tech. - I Semester
(16BT10201) **ELECTRIC CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PREREQUISITES: Physics at Intermediate Level

COURSE DESCRIPTION:

Fundamentals of electric circuit parameters; nodal and mesh analysis; analysis of single phase and polyphase systems; analysis of coupled circuits; network theorems.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. demonstrate knowledge on

- voltage and current relationships for various electric elements
- network reduction techniques
- concepts of 1-phase and 3-phase electric circuits
- concepts of magnetically coupled circuits
- various circuit theorems

CO2. analyze electric and coupled circuits with conventional concepts and theorems

CO3. design resonant circuits to meet the required specifications

CO4. evaluate electric and magnetically coupled circuits parameters using conventional techniques and theorems.

I B. Tech. - I Semester
(16BT10501) **PROGRAMMING IN C**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. demonstrate knowledge in:

- Elements of C Language
- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2. analyze complex engineering problems to develop suitable solutions

CO3. design algorithms for specified engineering problems

CO4. use appropriate 'C' language constructs for solving engineering problems

CO5. write programs using 'C' language to implement algorithms

I B. Tech. - I Semester
(16BT1BS32) **ENGINEERING PHYSICS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2. demonstrate analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3. develop skills in designing electronic circuits using semiconductor components.

CO4. use instrumental techniques in A.C sonometer and Melde's experiment.

CO5. apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B. Tech. - I Semester
(16BT10231) **ELECTRIC CIRCUITS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: -

COURSE DESCRIPTION:

Verification of Ohm's law, KVL, KCL and network theorems; analysis of AC and DC circuits; determination of resonant frequency in series and parallel RLC circuits; determination of self and mutual inductances in coupled circuits;

COURSE OUTCOMES:

After successful completion of the course, student will be able to:

CO1. demonstrate knowledge on

- identification of various circuit elements and their values.
- concepts of electrical and magnetic circuits.

CO2. analyze and relate physical observations and measurements in electric circuits to theoretical principles and theorems.

CO3. design circuit parameters to meet the required specifications

CO4. demonstrate skills in

- obtaining the current locus diagrams.
- determining the parameters of magnetically coupled circuits.
- measuring of active and reactive powers.

CO5. function effectively as an individual and as a member in a team

CO6. communicate effectively both oral and prepare laboratory reports.
opposing fluxes.

I B. Tech. - I Semester

(16BT10232) **ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: --

COURSE DESCRIPTION: Identification and specifications of various Electric and Electronic devices; analysis of various series, parallel and series-parallel electrical circuits; develop various electrical circuits for domestic and industrial applications.

COURSE OUTCOMES: After successful completion of the course, student will be able to

- CO1. demonstrate knowledge on various Electrical and Electronic Devices.
- CO2. analyze various series and parallel electrical circuits.
- CO3. design and develop various electrical circuits for domestic and industrial applications.
- CO4. function effectively as individual and as a member in a team.
- CO5. communicate effectively both oral and written forms

I B. Tech. - I Semester

(16BT10531) **PROGRAMMING IN C LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:-

A course on Programming in C

COURSE DESCRIPTION:

Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. demonstrate practical knowledge of using C language constructs:
 - Selection and Repetition statements.
 - Arrays, Strings and Functional statements.
 - Derived data types, Files and Pointers
- CO2. analyze problems to develop suitable algorithmic solutions
- CO3. design Solutions for specified engineering problems
- CO4. use appropriate 'C' language constructs for solving engineering problems
- CO5. implement and execute programs using 'C' language
- CO6. document programs and communicate effectively while conducting Professional transactions.

I B. Tech. - II Semester

(16BT1HS01) **Technical English**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1. demonstrate knowledge in
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing

- CO2. analyze the possibilities and limitations of language for understanding
- Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. design and develop functional skills for professional practice.
- CO4. apply writing skills in preparing and presenting documents
- CO5. function effectively as an individual and as a member in diverse teams.
- CO6. communicate effectively with the engineering community and society in formal and informal situations.

I B. Tech - II Semester

(16BT1BS01): **ENGINEERING CHEMISTRY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
- CO2. develop analytical skills in:
- Determination of hardness of water.
 - Determination of viscosity, flame and fire points, cloud and pour points.
- CO3. develop designing skills in:
- Synthesis of engineering plastics.
 - Chemical methods for the synthesis of Nano materials.
- CO4. develop skills for providing solutions through:
- Mitigation of hardness of water.
 - Newer Nanomaterials and engineering plastics for specific applications
- CO5. acquire awareness to practice engineering in compliance to modern techniques such as:
- Nalgonda technique for defluoridation of water
 - Electroplating technique for control of corrosion.
- CO6. acquire awareness to societal issues on:
- Quality of water.
 - Bio-diesel
 - Chemical materials utility and their impact.

I B. Tech. - II Semester

(16BT2BS01) **TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Intermediate /Senior secondary Mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z – transforms; partial differential equations.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

- CO1. demonstrate basic knowledge in
- Fourier series and Fourier transforms

- Fourier integrals
 - Laplace transforms and their applications
 - z- transforms and their applications
 - solving partial differential equations
- CO2. analyze
- Properties of Fourier series for a given function
 - Partial differential equations through different evaluation methods
 - Difference equations through z – transforms
 - Engineering systems and processes involving wave forms and heat transfer
- CO3. design mathematical models for
- Problems involving heat transfer and wave forms
 - Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z transforms and difference equations
- CO4. solve problems involving
- Fourier series and Fourier transforms
 - Laplace transforms
 - Z-transforms and difference equations
 - Heat transfer and wave motion
- CO5. use relevant transformation techniques for
- Obtaining Fourier transforms for different types of functions
 - Laplace transforms
 - Z- transforms
 - Partial differential equations

I B. Tech. - II Semester

(16BT20401) **ELECTRONIC DEVICES AND CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A Course on Engineering Physics.

COURSE DESCRIPTION:

Characteristics of general and special purpose electronic devices; Rectifiers; filters and regulators; Biasing and small signal analysis of BJT and FET.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. demonstrate knowledge in
- p-n junction diode and its characteristics
 - Zener diode and its characteristics
 - Rectifiers, Filters and Regulators
 - Characteristics of BJT, FET, MOSFET and special purpose electronic devices.
- CO2. analyze numerical and analytical problems in
- Rectifiers using Filters
 - Regulated Power Supplies
 - Transistor biasing circuits and stabilization
 - Transistor amplifiers
 - FET biasing circuits and amplifiers
- CO3. design electronic circuits such as
- Rectifiers with and without filters
 - Voltage regulators
 - BJT and FET biasing circuits
 - BJT and FET amplifiers
- CO4. solve engineering problems and arrive at solutions pertaining to electronic circuits.
- CO5. select appropriate technique for transistor modeling.

I B. Tech. - II-Semester
(16BT20541) **Foundations of Data Structures**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Programming in C

COURSE DESCRIPTION:

Concepts of sorting: sorting by exchange, sorting by distribution, sorting by merging and data structures: stacks, queues, linked lists, trees, graphs, and hash table.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. demonstrate knowledge in Sorting techniques, Linear and Non-linear Data Structures. CO2. analyze the performance of sorting techniques and their relationship to Data Structures.
- CO3. design appropriate hashing function for a given application and develop programs to implement Linear and Non-Linear data structures
- CO4. apply appropriate data structure to provide solutions for real time problems using C Language.

I B. Tech. - II Semester
(16BT1HS31) **ENGLISH LANGUAGE LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

- CO1. demonstrate knowledge in
 - . Phonetics
 - . Information Transfer
- CO2. analyze the situations in professional context by using
 - . Vocabulary
 - . Grammar
- CO3. design and develop functional skills for professional practice.
- CO4. apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.
- CO5. function effectively as an individual and as a member in diverse teams through
 - . Extempore talk and
 - . Role Play
- CO6. communicate effectively in public speaking in formal and informal situations.
- CO7. recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I B. Tech- II Semester

(16BT1BS31): **ENGINEERING CHEMISTRY LAB**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1. Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.
- CO2. Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
- CO3. Develop designing skills for the synthesis of polymers and Nanomaterials.
- CO4. Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.
- CO5. Provide solutions for environmental issues through determination of quality of water.

I B. Tech. - II Semester

(16BT10331) **COMPUTER AIDED ENGINEERING DRAWING**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	1	6	3

PREREQUISITES: --

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

On Successful completion of this course, students will be able to:

- CO1. understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2. develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3. produce different views and projection in drawing.
- CO4. Use modern CAD software for design and drafting of drawings.
- CO5. create multi-view drawings suitable for presentation to Engineering community.
- CO6. introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B. Tech. - II Semester

(16BT20551) **FOUNDATIONS OF DATA STRUCTURES LAB**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: A course on "Foundations of Data Structures"

COURSE DESCRIPTION:

Hands on programming to implement data structures - Linked lists, Stacks, Queues, Trees, Search trees, Sorting, and Hashing in C Language.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. demonstrate practical knowledge on stacks, queues, trees, graphs and Hashing Techniques
- CO2. identify suitable data structure to solve engineering problems.
- CO3. design solutions for complex engineering problems using linear and non-linear data structures.
- CO4. develop algorithms leading to multiple solutions by conducting investigations of complex problems.
- CO5. apply 'C' language as a tool for implementing linear and non linear data structures
- CO6. communicate effectively by writing Programs and document practical work.

II B.Tech. - I semester

(16BT3HS01) **ENVIRONMENTAL STUDIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	-	3

PREREQUISITES: Course on Engineering Chemistry

COURSE DESCRIPTION:

Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. demonstrate knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. develop strategies for environmental pollution control and natural resource management.
- CO4. solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. understand the impact of social issues and population on environment.
- CO7. provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. follow environmental protection laws for sustainable development.

II B.Tech. - I Semester

(16BT3BS02) **SPECIAL FUNCTIONS AND COMPLEX ANALYSIS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Intermediate/senior secondary Mathematics

COURSE DESCRIPTION: Beta, Gamma functions and their properties; Limits continuity and analyticity of complex functions; Integration, power series, singularities, residues; conformal mapping.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
 - Beta and Gamma functions
 - Expressing complex functions in power series
 - Differentiation and integration of complex functions
 - Conformal mappings and bilinear transformations
 - Expressing complex functions in terms of graphs and power series
- CO2. develop skills in analyzing the
 - the properties exhibited by complex functions in Argand plane
 - properties of real integrals through complex variable techniques
 - the properties of improper integrals through residue theory
 - conformal transformations of complex valued functions for inferences
 - the properties of complex functions by expressing them in power series and graphs

- CO3. develop skills in designing mathematical models involving
- Integrals of complex variable functions
 - Improper integrals using beta and gamma functions
 - Residue theory of complex functions
 - Power series expansions of complex variable functions
 - Transformations of complex variable functions
 - Fluid flow patterns and flux functions.
- CO4. develop analytical skills in providing solutions for problems involving
- Fluid, Electrical and Magnetic Potential functions
 - Integration of complex functions
 - Improper real integrals
- CO5. (i) use relevant Complex variable techniques for
- Residues and integrals of complex functions.
 - Improper real integrals through complex functions
- (ii) techniques of Beta and Gamma functions to improper integrals

II B.Tech. - I Semester (16BT30201) **DC MACHINES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Electric Circuits and Engineering Physics.

COURSE DESCRIPTION:

Construction, operation, types and applications of DC machines; Performance evaluation of various DC machines.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- construction and operation of various types of DC machines
 - armature reaction and commutation
 - characteristics of DC machines
 - parallel operation of DC generators
 - starting, braking and speed control of DC motors
 - testing of DC machines
- CO2. analyze the performance of DC machine for various operating conditions
- CO3. design suitable accessories / controllers for desired operation of DC Machines
- CO4. solve engineering problems pertaining to DC machines and provide feasible solutions
- CO5. apply the conceptual knowledge of DC machines in relevance to societal needs

II B.Tech. - I Semester (16BT30202) **ELECTROMAGNETIC FIELDS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Multi-Variable Calculus & Differential Equations and Engineering Physics.

COURSE DESCRIPTION: Static electric fields; Gauss's law and its applications; Potential and Potential Gradient; steady magnetic fields; Ampere's circuital law and its applications; Force in magnetic fields; behavior of various materials in electric and magnetic fields; Inductance and capacitance calculations; Maxwell's equations for time variant and time invariant fields.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on:
- static electric fields due to electric charges
 - static magnetic fields due to steady currents
 - time varying electric and magnetic fields
- CO2. analyze Maxwell's equations for both time variant and time invariant electric and magnetic fields.

CO3. solve problems using laws of electromagnetics to provide feasible solutions in electric and magnetic circuits.

CO4. select and apply appropriate law of electromagnetics to determine electric and magnetic fields around various charge distributions and current carrying conductors.

CO5. apply various principles and laws of electromagnetics to industrial applications.

II B.Tech. - I Semester

(16BT30203) SIGNALS, SYSTEMS AND NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Multi-variable calculus and Differential equations, Transformation Techniques & Partial Differential Equations and Electric circuits.

COURSE DESCRIPTION:

Signals and systems in continuous-time domain; Transformations on signals; Transient analysis of DC and AC circuits; Two Port networks; Filters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- signals and systems
- transformation of signals in time and frequency domain
- transient behavior of various circuits
- two port network parameters
- various filters

CO2. analyze

- continuous signals and linear time invariant systems
- signals transformed in time and frequency domain
- transient response for various circuits
- network parameters for various networks
- various filter circuits

CO3. Design

- different types of filters based on frequency and impedance.
- Two-port network for the given parameters.

CO4. evaluate the response of various LTI systems & signal transformations, transient response and different parameters of two port networks & filters to provide viable solutions.

CO5. apply appropriate transformation techniques for analyzing the signals and networks in time and frequency domains.

CO6. apply the conceptual knowledge of signals, transients, filters and two port network models in relevance to industry and society.

II B.Tech. - I Semester

(16BT30441) ANALOG ELECTRONIC CIRCUITS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Electronic Devices and Circuits and Electric Circuits.

COURSE DESCRIPTION:

BJT frequency response; Feedback amplifiers and Oscillators; Power amplifiers; Wave-shaping circuits; Multivibrators.

COURSE OUTCOMES: On successful completion of this course, students will be able to

CO1. apply the knowledge in

- BJT Frequency Response
- Feedback Amplifiers
- Oscillators

- Power Amplifiers
- Wave-shaping circuits
- Multi-vibrators

CO2. analyze BJT frequency response, amplifiers, oscillators and pulse circuits.

CO3. design and develop different types of amplifiers, oscillators and pulse circuits.

CO4. solve engineering problems pertaining to analog electronic circuits to provide valid conclusions.

CO5. apply appropriate techniques to obtain optimum solution in the field of analog electronic circuits.

CO6. provide real time solutions for societal needs in the area of analog electronic circuits.

II B.Tech. - I Semester

(16BT30231) DC MACHINES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:

Courses on Electric Circuits and Electric Circuits Lab

COURSE DESCRIPTION:

Construction, operation, types and applications of DC machines; Performance evaluation of various DC machines.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- construction and working of various types of DC machines.
- starting, braking and speed control of DC motors.
- testing of DC machines.
- parallel operation of DC generators.
- characteristics of DC machines.

CO2. analyze the performance of DC machines for various operating conditions.

CO3. design the circuit with suitable accessories / controllers for desired operating conditions of DC machines.

CO4. interpret and synthesize the data obtained from experimentation on DC machines and provide valid conclusions.

CO5. select and apply appropriate technique for testing and control of DC machines used in industry.

CO6. apply the conceptual knowledge of DC machines in relevance to industry and society.

CO7. commit to ethical principles and standards while exercising the practical investigations on DC machines.

CO8. work individually or in a group while exercising practical investigations in the field of DC machines.

CO9. communicate effectively in verbal and written form in relevance to DC machines.

II B.Tech. - I Semester

16BT30232: SIGNALS AND NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:

Courses on Multi-variable calculus & Differential equations, Transformation Techniques & Partial Differential Equations, Electric circuits and Electric Circuits Lab.

COURSE DESCRIPTION:

Experimentation on Signals and systems; Transient analysis; Twoport network parameters and passive filters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on signals, transients, two port networks & filters and their experimental implementation.

CO2. analyze and relate the experimental observations & measurements for validation.

- CO3. design a suitable experimental/simulation procedure for practical investigations on signals, systems and net works.
- CO4. demonstrate skills in evaluating various parameters and interpret the observations to provide feasible solutions.
- CO5. select appropriate technique for experimental investigations, analysis and interpretation of signals and net works.
- CO6. apply the conceptual knowledge of signals, transients, filters and twoport network models in relevance to industry and society.
- CO7. commit to ethical principles and standards while exercising the practical investigations on signals and net works.
- CO8. work individually or in a group in the field of signals and networks.
- CO9. communicate effectively in verbal and written form in signals and networks domain.

II B.Tech. - I Semester

(16BT30451) **ANALOG ELECTRONIC CIRCUITS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:

Courses on Electronic Devices and Circuits and Analog Electronic Circuits.

COURSE DESCRIPTION:

Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Non-linear AND Linear Wave shaping circuits; Feed Back Amplifiers; Design of Multi-vibrator circuits; Power Amplifiers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. apply the knowledge in
- Diodes-PN Junction Diodes, Zener Diodes, SCR
 - Transistors-BJT, FET, UJT
 - Feedback amplifiers and oscillators
 - Clipping and Clamping Circuits
 - RC High Pass and Low Pass Circuits
 - Multi-vibrators
- CO2. analyze different types amplifier, oscillator and pulse circuits.
- CO3. design different types of Electronic circuits like feedback amplifiers, Oscillators, Multi-vibrators, Schmitt Trigger.
- CO4. provide solutions through the design and conduct of experiments, analysis and synthesis.
- CO5. apply biasing technique for design of amplifiers.
- CO6. function effectively as an individual and as a member in a group in the area of analog electronic circuits.
- CO7. communicate effectively in oral and written form in the area of analog electronic circuits.

II B.Tech. - II Semester

(16BT40201) **ELECTRICAL MEASUREMENTS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Transformation Techniques & Partial Differential Equations and Signal, Systems & Networks.

COURSE DESCRIPTION:

Measurement of electrical quantities; construction, working, design and applications of various electrical measuring instruments; Performance evaluation of various electrical measuring instruments.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- construction, working and testing of various measuring instruments

- various errors and compensation
 - measurement of various electrical parameters and quantities
- CO2. analyze
- errors and compensations in instruments
 - instrument performance
 - measuring circuits
- CO3. design appropriate arrangement for extension of range in measuring instruments.
- CO4. estimate various electrical quantities using suitable instruments and techniques to provide viable solutions.
- CO5. select & use appropriate technique and instrument for the measurement of electrical quantities in domestic and industrial applications.
- CO6. apply the conceptual knowledge of electrical measuring instruments and testing in relevance to industry and society.

II B.Tech - II Semester

(16BT40202) GENERATION OF ELECTRIC POWER

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Engineering Physics, Engineering Chemistry, Electronic Devices and Circuits.

COURSE DESCRIPTION:

Generation of electric power using hydro, thermal, nuclear, gas and renewable energy sources; Cogeneration; Economic aspects of power generation and power factor improvement.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- layout of various power plants and their operation.
 - different types of turbines and their applications in power generating stations.
 - non-conventional energy sources.
 - aspects of cogeneration.
 - economic aspects of power generation.
 - power factor improvement methods.
- CO2. analyze
- load factor, loss factor and their relations.
 - power factor improvement methods and economic aspects of power generation.
- CO3. design capacitors for most economic power factor.
- CO4. evaluate various parameters and economic aspects of power generation to provide viable solution.
- CO5. select feasible geographical sites for erecting different power plants.
- CO6. apply the conceptual knowledge of electric power generation through conventional and non-conventional sources to substantiate the societal needs.
- CO7. realize constraints and impacts of conventional & non-conventional power generation technology on environment and society.
- CO8. adhere environmental regulations for eco-friendly operation of power plants.

II B.Tech. - II Semester

(16BT40203) TRANSFORMERS AND INDUCTION MACHINES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on DC Machines, Electromagnetic Fields.

COURSE DESCRIPTION:

Constructional details, principle of operation, equivalent circuit, testing, performance and applications of transformers and three phase induction motors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- construction, operation of various types of transformers and induction machines.
 - characteristics of transformers and induction machines.
 - parallel operation of transformers.
 - starting, braking and speed control of induction machines.
 - testing of transformers and induction machines.
- CO2. analyze the operation and performance of transformers and induction machines for various operating conditions.
- CO3. design suitable accessories / controllers for machines to meet the desired specifications.
- CO4. solve engineering problems pertaining for transformers and induction machines to provide viable solutions.
- CO5. select appropriate techniques and tools for desired operation of transformers and induction machines in domestic, agriculture and industrial applications.
- CO6. apply the conceptual knowledge of Transformers and Induction Machines in relevance to industry and society.

II B.Tech - II Semester

(16BT41002) **LINEAR AND DIGITAL ICs**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Electronic Devices and Circuits& Analog Electronic Circuits.

COURSE DESCRIPTION:

Differential Amplifier; Characteristics of Operational Amplifiers; Linear & Non-Linear Applications of Op-Amp; IC 555 timer and phase locked loops; Application of PLL; A-D & D-A Converters; CMOS and Bipolar Logic Interfacing; HDL with combinational and sequential logic design.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
- Op-amp operation and applications.
 - Timer & PLL circuits.
 - A-D & D-A Converters
 - CMOS and Bipolar logic Interfacing.
 - HDL design and programming.
- CO2. analyze
- Op-amp based circuits.
 - Timers for various circuits.
 - Different logic families.
- CO3. design
- Circuits using Op-amps.
 - Logic gates using CMOS.
 - Combinational and sequential circuits.
- CO4. solve problems in
- Evaluating parameters of Op-amp based circuits.
 - Programming of various combinational and sequential logic design.
- CO5. apply appropriate modeling technique to suit IC Design.
- CO6. understand the impact of design and use of Linear and Digital ICs on the development of efficient and cost effective products.

II B.Tech - II Semester

(16BT30403) **SWITCHING THEORY AND LOGIC DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:--**COURSE DESCRIPTION:**

Number system and Boolean algebra; Minimization; Analysis and synthesis of digital circuits; Asynchronous Sequential Logic & Programmable Memories.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the knowledge in
- Conversion of number systems, Binary Codes.
 - Basic theorems, properties and postulates of Boolean algebra.
 - Minimization of switching functions using Map method and Tabular method.
 - Combinational and sequential circuits.
 - Realization of Boolean functions using PLDs.
- CO2. analyse combinational and sequential circuits.
- CO3. design and develop various combinational, sequential circuits and PLDs.
- CO4. solve problems and arrive at solutions pertaining to Digital Electronics.
- CO5. apply minimization techniques to asynchronous and synchronous designs and suggest appropriate design for engineering solutions.
- CO6. apply appropriate logic functions to obtain optimized designs useful for the society.

II B.Tech - II Semester

(16BT41041) **COMPUTER ARCHITECTURE AND ORGANIZATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --**COURSE DESCRIPTION:**

Basic structure of computers; computer arithmetic operations; register transfer and organization; 8085 architecture, programming and interfacing of 8085 microprocessor; Concepts of micro programmed control, pipelining and memory system.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- Internal organization of a computer.
 - Various memories and hierarchy in a computer.
 - Architecture, instruction set and addressing modes of 8085 microprocessor.
- CO2. analyze the performance of a computer.
- CO3. design microprocessor based systems for real time applications.
- CO4. solve engineering problems and arrive at solutions by developing embedded products.
- CO5. choose appropriate hardware, algorithm and program using suitable IDE.
- CO6. practice professional engineering to deliver efficient and cost effective embedded based products for society.

II B.Tech. - II Semester

(16BT40231) **ELECTRICAL MEASUREMENTS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:

Courses on Signal, Systems and Networks, Electric Circuits Lab and DC Machines Lab.

COURSE DESCRIPTION:

Measurement of electrical quantities; Testing of single phase energy meter and current transformer.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- measurement of electrical quantities
 - measuring instruments and their testing
- CO2. analyze various electrical quantities, parameters and measuring instruments.
- CO3. design the circuit with suitable accessories for desired measurement and testing.

- CO4. interpret and synthesize the data obtained from experimentation on measurement of electrical quantities to provide valid conclusions.
- CO5. select and use various measuring instruments in domestic and industrial applications.
- CO6. apply the conceptual knowledge of instruments, measurement and testing techniques in relevance to industry and society.
- CO7. commit to ethical principles and standards while exercising the practical investigations on measurement and testing techniques.
- CO8. work individually or in a group in the field of electrical measurements and instrument testing.
- CO9. communicate effectively in verbal and written form in relevance to electrical measurements and instrument testing.

II B.Tech. - II Semester

(16BT40232) TRANSFORMERS AND INDUCTION MACHINES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Course on DC Machines Lab

COURSE DESCRIPTION:

Construction, types, operation and applications of transformers and induction machines; Performance evaluation of transformers and induction machines.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - construction, operation of various types of transformers and induction machines.
 - starting and speed control of induction machines.
 - testing of transformers and induction machines.
 - parallel operation of transformers.
 - characteristics of transformers and induction machines.
- CO2. analyze the performance of transformers and induction motors for various operating conditions.
- CO3. design the circuit with suitable accessories / controllers for desired operation of Transformers and Induction motors.
- CO4. interpret and synthesize the data obtained from experimentation on transformers & induction machines and provide valid conclusions.
- CO5. select and apply appropriate technique for testing and control of transformers & induction machines used in domestic and industrial applications.
- CO6. apply the conceptual knowledge of Transformers and Induction motors in relevance to industry and society.
- CO7. commit to ethical principles and standards while exercising the practical investigations on Transformers and Induction motors.
- CO8. work individually or in a group while exercising practical investigations in the field of Transformers and Induction motors.
- CO9. communicate effectively in verbal and written form in relevance to Transformers and Induction motors.

II B.Tech.- II Semester

(16BT41033) LINEAR AND DIGITAL ICs LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A course on Linear and Digital ICs.

COURSE DESCRIPTION:

Op-Amp characteristics; Applications of Op-Amp; 555 timer; PLL; Digital logic families and interfacing; Digital IC Applications; Programming of digital IC's in HDL.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. demonstrate knowledge on analog and digital circuits.
- CO2. apply analytical skills to determine the op-amp parameters.

- CO3. design of analog and digital circuits for Linear & Nonlinear applications.
 CO4. provide valid conclusions through analysis and synthesis of analog and digital circuits.
 CO5. apply appropriate simulation tools for programming of analog and digital circuits.
 CO6. work individually and also in a group to develop applications using linear and digital ICs.
 CO7. communicate effectively with engineering community to design analog circuits.

III B.Tech. - I Semester

(16BT3HS02) **MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:--

COURSE DESCRIPTION:

Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate Knowledge in
- Tools and concepts of Micro Economics
 - Basic Principles and concepts of Accountancy
 - Financial Accounting
 - Significance of Economics and Accountancy
- CO2. apply skills in managerial decision making of an organization.
 CO3. apply the economic theories i.e., Demand, Production, Cost, Markets and Price
 CO4. demonstrate effective communication in Business and Accounting transactions
 CO5. ascertain the profitability and soundness of an organization
 CO6. practice financial accounting

III B.Tech. - I Semester

(16BT50201) **CONTROL SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:Courses on Multivariable Calculus and Differential Equations, Transformation Techniques and Partial Differential Equations and DC Machines/Electrical Technology.

COURSE DESCRIPTION:

Concepts of control system, transfer function of various physical systems, time response analysis, frequency response analysis, controller design, state space analysis.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- the concepts of open and closed loop control systems.
 - stability analysis in time and frequency domain.
 - controllers and compensators to meet the desired specifications.
 - state variable techniques.
- CO2. analyze
- time and frequency domain response of second order systems.
 - stability analysis using root-locus, Bode and Nyquist plots.
 - controllers and compensators to meet the desired response.
 - state space representation from transfer function.
- CO3. design a compensator to meet the design specifications of control system.
 CO4. solve problems pertaining to control systems to provide feasible solutions in real time environment.
 CO5. select appropriate techniques to solve control system problems in relevance to industry.
 CO6. apply the conceptual knowledge of control systems in domestic and industrial applications.

III B.Tech. - I Semester
(16BT50202) **POWER ELECTRONICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Engineering Physics, Electrical Circuits and Electronic Devices & Circuits.

COURSE DESCRIPTION:

Power semiconductor devices; Silicon Controlled Rectifier - Turn-on methods, Triggering and commutation circuits for SCR; Single phase and three phase Rectifiers; AC voltage controllers; Cycloconverters; Choppers and Inverters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - the characteristics of various power transistors.
 - operation, switching characteristics, ratings, protection and combinations of SCR.
 - various triggering methods and commutation techniques for SCR.
 - operation of line commutated converters and SCR based forced commutated converters.
- CO2. analyze the performance of different power converters subjected to various loads.
- CO3. design static and dynamic equalizing circuits, snubber circuits and commutating elements for protection and functionality of power electronic circuits.
- CO4. investigate various configurations of power electronic circuits to provide feasible solutions.
- CO5. select an appropriate power semiconductor device and/or circuit for real time applications.
- CO6. apply the conceptual knowledge of power semiconductor devices and/or circuits in relevance to industry.

III B.Tech. - I Semester
(16BT50203) **SYNCHRONOUS MACHINES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Transformers and Induction machines.

COURSE DESCRIPTION:

Construction, operation, characteristics, voltage regulation and parallel operation of alternators; operation and performance characteristics of synchronous motors; construction, operation, characteristics and applications of fractional kW motors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - constructional details, working, characteristics and performance of a three phase synchronous machine and fractional kilowatt motors.
 - armature reaction, voltage regulation and synchronization of alternator.
 - starting of a synchronous motor.
 - parallel operation of alternators.
- CO2. analyse the performance of synchronous and single phase machines for various operating conditions.
- CO3. design suitable accessories/controllers for desired operation of synchronous machines.
- CO4. solve problems pertaining to synchronous machines and fractional kW motors to provide feasible solutions.
- CO5. select appropriate techniques for control and operation of synchronous and fractional kW machines in relevance to industrial applications.
- CO6. apply the conceptual knowledge of synchronous machines in relevance to industry.

III B.Tech.- I Semester

(16BT50204) **TRANSMISSION AND DISTRIBUTION**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: Courses on Generation of Electric Power, Electromagnetic Fields and Signals, Systems & Networks.

COURSE DESCRIPTION:

Parameters of overhead transmission lines and underground cables; Performance of transmission lines, travelling wave phenomenon; Types of insulators; Sag and corona; Distribution systems classification, analysis and its planning.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - classification of transmission and distribution systems
 - parameters and configurations of transmission and distribution systems
 - transients, corona and sag
 - insulation system for cables and transmission lines
- CO2. analyze
 - the electrical and mechanical aspects of cables and transmission lines
 - various distribution feeder configurations
 - voltage drop and power loss in distribution system
- CO3. design
 - parameters for transmission lines and underground cables.
 - substation feeders.
- CO4. evaluate the parameters, performance & mechanical aspects of transmission lines, underground cables and distribution systems to provide feasible solutions.
- CO5. select appropriate model for transmission and distribution systems while exercising modeling and planning of power system.
- CO6. apply the conceptual knowledge of transmission and distribution systems in relevance to industry and society.
- CO7. follow professional norms for voltage regulation in transmission and distribution systems.

III B.Tech.- I Semester

(16BT40502) **DATABASE MANAGEMENT SYSTEMS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:--

COURSE DESCRIPTION:

Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - Data models and Database Languages
 - Database design
 - Normal forms
 - Storage and Indexing
- CO2. analyze databases using normal forms to provide solutions for real time applications.
- CO3. design solutions for database problems using database design, views design and framing queries.
- CO4. use database techniques for designing databases, managing databases and its security.
- CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.
- CO6. apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

III B.Tech.- I Semester

(16BT51003) **PRINCIPLES OF COMMUNICATIONS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: Course on Signals, Systems and Networks.

COURSE DESCRIPTION:

Fundamentals of Communications; Analog and digital communications - modulation and Demodulation Techniques; Information theory and coding.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate fundamental knowledge in
 - elements of communication systems.
 - amplitude, Frequency, and Phase Modulators and De modulators.
 - data transmission and detection of digital signals.
 - information theory and coding techniques.
- CO2. perform analysis of different modulation techniques and calculate various performance parameters
- CO3. design and develop modulators and demodulators for communication systems.
- CO4. solve engineering problems for feasibility and provide optimal solutions in the area of Analog and Digital Communication Systems.
- CO5. select the appropriate modulation and demodulation techniques for transmission and reception of signals.
- CO6. follow standards while developing the communication systems.

III B.Tech. - I Semester

(16BT51041) **SENSORS AND SIGNAL CONDITIONING**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: Courses on Electrical Measurements and Linear & Digital ICs.

COURSE DESCRIPTION:

Principle of operation, construction, advantages, limitations and applications of resistive, inductive, capacitive, self-generating, digital and other sensors; Signal conditioning circuits and their operations.

COURSE OUTCOMES: On completion of the course, the students will be able to

- CO1. demonstrate knowledge on
 - various sensors.
 - signal conditioning circuits.
- CO2. analyze
 - various sensors for measuring physical quantities.
 - signal conditioning circuits.
- CO3. design an appropriate instrumentation amplifiers for commercial applications.
- CO4. evaluate physical quantities using sensors and signal conditioning circuits to provide feasible solutions.
- CO5. select& use appropriate sensors for the measurement of physical quantities in domestic and industrial applications.
- CO6. apply the conceptual knowledge of sensors and signal conditioning circuits in relevance to industry and society.

III B.Tech. - I Semester
(16BT31501) **OPERATING SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.
- CO2. identify the functionality involved in process management concepts like scheduling and synchronization.
- CO3. design models for handling deadlock and perform memory management.
- CO4. synthesize and apply programming API's to perform Process management.
- CO5. use appropriate protection tools to provide access control to Operating system users.

III B.Tech. - I Semester
(16BT50231) **CONTROL SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Signals, Systems and Networks, DC Machines, Transformers & Induction Machines, Analog Electronic Circuits and Linear & Digital ICs.

COURSE DESCRIPTION:

Open and closed loop systems; DC and AC servo motor; stability analysis for mechanical and electrical systems; process control system; design of compensators.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - open and closed loop systems
 - stability analysis of a given system
 - process control
 - speed control of DC motor
 - compensators
- CO2. analyze
 - characteristics of AC and DC servomotors
 - stability of the system using root locus, Bode and Nyquist plots
 - time and frequency domain specifications of second order system
 - concept of controllability and observability of the system
- CO3. design
 - compensators & controllers to analyze the stability of the system
 - ladder network for PLC to verify boolean expressions
- CO4. interpret the experimental investigations to provide feasible solutions using the concepts of control engineering.
- CO5. select and apply appropriate technique for solving complex problems in control systems.
- CO6. apply the conceptual knowledge of control systems in relevance to industry and society.
- CO7. commit to ethical principles and standards while exercising the practical investigations on control systems.
- CO8. work individually or in a group in the domain of control systems.
- CO9. communicate effectively in verbal and written form in relevance to control systems.

III B.Tech. - I Semester

(16BT50232) **SYNCHRONOUS MACHINES LAB**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: Course on Transformers and Induction Machines Lab

COURSE DESCRIPTION:

Construction, performance and parallel operation of alternators; V and inverted-V curves for synchronous motor; determination of equivalent circuit and performance characteristics of single phase induction motors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- construction and operation of 3-phase synchronous machines and 1-phase motors.
 - V and inverted-V curves of synchronous motor.
 - parallel operation of 3-phase synchronous generators.
 - characteristics of synchronous machines.
- CO2. analyze the performance of synchronous and fractional kW machines for various operating conditions.
- CO3. design the circuit with suitable accessories / controllers for desired operating conditions of synchronous and fractional kW machines.
- CO4. interpret and synthesize the data obtained from experimentation on synchronous and fractional kW machines to provide valid conclusions.
- CO5. select and apply appropriate technique for testing and control of synchronous and fractional kW machines for domestic and industrial applications.
- CO6. apply the conceptual knowledge of synchronous and fractional kW machines in relevance to domestic and industrial needs.
- CO7. follow ethical principles and standards while exercising the practical investigations on synchronous and fractional kW machines.
- CO8. work individually or in a group while exercising practical investigations in the field of synchronous and fractional kW machines.
- CO9. communicate effectively in verbal and written form in relevance to synchronous and fractional kW machines.

III B.Tech. - I Semester

(16BT4HS31) **SOFT SKILLS LAB**

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION:

This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
- Goal Setting
 - Creative Thinking
 - Leadership Skills and
 - Team Work
- CO2. analyse the situations and develop skills for
- Body Language
 - Personality Development and
 - Stress Management
- CO3. apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. function effectively as an individual and as a member in diverse teams.
- CO5. communicate effectively in public speaking in formal and informal forums.

III B.Tech.- II Semester
(16BT5HS01) **MANAGEMENT SCIENCE**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial context.
- CO2. identify and analyse management problems in the business organizations reaching substantiated conclusions using principles of management.
- CO3. design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
- CO4. competently employ broad based analytical tools for decision making, system design, analysis and performance.
- CO5. provide solution to organizations for sustainable development.
- CO6. apply knowledge of engineering and management principles to manage the projects in multidisciplinary environments.

III B.Tech - II Semester
(16BT60201) **POWER SEMI CONDUCTOR DRIVES**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: Courses on Power Electronics, Synchronous Machines and Control Systems.

COURSE DESCRIPTION:

DC drives: Rectifier fed and Chopper fed drives; AC Drives: Induction motor drives, Synchronous and Stepper motor drives.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - dynamics of electrical drives.
 - operation and speed control of various DC & AC drives.
 - open loop and closed loop control of DC & AC drives.
- CO2. analyze single and multi-quadrant operations of DC & AC drives with speed-torque characteristics.
- CO3. design and develop various configurations of power electronic converters for AC & DC drives.
- CO4. investigate open and closed loop operations of various drives using different speed control techniques to enhance the drive performance.
- CO5. apply appropriate power converters for controlling the drives in real time applications.
- CO6. apply the conceptual knowledge of power semiconductor drives in relevance to industry and society.

III B.Tech.- II Semester (16BT60202) **POWER SYSTEM ANALYSIS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: Courses on Matrices & Numerical Methods, Electric Circuits and Transmission and Distribution.

COURSE DESCRIPTION:

Per unit representation; Symmetrical component theory; Sequence networks for power system networks; Formulation of bus impedance and admittance matrices; Computation of power flow using various numerical techniques; Analysis of various faults; Power system stability analysis.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- per unit representation, symmetrical component theory and sequence network representation of power system networks.
 - formation of power system network matrices.
 - load flow studies.
 - various faults.
 - power system stability.
- CO2. analyze
- the power system network for sequence network representation.
 - the power system networks for the formation of bus impedance and admittance matrices.
 - the load flow problem of a power system network for different conditions.
 - various faults.
 - the stability of the power system under different operating conditions.
- CO3. evaluate
- per unit quantities for various power system components and networks.
 - the power system network for various planning strategies and provide a feasible solution.
- CO4. apply appropriate techniques/methods to analyze power system network operating under various conditions.
- CO5. apply the conceptual knowledge of power system analysis to assess and analyze a power system for various scenarios.

III B.Tech. - II Semester (16BT50501) **COMPUTER NETWORKS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: Course on Computer Architecture and Organization

COURSE DESCRIPTION:

Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sublayer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on:
- Functionalities of Various OSI and TCP/IP layers
 - 3G Mobile phone networks, 802.11
 - TCP,UDP and SMTP
- CO2. analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.
- CO3. design and compute subnet masks and addresses for networking requirements.
- CO4. solve problems related to Flow control, Error control, congestion control and Network Routing.
- CO5. apply Network Standards - 802.3 and 802.11 for developing computer Networks.
- CO6. assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.

III B.Tech.- II Semester

(16BT61001) **ARM PROCESSORS & PIC MICROCONTROLLERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Switching theory and logic design.

COURSE DESCRIPTION:

ARM Processors architecture, Programming, PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, Interfacing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in ARM Processors architecture, PIC architecture, Pin out, Instruction set.
- CO2. analyze various design issues regarding usage of on chip resources and Low power modes.
- CO3. design embedded systems using ARM Processors and PIC microcontrollers to suit market requirements.
- CO4. solve engineering problems and arrive at solutions in designing embedded Systems.
- CO5. use on-chip resources to design embedded systems with an understanding of limitations.
- CO6. practice professional engineering to deliver efficient and cost effective microcontroller based products.

III B.Tech.- II Semester

(16BT61041) **PROGRAMMABLE LOGIC CONTROLLERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Switching Theory and Logic Design.

COURSE DESCRIPTION:

Introduction to PLC; PLC ladder diagrams; programming PLC; timers, counters and sequences used in PLC; data handling functions; Bit Patterns; advanced PLC functions.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on programmable logic controllers, various functions of PLCs.
- CO2. analyze the process of automation using PLCs.
- CO3. design skills in automating a process control.
- CO4. solve engineering problems in industries using PLCs.
- CO5. select suitable PLC with an understanding of limitations.
- CO6. practice professional engineering to deliver efficient and cost effective designs for society and domestic applications.

III B.Tech.- II Semester

(16BT51241) **OBJECT ORIENTED PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. demonstrate knowledge on:
 - Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
 - Packages, interfaces, multithreading, exception handling, event handling.
- CO2. analyze complex engineering problems using object oriented concepts.

- CO3. design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
- CO4. apply AWT and Applets to create interactive Graphical User Interfaces.
- CO5. use advanced programming languages to develop web applications.
- CO6. build Java Applications suitable for societal requirements.

III B.Tech.-II Semester

(16BT60203) DESIGN AND ESTIMATION OF ELECTRICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Electrical and Electronic workshop practice.

COURSE DESCRIPTION:

Design and estimation of residential & commercial buildings, overhead transmission & distribution lines and industrial buildings; Light sources, principals of light & design, types of lamps; electric heating, welding and their applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- electrical wiring of residential & commercial and industrial buildings.
 - material and size of conductors for overhead transmission & distribution lines.
 - light sources and illumination.
 - electric heating & welding.
- CO2. analyze
- estimation of residential & commercial buildings, overhead transmission & distribution lines and industrial buildings.
 - proper illumination strategy for effective lighting.
 - heating and welding schemes for industrial purpose.
- CO3. design of electrical wiring for residential & commercial buildings and industrial buildings, overhead transmission & distribution lines and suitable illumination system for effective lighting.
- CO4. solve engineering problems pertaining to utilization of electrical energy and provide feasible solutions.
- CO5. apply suitable electric wiring, heating, welding and illumination techniques for domestic and industrial applications.
- CO6. apply the conceptual knowledge of utilization strategies and techniques in relevance to industry and society.
- CO7. adhere the constraints and standards for applications of electric energy in different fields.

III B.Tech. - II Semester

(16BT60204) DIGITAL SIGNAL PROCESSING FOR ELECTRICAL ENGINEERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Signals, Systems & Networks and Power Electronics.

COURSE DESCRIPTION:

Discrete-time signals and systems; Discrete Fourier series, Discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT) algorithms for the analysis of discrete time sequences; design and realization of Digital IIR and FIR filters; DSP based control of stepper motors; DSP based implementation of DC-DC buck-boost converters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- digital signals and systems
 - DFT and FFT
 - analog & digital filter
 - digital filter realization
- CO2. Analyze discrete time signals and systems using DFT and FFT techniques.
- CO3. design and realize IIR and FIR digital filters using different techniques.

- CO4. evaluate the Discrete Fourier Transform (DFT) of a sequence and use the DFT to compute the convolution of two sequences and plot the frequency response of linear time-invariant systems.
- CO5. Use relevant DSP controllers and techniques for applications in power electronics and electrical machines.
- CO6. apply the conceptual knowledge of digital signal processing in relevance to industry and society.

III B.Tech. - II Semester (16BT60205) **ELECTRICAL MACHINE DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Synchronous Machines.

COURSE DESCRIPTION:

Electrical machine design concepts; Design of transformers, DC machines, Induction machines and Alternators.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on design concepts of various types of electrical apparatus.
- CO2. analyze the specific electric & magnetic loading characteristics for performance evaluation.
- CO3. design a suitable electrical machine for domestic and industrial needs.
- CO4. investigate and interpret the design data for evaluating the performance of electrical apparatus to provide valid conclusions.
- CO5. apply appropriate technique/procedure for designing electrical apparatus.

III B.Tech. - II Semester (16BT60206) **HVDC TRANSMISSION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Power Electronics and Transmission & Distribution.

COURSE DESCRIPTION:

Need for HVDC Transmission, planning and modern trends; Analysis and control of power converters; Harmonics; Characteristics and design of filters; Faults and protection of converters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- different types of HVDC transmission system, various converter configurations and their control.
 - effects of harmonics, faults and their control methods.
- CO2. analyze
- different converter configurations.
 - different control and protection strategies in HVDC system.
 - power flow in HVDC transmission system.
- CO3. demonstrate skills in designing filter circuits for minimizing harmonics.
- CO4. solve problems in HVDC transmission to provide viable solutions.
- CO5. select and apply appropriate devices, schemes and techniques for real time applications in HVDC transmission.
- CO6. apply the conceptual knowledge of HVDC transmission in relevance to industry and society.

III B.Tech.- II Semester
(16BT60207) **ADVANCED CONTROL SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Control systems

COURSE DESCRIPTION:

Design of compensators and controllers, state space, canonical forms, controllability and observability, describing function, phase plane analysis, Lyapunov's stability analysis, Full order observer and reduced order observer.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- state space analysis.
 - various compensators and controllers.
 - stability in the sense of Lyapunov.
 - full and reduced order observers in state space analysis.
- CO2. analyze the stability of nonlinear system using
- describing function approach.
 - phase plane analysis.
 - Lyapunov's method.
- CO3. design suitable compensator and controllers using root locus and Bode plot.
- CO4. evaluate stability of systems using pole placement and Lyapunov method to provide valid solutions.
- CO5. select appropriate techniques for analyzing the stability of the system.
- CO6. apply the conceptual knowledge of advanced control systems in relevance to industry and society.

III B.Tech.- II Semester
(16BT60208) **HIGH VOLTAGE ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Engineering Physics, Engineering Chemistry, Electromagnetic Fields and Electrical Measurements.

COURSE DESCRIPTION:

Types of insulation systems; Breakdown process in solid, liquid and gaseous dielectrics; Generation of high AC and DC voltages, Impulse voltages and currents; Measurement of high voltage, current, resistivity, dielectric constant and loss factor; Testing of electrical apparatus.

COURSE OUTCOMES: on successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- various insulation systems and their behavior under voltage stress.
 - generation and measurement of high voltages and currents.
 - testing of various high voltage electrical apparatus.
- CO2. analyze
- breakdown phenomenon in different insulation systems.
 - circuits for generation of high voltage and currents.
 - methods of measuring high voltage quantities.
- CO3. design circuits for high voltage generation, measurement and testing.
- CO4. evaluate different parameters in high voltage engineering to provide valid conclusions.
- CO5. select suitable testing and diagnostic techniques for the high voltage apparatus.
- CO6. apply contextual knowledge of high voltage engineering to sustain industrial needs.
- CO7. follow the appropriate standard for testing of high voltage apparatus.

III B.Tech.- II Semester
(16BT60209) **INSTRUMENTATION**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Courses on Analog Electronic Circuits, Electrical Measurements, Computer Architecture and Organization.

COURSE DESCRIPTION:

Principle of operation, advantages and limitations of various types of electronic and digital instruments for measurement of electrical quantities; Storage oscilloscopes, Data acquisition, display devices and recorders.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstration knowledge on
- various types of electronic and digital instruments.
 - signal analyzers and storage oscilloscopes.
 - data acquisition systems, display devices and recorders.
- CO2. analyze
- various types of electronic and digital instruments.
 - signal analyzers and storage oscilloscopes.
 - display devices, recorders and various data acquisition systems.
- CO3. design an appropriate display system for industrial and commercial applications.
- CO4. estimate the magnitude, phase, frequency and spectrum of signal with oscilloscope to provide feasible solution.
- CO5. select an appropriate instrumentation principles and techniques to substantiate the industrial requirements.
- CO6. apply the conceptual knowledge of various instrumentation principles and techniques in relevance to industry.

III B.Tech.- II Semester
(16BT60210) **SPECIAL ELECTRICAL MACHINES**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Course on Synchronous Machines

COURSE DESCRIPTION:

Construction, operation, types, characteristics and applications of Stepper Motors, Switched Reluctance Motor, PM Brushless DC Motor, Synchronous Reluctance, Linear Induction and synchronous Motors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- construction and operation of various types of special electrical machines.
 - characteristics of special electrical machines.
 - open loop and closed loop operation of special electrical machines.
- CO2. analyze the operation and performance of special electrical machines for various operating conditions.
- CO3. design suitable accessories / controllers for desired operation and control of special electrical machines.
- CO4. solve engineering problems pertaining to special electrical machines to provide feasible solutions.
- CO5. Select and apply appropriate technique and tools for control and operation of special electrical machines in domestic and industrial applications.
- CO6. apply the conceptual knowledge of special electrical machines in relevance to industry and society.

III B.Tech.- II Semester

(16BT60231) **POWER ELECTRONICS AND DRIVES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Courses on Transformers & Induction Machines and Power Electronics.

COURSE DESCRIPTION: Characteristics of power switching devices; Triggering and commutation circuits of SCR; working of various power electronic converters and AC & DC drives.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on characteristics of power switching devices, their triggering and commutation circuits, various converters and drives.
- CO2. analyse physical observations and measurements of various parameters related to powerswitching devices, converter circuits and drives.
- CO3. design, validate and apply different triggering and commutation circuits for SCR.
- CO4. interpret and synthesize the data obtained from experimentation on power electronic devices / circuits / drives to provide valid conclusions.
- CO5. select an appropriate power switching device and/or circuit for real time applications.
- CO6. apply the conceptual knowledge of power semiconductor drives in relevance to industry and society.
- CO7. commit to ethical principles and standards while exercising the practical investigations on power electronics and drives.
- CO8. work individually or in a group in the field of Power electronics and drives.
- CO9. communicate effectively in verbal and written form in relevance to power electronics and drives.

III B.Tech.- II Semester

(16BT60232) **POWER SYSTEM - I LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Course on Transmission & Distribution and Power System Analysis.

COURSE DESCRIPTION: Experimentation on Transmission and distribution systems; Load flow, Fault and Stability analysis.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on transmission & distribution systems and various types of power system analysis for experimental implementation.
- CO2. analyze, evaluate and relate experimental observations and measurements for validation.
- CO3. design a suitable measuring and testing setup for experimentation on power systems.
- CO4. interpret the data obtained from experimentation to provide valid conclusions
- CO5. select and apply appropriate technique for solving complex problems in the power systems.
- CO6. apply the conceptual knowledge of power systems in relevance to industry and society
- CO7. commit to ethical principles and standards while exercising the practical investigations on power system.
- CO8. work individually or in a group while exercising practical investigations in the field of power system analysis.
- CO9. communicate effectively in verbal and written form in relevance to power system.

III B.Tech.- II Semester
(16BT60233) **SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PREREQUISITES: All the courses of the program up to III B. Tech. - I Semester.

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES: Completion of the seminar work enables a successful student to demonstrate:

CO1. Knowledge on the seminar topic.

CO2. Analytical ability exercised during the seminar work.

CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.

CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.

CO5. Ability to function effectively as an individual as experienced during the seminar work.

CO6. Ability to present views cogently and precisely on the seminar topic.

CO7. Ability to engage in life-long learning as experience during the seminar work.

IV B.Tech - I Semester
(16BT70201) **POWER SYSTEM OPERATION AND CONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Transmission & Distribution and Control Systems.

COURSE DESCRIPTION: Load forecasting; Optimal operation of generators in thermal power station; Optimal scheduling of hydrothermal system; Unit commitment; Modeling of Power system components; Reactive power and Voltage control; Load frequency control.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on:

- load forecasting methods.
- characteristics, scheduling and optimal operation of thermal and hydro power plants
- unit commitment.
- modeling of power system components for LFC and AVR studies.
- concepts of reactive power and voltage control.
- load frequency control in single - and two-area systems.

CO2. analyze

- the criteria for optimal operation of thermal and hydro thermal plants with and without transmission losses.
- unit commitment of thermal units.
- compensation and tap settings required for reactive power and voltage control
- LFC parameters in single - and two-area power system.

CO3. design suitable strategy to control reactive power, voltage and LFC dynamics in power system.

CO4. evaluate various operational parameters for scheduling & economic operation and control of power system to provide viable solution.

CO5. apply appropriate tools and techniques for secured operation and control of power system.

CO6. apply the conceptual knowledge of power system operation and control in relevance to industry and society.

IV B. Tech. - I Semester
(16BT70402) **EMBEDDED SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Switching Theory and Logic Design and Computer Architecture and Organization

COURSE DESCRIPTION: Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge in
 - MSP430 Architecture, Pin out, Instruction set
 - High level programming
 - Usage of On-chip resources like ADC, DAC, Timers
 - Internet of Things related issues
- CO2. analyze various design issues regarding
 - Usage of on chip resources
 - Low power modes
 - Communication support
- CO3. design embedded systems using MSP430 series micro controllers to suit market requirements.
- CO4. solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.
- CO5. apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.
- CO6. reason out and practice professional engineering to deliver efficient and cost effective embedded based products to society.

IV B.Tech. - I Semester
(16BT70202) **SWITCHGEAR AND PROTECTION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Transformers and Induction Machines, Synchronous Machines and Transmission & Distribution.

COURSE DESCRIPTION: Overview of protection schemes; Fuses and circuit breakers; Electromagnetic, static and microprocessor based relays; Protection schemes for various components under various operating conditions; Neutral grounding.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - operation of various protective devices and schemes.
 - protection principles for power system components.
 - neutral grounding.
- CO2. analyzedifferent protective devices and protection schemes under various operating conditions.
- CO3. designproper protection scheme for different power sys tem components.
- CO4. Evaluate operating parameters and settings of protective devices in different protection schemes to provide feasible solutions.
- CO5. select and apply appropriate protective device and scheme for different scenarios.
- CO6. apply various grounding methods for safety of power system components and personnel.

IV B.Tech. - I Semester

(16BT70203) **ENERGY CONSERVATION AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Electrical Measurements and Transmission & Distribution.

COURSE DESCRIPTION: Principles of energy conservation, audit and management; Energy efficient motors, lighting, instruments and significance of energy economics.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - energy auditing practices.
 - energy conservation schemes.
 - energy economics and management.
- CO2. analyze
 - energy conservation measures.
 - energy auditing practices.
 - energy economics and management.
- CO3. design an appropriate energy conservation scheme for commercial and industrial applications.
- CO4. explore relevant methods of energy auditing in various industries and provide feasible solutions to conserve energy.
- CO5. select and apply appropriate technique for energy auditing and conservation.

IV B.Tech. - I Semester

(16BT70204) **FLEXIBLE AC TRANSMISSION SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Power Electronics and Transmission & Distribution.

COURSE DESCRIPTION: Conventional AC Power Transmission System; Real and Reactive Power Transmission; load and line compensation; Concepts of FACTS; Compensation using FACTS Devices and Controllers; Shunt Compensation, Series Compensation, Phase angle Regulation and Combined compensation.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - real and reactive power flow in conventional system.
 - concept of FACTS devices and controllers.
 - shunt and series compensation using FACTS devices.
 - phase angle regulation and combined compensation.
- CO2. analyze
 - stability and voltage profile of a compensated and un compensated transmission lines.
 - Voltage regulation, improvement of transient stability, prevention of voltage instability, power oscillation damping with various FACTS devices and controllers.
- CO3. design suitable compensation strategy for better voltage profile and secured operation of power system.
- CO4. solve problems of transmission system to provide feasible solutions.
- CO5. select and apply appropriate devices, schemes and techniques for real time applications in AC power transmission.

IV B.Tech. - I Semester
(16BT70205) **POWER SYSTEM AUTOMATION**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Course on Switchgear and Protection.

COURSE DESCRIPTION: Power system operation and control, Substation and Distribution automation; Deregulation and Restructuring of power system.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- real time operation and control of power system.
 - substation and distribution automation.
 - restructuring of power system.
- CO2. analyze
- various automation devices.
 - technical issues.
 - restructured model of power system.
- CO3. design a suitable architecture for substation automation.
- CO4. examine operational and technical issues to provide feasible solutions for substation and distribution automation.
- CO5. apply principles of DMS framework to integrate with real time power system.
- CO6. apply the conceptual knowledge of real time operation and control of power system in relevance to industry and society.

IV B.Tech. - I Semester
(16BT70206) **POWER SYSTEM RELIABILITY**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Courses on Multi-variable Calculus & Differential Equations and Transmission & Distribution.

COURSE DESCRIPTION: Overview of Probability theory; Study of network modelling and reliability functions; Assessment of repairable systems; Evaluation of generation system reliability, estimation of distribution system reliability indices.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- elements of probability theory and probability distributions.
 - types of failures, reliability block diagram reductions.
 - network reduction techniques and Markov modelling.
 - loss of generation, frequency and duration techniques.
 - distribution system reliability indices.
- CO2. analyze
- various probability distributions.
 - the network reduction techniques and Markov modelling.
 - frequency and duration techniques.
 - loss of generation, customer, load and energy oriented indices.
- CO3. design component/system for desired life expectancy and reliability.
- CO4. investigate various reliability indices and evaluate the power system performance to provide feasible solutions.
- CO5. select and apply appropriate mathematical tool for assessment of power system reliability indices.
- CO6. apply the conceptual knowledge of reliability engineering and its applications in relevance to industry and society.

IV B.Tech. - I Semester

(16BT70207) **ANALYSIS OF POWER ELECTRONIC CONVERTERS**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Courses on Electrical Circuits, Electronic Devices & Circuits, Analog Electronics Circuits, Linear and Digital ICs and Power Electronics.

COURSE DESCRIPTION: Advanced Power semiconductor devices; MOSFET and IGBT-Gate and base drive circuits; 3-, 6- and 12- pulse converters; Switching Regulators; Advanced PWM Techniques.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on the characteristics of various special power switching devices & various triggering methods for MOSFET and IGBT.
- CO2. analyze the performance of different power converters subjected to various loads.
- CO3. design the suitable switching regulators for appropriate power electronic applications.
- CO4. examine various configurations of power electronic circuits to provide feasible solutions.
- CO5. select an appropriate power semiconductor device and/ or circuit for real time applications.
- CO6. apply the conceptual knowledge of power semiconductor devices and/or circuits in relevance to industry.

IV B.Tech. - I Semester

(16BT70208) **POWER QUALITY**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Course on Transmission and Distribution

COURSE DESCRIPTION: Power quality terminology, power quality issues, classification; Different sources of power quality disturbances; Harmonic distortion; Principles for controlling harmonics; Power quality measuring equipment; Power quality monitoring standards; Impact of distributed generation on power quality.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - sources of power quality disturbances and issues.
 - power quality monitoring and measuring instruments.
 - power quality standards.
 - effect of distributed generation on power quality.
- CO2. analyze various power quality issues.
- CO3. design a suitable harmonic filter for commercial and industrial loads.
- CO4. investigate various power quality issues and provide feasible solutions for improvement of power quality.
- CO5. Select and use an appropriate equipment for monitoring and measurement of power quality.
- CO6. apply the conceptual knowledge of power quality in relevance to industry and society.

IV B.Tech. - I Semester

(16BT70209) **SMART GRID TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	--	3

PREREQUISITES: Course on Transmission and Distribution

COURSE DESCRIPTION: Smart grid benefits and requirements; Distribution management systems, smart substations, energy management systems; Smart meters and AMI; Power quality in smart grids; Communication channels and networks.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - smart grid initiatives and technologies
 - communication technologies for the smart grid
 - sensing, measurement, control and automation.

- CO2. analyze different communication channels and networks in smart grid.
 CO3. use modern techniques/tools to convert conventional grid to smart grid.
 CO4. apply principles of energy management systems to industrial applications.
 CO5. follow the protocols and standards for communication technologies.

IV B.Tech. - I Semester

(16BT70210) **SOFT COMPUTING TECHNIQUES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on DC Machines and Transmission and Distribution.

COURSE DESCRIPTION: Architectures of artificial neural networks; Learning strategies; Fuzzy set theory; Fuzzy systems design; Applications of neural networks and fuzzy systems; Genetic algorithms and its applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- learning rules, strategies and algorithms of artificial neural network.
 - fuzzy logic system.
 - genetic algorithms.
- CO2. analyze
- learning methods and algorithms of neural networks.
 - fuzzy & classical sets.
 - operators of genetic algorithms.
- CO3. design fuzzy systems, neural networks and genetic algorithms for desired specifications.
- CO4. evaluate electrical engineering problems using soft computing techniques to provide feasible solutions.
- CO5. select and apply suitable soft computing techniques to solve electrical engineering problems.
- CO6. apply the conceptual knowledge of soft computing techniques in relevance to industry and society.

IV B.Tech. - I Semester

(16BT6HS01) **BANKING AND INSURANCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate Knowledge in
- Tools and concepts of Banking and Insurance.
 - Basic Principles and concepts of Insurance and Banking.
 - e-fund transfers, e-payments and e-business models.
- CO2. develop skills in providing solutions for
- Online banking and e – payments...
 - Risk Management through insurance benefits the society at large.
 - Money management by leveraging on technology, banking and insurance services.
- CO3. exhibit conceptual soundness about banking and insurance, this would contribute to More employment opportunities.
- CO4. provide life skills for effective utilization of Banking and Insurance facilities.

IV B.Tech. - I Semester

(16BT6HS02) **BUSINESS COMMUNICATION AND CAREER SKILLS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Nature and scope of communication; Corporate communication; Writing business documents; Careers and resumes; Interviews.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
 - Corporate Communication
 - Main Stages of Writing Messages
 - Career Building
- CO2. analyze the possibilities and limitations of language in
 - Communication Networks
 - Crisis Management/Communication
- CO3. design and develop the functional skills for professional practice in Business Presentations & Speeches
- CO4. apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. function effectively as an individual and as a member in diverse teams.
- CO6. communicate effectively with the engineering community and society in formal and informal situations.

IV B.Tech. – I Semester

(16BT6HS03) **COST ACCOUNTING AND FINANCIAL MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Scope, Objectives and Elements of cost Accounting; Cost Sheet and Tender quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: concept of Risk and Return on Investment.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate Knowledge in
 - Elements of Costing.
 - Basic concepts of Financial Management.
 - Risk and Return
 - Significance of Cost Accountancy
 - Behavioral Finance
- CO2. develop skills in
 - Material, Labor, Overheads control.
 - Excellence and ability to minimize the cost of the organization
- CO3. develop effective Communication in Cost control and Financial Management.
- CO4. provide solutions for effective investment decisions.

IV B.Tech. – I Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate Knowledge in
- Schemes and institutions encouraging entrepreneurship.
 - Basic Principles and concepts of Accountancy.
 - Significance of entrepreneurship.
- CO2. develop skills in providing solutions for
- Personal excellence through financial and professional freedom.
 - Women entrepreneurship serving as contrivance in societal development
- CO3. develop critical thinking and evaluation ability.
- CO4. widens knowledge and build up attitude towards trouble shooting.
- CO5. demonstrate business acumen

IV B. Tech. – I Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PREREQUISITES:—

COURSE DESCRIPTION: Oral communications; Basic grammar; advanced grammar; basic writing; Business French (La Francais Commercial)

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. demonstrate knowledge in
- Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. analyze the possibilities and limitations of language, understanding
- Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. design and develop language skills for professional practice.
- CO4. apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. understand French culture and civilization.
- CO6. communicate effectively with the native French in day to day situation.

IV B.Tech. - I Semester

(16BT6HS06) **GERMAN LANGUAGE (Deutsch als Fremdsprache)**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. demonstrate knowledge in
- Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. analyze the possibilities and limitations of language, understanding
- Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. design and develop language skills for professional practice.
- CO4. apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. understand German culture and civilization.
- CO6. communicate effectively with the native German in day to day situation.

IV B.Tech. - I Semester

(16BT6HS07) **INDIAN CONSTITUTION**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, understanding for better professional practice and good citizenry.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. demonstrate knowledge in
- Parliamentary proceedings, laws, legislature, administration and its philosophy
 - Federal system and judiciary of India
 - Social problems and public services like central civil services and state civil services
 - Indian and international political aspects and dynamics
- CO2. develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen

IV B.Tech. - I Semester

(16BT6HS08) **INDIAN ECONOMY**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES: On successful completion of the course, the students will be able to

- CO1. demonstrate knowledge in
- Micro and Macro Economics.

- Traditional and Modern methods of Capital Budgeting.
 - Five year plans and NITI Aayog.
- CO2. analyze
- Capital Budgeting.
 - Value Analysis and Value Engineering.
 - Economic analysis
 - Law of supply and demand
- CO3. understand the nuances of project management and finance

IV B.Tech. - I Semester
(16BT6HS09) **INDIAN HERITAGE AND CULTURE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
- Human aspirations and values in Vedic culture.
 - Cultural aspects of Buddhism and Jainism
 - Unification of our country under Mourya's and Gupta's administrations
 - Socio Religious aspects of Indian culture
 - Reform movements and harmonious relations.
- CO2. apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts

IV B.Tech. - I Semester
(16BT6HS10) **INDIAN HISTORY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on evolution and history of India as a nation
- CO2. analyze social and political situations of past and current periods
- CO3. practice in career or at other social institutions morally and ethically

IV B.Tech. - I Semester
(16BT6HS11) **PERSONALITY DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
- Self-Management

- Planning Career
- CO2. analyze the situations based on
 - Attitudes
 - Thinking strategies
- CO3. design and develop the functional skills for professional practice in
- CO4. function effectively as an individual and as a member in diverse teams.
- CO5. communicate effectively in public speaking in formal and informal situations.

IV B.Tech. - I Semester (16BT6HS12) **PHILOSOPHY OF EDUCATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
 - Philosophy of Engineering education.
 - Philosophical Methods.
 - Knowledge acquiring methods.
 - Engineering education and responsibilities.
- CO2. understand the impact of Outcome Based Education for effective educational outcomes
- CO3. apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

IV B.Tech. - I Semester (16BT6HS13) **PUBLIC ADMINISTRATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
 - Public Policy.
 - Good Governance.
 - E-governance.
 - Development Administration.
- CO2. analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. design and develop solutions in e-governance models to find and provide opportunities in e-governance.
- CO4. adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. understand the significance of Administrative Development in finding professional engineering solutions by probing
 - Bureaucracy.
 - Role of civil society.

IV B.Tech. - I Semester
(16BT60112) **BUILDING MAINTENANCE AND REPAIR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. analyze failures, repair and rehabilitation techniques.
- CO3. solve complex building maintenance problems through proper investigations and interpretation.
- CO4. use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. provide solutions for building maintenance and repair problems considering health and safety.
- CO6. consider environmental sustainability in building maintenance and repair.
- CO7. maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

IV B.Tech. - I Semester
(16BT60113) **CONTRACT LAWS AND REGULATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. analyze contracts and tenders.
- CO3. address the legal issues in contracts and tenders.
- CO4. follow laws and regulations in the preparation of contracts and tenders.
- CO5. prepare contract and tender documents as per the standards.
- CO6. consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

IV B.Tech. - I Semester
(16BT60114) **DISASTER MITIGATION AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of course, students will be able to:

- CO1. demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. analyze disasters and their vulnerability.
- CO3. design strategies for effective disaster mitigation.
- CO4. address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. use appropriate methods in disaster mitigation and management.

- CO6. use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. solve disaster related issues considering environment.
- CO8. consider economical issues in disaster management.

IV B.Tech - I Semester

(16BT60115) **ENVIRONMENTAL POLLUTION AND CONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. recommend suitable solutions to complex environmental pollution problems.
- CO4. use appropriate remedial technique to solve environmental pollution problems.
- CO5. understand the effects of environmental pollution on human health and vegetation.
- CO6. encourage sustainable development through implementation of pollution control measures.
- CO7. maintain IS Codes for environmental quality control.

IV B.Tech - I Semester

(16BT60116) **PLANNING FOR SUSTAINABLE DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. develop suitable methods and systems for sustainable development.
- CO4. use appropriate techniques in solving issues related to sustainable development.
- CO5. provide solutions to problems associated with sustainable development considering society.
- CO6. consider environment while planning sustainable development.
- CO7. communicate effectively on sustainable development issues through media and education.
- CO8. consider economical issues while planning for sustainable development.

IV B.Tech. - I Semester

(16BT60117) **PROFESSIONAL ETHICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the principles of ethics, importance of professional values and social responsibility.

- CO2. analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. use appropriate theories in resolving issues pertain to professional ethics.
- CO6. understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. practice engineering with professionalism, accountability and ethics.
- CO8. function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. write reports without bias and give instructions to follow ethics.

IV B.Tech. - I Semester (16BT60118) **RURAL TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Rural technology; Non conventional energy; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the knowledge on technologies for rural development.
- CO2. analyze various technologies available which are appropriate for rural development.
- CO3. carryout feasibility study on the public and private partnership for rural development.
- CO4. develop and use latest technologies for rural development.
- CO5. address health and safety issues while choosing technologies for rural development.
- CO6. educate the rural populace on the positive impacts of bio-fertilisers and usage of agro machinery in agriculture.

IV B.Tech - I Semester (16BT60308) **GLOBAL STRATEGY AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the knowledge on Strategic management, Research & development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. develop the products and production process by using research and development strategies.
- CO4. conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. apply ethics in strategic decision making.

IV B.Tech - I Semester

(16BT60309) **INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

IV B.Tech. - I Semester

(16BT60310) **MANAGING INNOVATION AND ENTREPRENEURSHIP**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2. analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3. develop a comprehensive and well planned business structure for a new venture.
- CO4. conduct investigation on complex problems, towards the development of Project.
- CO5. apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6. apply ethics in constructive innovation framework.
- CO7. exhibit professionalism by employing modern project management and financial tools.

IV B.Tech. - I Semester

(16BT60311) **MATERIALS SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semiconductors; Strengthening mechanisms of

metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate the knowledge on concepts of fundamental science and engineering principles relevant to materials.
- CO2. analyze the structures of various types of Ferrous, Non-ferrous alloys influencing various engineering applications.
- CO3. conduct investigations to select suitable materials with desired properties for engineering applications.
- CO4. use phase diagrams to interpret the data regarding microstructure of materials.
- CO5. consider health and safety issues while providing materials to real time applications.
- CO6. use composite materials that reduce material waste in design and manufacturing for sustainability.

IV B.Tech. - I Semester

(16BT70412) **GREEN TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. deploy conceptual knowledge in green technologies pertaining to engineering practice.
- CO2. analyze various green technologies for engineering practice.
- CO3. provide green solutions to engineering problems.
- CO4. apply various green techniques in the engineering practice.
- CO5. consider health and safety issues while providing green solutions to the society.
- CO6. understand issues related to environment sustainability.
- CO7. apply ethical standards for environmental sustainability in the engineering practice.

IV B.Tech. - I Semester

(16BT70413) **INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
 - Nanoscale technology.
 - Difference between micro and nanotechnology
 - Classification of Nanostructure and Nanomaterial
 - Fabrication of various nanomaterials and nanostructures.
- CO2. analyze numerical and analytical problems in
 - Nanomaterial size by using Scanning Electrons
 - Microscope and X-Ray diffraction
- CO3. design and fabricate devices based on nanostructures like
 - Nano solar cell
 - Nano cantilever
 - Nano bio-sensor
- CO4. synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.

- CO5. select appropriate technique for fabrication of nanostructures and Nano composites.
 CO6. apply ethical standards and legal issues while using chemical substances infabrication of new nanostructures.

IV B.Tech. - I Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in
- Systems Process and System Design
 - Systems Analysis and Modeling
 - System Development Life Cycle
 - Design Management and Maintenance Tools.
- CO2. analyze system Process and estimate the given models by using case tools.
 CO3. design and develop a model to the organizational systems.
 CO4. solve complex problems related to engineering systems and produce accurate results
 CO5. apply object oriented techniques for modeling dynamic systems.
 CO6. contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

IV B.Tech.- I Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators
 CO2. analyze the properties of materials and identify its suitability for MEMS devices.
 CO3. design MEMS devices that meet desired specifications and requirements.
 CO4. analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
 CO5. use modern techniques in micro manufacturing process.
 CO6. develop efficient and cost effective MEMS based products for society.

IV B.Tech. – I Semester

(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber

Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge in Cyber security, Cybercrimes and its related laws in Indian and Global Act.
- CO2. analyze the legal perspectives and laws related to cybercrimes in Indian context.
- CO3. apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cybercrimes.
- CO4. solve Cyber security issues using privacy policies.
- CO5. use antivirus tools to minimize the impact of cyber threats.
- CO6. follow security standards for the implementation of Cyber Security and laws.

IV B.Tech. - I Semester

(16BT61505) BIO-INFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2. analyze biological sequences for Homology Modeling.
- CO3. apply clustering methods for Phylogenetic trees.
- CO4. solve bio sequencing problems using dynamic programming.
- CO5. select and apply appropriate techniques and tools to structure Prediction.

IV B.Tech. - I Semester

(16BT70231) POWER SYSTEM - II LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Matrices and Numerical Methods, Electric Circuits and Transmission & Distribution.

COURSE OUTCOMES: on successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - formation of network matrices and parameters of power system.
 - various load flow methods and faults.
 - load frequency control and stability of power system.
- CO2. analyze
 - the formation of power system network matrices.
 - the power flow solutions using various load flow techniques.
 - various types of power system faults.
 - load frequency problem.
 - stability for the stable operation of power system.
- CO3. design a suitable operating and control strategy to meet the required specifications of power system.
- CO4. develop programming skills to solve and simulate power system problems to provide viable solution.
- CO5. select and apply appropriate technique for solving complex problems in the power systems.
- CO6. apply the conceptual knowledge of power systems in relevance to industry and society.
- CO7. commit to ethical principles and standards while exercising the practical investigations on power system.
- CO8. work individually or in a group in the field of power systems.
- CO9. communicate effectively in verbal and written form in power system domain.

IV B.Tech. - I Semester
(16BT70432) **EMBEDDED SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Course on Embedded systems.

COURSE DESCRIPTION: IDE for Embedded System Design using MSP430; Interfacing Switch & LED; Timers-WDT, Configuring, Programming; ADC-usage; Power down modes; DAC; PWM Generator; Networking - SPI, Wi-Fi.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. demonstrate knowledge in designing complex energy efficient embedded systems.
- CO2. analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC, Comparator, SPI.
- CO3. design embedded systems to suit market requirements.
- CO4. solve engineering problems by proposing potential solutions using industry choice advanced Microcontrollers.
- CO5. apply appropriate techniques, resources, and CCSV6 based IDE for modeling embedded systems with understanding of limitations.
- CO6. provide embedded system solutions for societal needs.
- CO7. work individually and in a group to develop embedded systems.
- CO8. communicate effectively in oral and written form in the field of embedded systems.

IV B.Tech. – I Semester
(16BT70232) **COMPREHENSIVE ASSESSMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to demonstrate:

- CO1. knowledge in the courses of the program.
- CO2. analytical ability in the courses of the program.
- CO3. design skills in the courses of the program.
- CO4. ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. ability to function effectively as an individual in the courses of the program.
- CO10. ability to present views cogently and precisely in the courses of the program.
- CO11. ability to engage in life-long learning in the courses of the program.

IV B.Tech. - II Semester
(16BT80231) **PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study

and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

- CO1. knowledge on the project topic.
- CO2. analytical ability exercised in the project work.
- CO3. design skills applied on the project topic.
- CO4. ability to investigate and solve complex engineering problems faced during the project work.
- CO5. ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
- CO6. ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
- CO7. understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. ability to apply ethics and norms of the engineering practice as applied in the project work.
- CO9. ability to function effectively as an individual as experienced during the project work.
- CO10. ability to present views cogently and precisely on the project work.
- CO11. project management skills as applied in the project work.
- CO12. ability to engage in life-long learning as experience during the project work.

I B. Tech. - I Semester
(16BT1BS02) ENGINEERING PHYSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION: Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.
- CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
- CO3: Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
- CO4: Develop problem solving skills in engineering context.
- CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser

I B. Tech. – I Semester
(16BT1BS03) MATRICES AND NUMERICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire basic **knowledge** in
- (a) Finding the rank of matrices and analyzing them.
 - (b) Solving algebraic and transcendental equations by various numerical methods.
 - (c) Fitting of various types of curves to the experimental data.
 - (d) Estimating the missing data through interpolation methods.
 - (e) Identification of errors in the experimental data
 - (f) Finding the values of derivatives and integrals through various numerical methods.
 - (g) Solving differential equations numerically when analytical methods fail.
- CO2: Develop skills in **analyzing** the
- (a) methods of interpolating a given data
 - (b) properties of interpolating polynomials and derive conclusions
 - (c) properties of curves of best fit to the given data
 - (d) algebraic and transcendental equations through their solutions
 - (e) properties of functions through numerical differentiation and integration
 - (f) properties of numerical solutions of differential equations
- CO3: Develop skills in **designing** mathematical models for
- (a) Fitting geometrical curves to the given data
 - (b) Solving differential equations
 - (c) Constructing polynomials to the given data and drawing inferences.
- CO4: Develop numerical skills in **solving the problems** involving
- (a) Systems of linear equations
 - (b) Fitting of polynomials and different types of equations to the experimental data
 - (c) Derivatives and integrals
 - (d) Ordinary differential equations
- CO5: Use relevant numerical **techniques** for
- (a) Diagonalising the matrices of quadratic forms

- (b) Interpolation of data and fitting interpolation polynomials
- (c) Fitting of different types of curves to experimental data
- (d) obtaining derivatives of required order for given experimental data
- (e) Expressing the functions as sum of partial fractions

I B. Tech. - I Semester

(16BT1BS04) MULTI - VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire knowledge in
- (a) Higher order Differential equations
 - (b) Maximum and minimum values for the functions of several variables
 - (c) Double and triple integrals
 - (d) Differentiation and integration of vector functions.
 - (e) Line and surface volume
 - (f) transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2: Develop skills in analyzing the
- (a) methods for differential equation for obtaining appropriate solutions,
 - (b) Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - (c) The variations in the properties of functions near their stationary values
 - (d) Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3: Develop skills in designing mathematical models for
- (a) R-C and L-R-C oscillatory electrical circuits
 - (b) Heat transfer and Newton's law of cooling
 - (c) Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces
- CO4: Develop analytical skills in solving the problems involving
- (a) Newton's law of cooling
 - (b) non homogeneous linear differential equations
 - (c) maximum and minimum values for the functions
 - (d) lengths of curves, areas of surfaces and volumes of solids in engineering
 - (e) transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5: Use relevant mathematical techniques for evaluating
- (a) various types of particular integrals in differential equations
 - (b) stationary values for multi variable functions
 - (c) multiple integrals in change of variables
 - (d) integrations of vector functions.

I B. Tech. - I Semester

(16BT10241) NETWORK ANALYSIS S

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	0	

PRE-REQUISITES: --

COURSE DESCRIPTION: Basic concepts of electric circuits; Voltage - Current relationship of basic circuit elements; Mesh and Nodal analysis; Network theorems; AC circuits; Two-port network parameters; Transient analysis.

COURSE OUTCOMES: After successful completion of the course, student will be able to

- CO1: Demonstrate knowledge in
- voltage and current relationships for various electric elements.
 - network reduction techniques.
 - concepts of AC fundamentals and single phase circuits.

- concepts of two-port networks.
 - various network theorems.
 - transient behavior of the circuits.
- CO2: Analyze
- a circuit using conventional, mesh and nodal concepts.
 - a two-port network for various network parameters.
 - various types of two-port networks.
 - the transient behavior of the circuits.
- CO3: Design circuits to meet the required specifications
- CO4: Evaluate
- electrical circuits for voltage, current and power using conventional circuit analysis methods and network theorems.
 - transient response.
 - two-port networks.

I B. Tech. - I Semester **(16BT10501) PROGRAMMING IN C**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION: Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1: Demonstrate knowledge in:
- o Elements of C Language
 - o Selection and Repetition statements.
 - o Arrays, Strings and Functional statements.
 - o Derived data types, Files and Pointers
- CO2: Analyze complex engineering problems to develop suitable solutions
- CO3: Design algorithms for specified engineering problems
- CO4: Use appropriate 'C' language constructs for solving engineering problems
- CO5: Write programs using 'C' language to implement algorithms

I B. Tech. I-Semester **(16BT1BS32) ENGINEERING PHYSICS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION: Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.
- CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.
- CO3: Develop skills in designing electronic circuits using semiconductor components.
- CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.
- CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B. Tech. - I Semester

(16BT10232) ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: NIL

COURSE DESCRIPTION: Identification and specifications of various Electric and Electronic devices; analysis of various series, parallel and series-parallel electrical circuits; develop various electrical circuits for domestic and industrial applications.

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1: Demonstrate knowledge on various Electrical and Electronic Devices.

CO2: Analyze various series and parallel electrical circuits.

CO3: Design and develop various electrical circuits for domestic and industrial applications.

CO4: Function effectively as individual and as a member in a team.

CO5: Communicate effectively both oral and written forms

I B. Tech. - I Semester

(16BT10251) NETWORK ANALYSIS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: NIL

COURSE DESCRIPTION: Verification of KVL, KCL and network theorems; analysis of AC and DC circuits; determination of resonant frequency in series and parallel RLC circuits; evaluation of transients

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1: Demonstrate knowledge in

- Identification of various circuit elements and their values.
- Concepts of electric circuits and two-port networks.

CO2: Analyze and relate physical observations and measurements in electric circuits to theoretical perception.

CO3: Design circuit parameters to meet the required specifications.

CO4: Demonstrate skills in evaluating and interpret

- Various circuit parameters using conventional and network theorems
- Network parameters

CO5: Function effectively as individual and as a member in a team.

CO6: Communicate effectively in oral format and prepare laboratory reports.

I B. Tech. - I Semester

(16BT10531) PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:- A course on "Programming in C"

COURSE DESCRIPTION: Hands on practice in developing and executing simple programs using C Programming constructs— Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Demonstrate practical knowledge of using C language constructs:

- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2: Analyze problems to develop suitable algorithmic solutions

CO3: Design Solutions for specified engineering problems

- CO4: Use appropriate 'C' language constructs for solving engineering problems
 CO5: Implement and execute programs using 'C' language
 CO6: Document programs and communicate effectively while conducting Professional transactions.

I B. Tech. - II Semester (16BT1HS01) Technical English

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1: Demonstrate knowledge in

- ◆ Process of communication
- ◆ Modes of listening
- ◆ Paralinguistic features
- ◆ Skimming and Scanning
- ◆ Elements of style in writing

CO2: Analyze the possibilities and limitations of language for understanding

- ◆ Barriers to Communication
- ◆ Barriers to Effective Listening
- ◆ Barriers to Speaking
- ◆ Formal and metaphorical language

CO3: Design and develop functional skills for professional practice.

CO4: Apply writing skills in preparing and presenting documents

CO5: Function effectively as an individual and as a member in diverse teams.

CO6: Communicate effectively with the engineering community and society in formal and informal situations.

I B. Tech. - II Semester (16BT1BS01): ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.

CO2: Develop analytical skills in:

- a. Determination of hardness of water.
- b. Determination of viscosity, flame and fire points, cloud and pour points.

CO3: Develop designing skills in:

- a. Synthesis of engineering plastics.
- b. Chemical methods for the synthesis of Nano materials.

CO4: Develop skills for providing solutions through:

- a. Mitigation of hardness of water.
- b. Newer Nanomaterials and engineering plastics for specific applications

CO5: Acquire awareness to practice engineering in

compliance to modern techniques such as:

- a. Nalgonda technique for defluoridation of water
- b. Electroplating technique for control of corrosion.

CO6: Acquire awareness to societal issues on:

- a. Quality of water.
- b. Bio-diesel
- c. Chemical materials utility and their impact.

I B. Tech. - II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z – transforms; partial differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO1: Acquire basic knowledge in

- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations

CO2: Develop skills in analyzing the

- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO3: Develop skills in designing mathematical models for

- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z- transforms and difference equations

CO4: Develop analytical skills in solving the problems involving

- (a) Fourier series and Fourier transforms
- (b) Laplace transforms
- (c) Z-transforms and difference equations
- (d) Heat transfer and wave motion

CO5: Use relevant transformation techniques for

- (a) Obtaining Fourier transforms for different types of functions
- (b) Laplace transforms
- (c) Z- transforms
- (d) Partial differential equations

I B. Tech. - II Semester

(16BT20401) ELECTRONIC DEVICES AND CIRCUITS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Engineering Physics.

COURSE DESCRIPTION: Characteristics of general and special purpose electronic devices; Rectifiers; filters and regulators; Biasing and small signal analysis of BJT and FET.

COURSE OUTCOMES: On successful completion of this course the students will be able to:

CO1: Demonstrate knowledge in

- p-n junction diode and its characteristics
- Zener diode and its characteristics
- Rectifiers, Filters and Regulators
- Characteristics of BJT, FET, MOSFET and special purpose electronic devices.

CO2: Analyze numerical and analytical problems in

- Rectifiers using Filters

- Regulated Power Supplies
- Transistor biasing circuits and stabilization
- Transistor amplifiers
- FET biasing circuits and amplifiers

CO3: Design electronic circuits such as

- Rectifiers with and without filters
- Voltage regulators
- BJT and FET biasing circuits
- BJT and FET amplifiers

CO4: Solve engineering problems and arrive at solutions pertaining to electronic circuits.

CO5: Select appropriate technique for transistor modeling.

I B. Tech. - II Semester (16BT20541) Foundations of Data Structures

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on “Programming in C”

COURSE DESCRIPTION: Concepts of sorting: sorting by exchange, sorting by distribution, sorting by merging and data structures: stacks, queues, linked lists, trees, graphs, and hash table.

COURSE OUTCOMES: On successful completion of this course the students will be able to:

CO1: Gain knowledge in Sorting techniques, Linear and Non- linear Data Structures.

CO2: Analyze the performance of sorting techniques and their relationship to Data Structures.

CO3: Design appropriate hashing function for a given application and develop programs to implement Linear and Non-Linear data structures

CO4: Apply appropriate data structure to provide solutions for real time problems using C Language.

I B. Tech. - II Semester (16BT1HS31) ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES: On successful completion of this course the students will be able to:

CO1: Demonstrate knowledge in

- Phonetics
- Information Transfer

CO2: Analyze the situations in professional context by using

- Vocabulary
- Grammar

CO3: Design and develop functional skills for professional practice.

CO4: Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.

CO5: Function effectively as an individual and as a member in diverse teams through

- Extempore talk and
- Role Play

CO6: Communicate effectively in public speaking in formal and informal situations.

CO7: Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I B. Tech. - II Semester

(16BT1BS31): ENGINEERING CHEMISTRY LABORATORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

- CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.
- CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
- CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.
- CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, PH of a solution, determination of viscosity of lubricants and estimation of iron in cement.
- CO5: Provide solutions for environmental issues through determination of quality of water.

I B. Tech. - II Semester

(16BT10331) COMPUTER AIDED ENGINEERING DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	6	3

PRE-REQUISITES: None

COURSE DESCRIPTION: Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B. Tech. - II Semester

(16BT20551) Foundations of Data Structures Lab

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Foundations of Data Structures"

COURSE DESCRIPTION: Hands on programming to implement data structures - Linked lists, Stacks, Queues, Trees, Search trees, Sorting, and Hashing in C Language.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1: Gain practical knowledge on stacks, queues, trees, graphs and Hashing Techniques
- CO2: Identify suitable data structure to solve engineering problems.
- CO3: Design solutions for complex engineering problems using linear and non-linear data structures.

- CO4: Develop algorithms leading to multiple solutions by conducting investigations of complex problems.
 CO5: Apply 'C' language as a tool for implementing linear and non linear data structures
 CO6: Communicate effectively by writing Programs and document practical work.

II B. Tech. – I Semester **(16BT3HS01) ENVIRONMENTAL STUDIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on Engineering Chemistry

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
 CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
 CO3. Develop strategies for environmental pollution control and natural resource management.
 CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
 CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
 CO6. Understand the impact of social issues and population on environment.
 CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
 CO8. Follow environmental protection laws for sustainable development.
 CO9. Communicate effectively on environmental issues in the form reports.

II B.Tech. - I semester **(16BT3BS02) SPECIAL FUNCTIONS AND COMPLEX ANALYSIS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate/senior secondary Mathematics

COURSE DESCRIPTION: Beta, Gamma functions and their properties; Limits continuity and analyticity of complex functions; Integration, power series, singularities, residues; conformal mapping.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Acquire knowledge in
- Beta and Gamma functions
 - Expressing complex functions in power series
 - Differentiation and integration of complex functions
 - Conformal mappings and bilinear transformations
 - Expressing complex functions in terms of graphs and power series
- CO2. Develop skills in analyzing the
- The properties exhibited by complex functions in Argand plane
 - Properties of real integrals through complex variable techniques
 - The properties of improper integrals through residue theory
 - Conformal transformations of complex valued functions for inferences
 - The properties of complex functions by expressing them in power series and graphs
- CO3. Develop skills in designing mathematical models involving
- Integrals of complex variable functions
 - Improper integrals using beta and gamma functions
 - Residue theory of complex functions
 - Power series expansions of complex variable functions
 - Transformations of complex variable functions

- Fluid flow patterns and flux functions.
- CO4. Develop analytical skills in providing solutions for problems involving
- Fluid, Electrical and Magnetic Potential functions
 - Integration of complex functions
 - Improper real integrals
- CO5. Use relevant Complex variable techniques for
- Residues and integrals of complex functions.
 - Improper real integrals through complex functions
 - Techniques of Beta and Gamma functions to improper integrals

II B. Tech. – I Semester

(16BT31001) ELECTRICAL AND ELECTRONIC MEASUREMENTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Network Analysis, Engineering Physics.

COURSE DESCRIPTION: Construction and principle of operation of Ammeters, Voltmeters, Ohmmeters; Potentiometers; Power meter; Power Factor meter; Energy Meters; Design of Bridges - AC, DC, Frequency and Time measurements.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in construction and Principle of operation of different instruments used for measurement of
- Voltage
 - Current and Resistance
 - Power
 - Power factor
 - Energy measurement
 - Frequency and time
- CO2. Analyze the performance characteristics of various measuring instruments.
- CO3. Design instruments and circuits for measurement of Power, Energy, Power factor, Voltage, Current, Resistance, Capacitance and Inductance.
- CO4. Interpret and synthesize data obtained from measuring systems to provide valid conclusions.
- CO5. Select appropriate technique to measure Power, Energy, Power factor, Voltage, Current, Resistance, Capacitance and Inductance.
- CO6. Apply contextual knowledge to develop measuring instruments used in domestic and industries.

II B. Tech. – I Semester

(16BT31002) SENSORS AND TRANSDUCERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Engineering Physics.

COURSE DESCRIPTION: Units and standards; Static and dynamic characteristics of transducers; Working principle of resistive, inductive, capacitive, self-generating and other sensors; Applications of sensors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on principles of sensors and transducers with their characteristics.
- CO2. Apply analytical skills to determine the response of sensors for change in physical parameters.
- CO3. Solve the problems pertaining to RTD, Thermistors, piezoelectric, capacitive and inductive sensors.
- CO4. Select an appropriate sensor to measure the physical parameter for specific application.
- CO5. Apply the principles of resistive, inductive, capacitive, self-generating and other sensors for measuring real time physical parameters in industries.
- CO6. Follow the ethical standards while using measuring instruments.

II B. Tech. – I Semester

(16BT30403) SWITCHING THEORY AND LOGIC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Number system and Boolean algebra; Minimization; Analysis and synthesis of digital circuits; Asynchronous Sequential Logic & Programmable Memories.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge in
 - Conversion of number systems, Binary Codes.
 - Basic theorems, properties and postulates of Boolean algebra.
 - Minimization of switching functions using Map method and Tabular method.
 - Combinational and sequential circuits.
 - Realization of Boolean functions using PLDs.
- CO2. Analyse combinational and sequential circuits.
- CO3. Design and develop various combinational, sequential circuits and PLDs.
- CO4. Solve problems and arrive at solutions pertaining to Digital Electronics.
- CO5. Apply minimization techniques to asynchronous and synchronous designs and suggest appropriate design for engineering solutions.
- CO6. Apply appropriate logic functions to obtain optimized designs useful for the society.

II B. Tech. – I Semester

(16BT30241) ELECTRICAL TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Network Analysis, Engineering Physics.

COURSE DESCRIPTION: Analysis of phase & line quantities and measurement of power in three phase system; Constructional details, operation, performance evaluation and applications of DC & AC machines; Testing of DC machines and Transformers; Special machines and single phase transformers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
 - Construction and operation of various electrical machines
 - Measurement of power in three-phase system
 - Applications of various types of electrical machines
- CO2. Analyze
 - The operation and performance of various electrical machines
 - The polyphase circuit for measurement of power
- CO3. Design suitable accessories / controllers for various machines to meet the nominal specifications.
- CO4. Solve engineering problems pertaining to various machines and provide feasible solutions.
- CO5. Select appropriate control techniques for various electrical machines used in domestic and industrial applications.
- CO6. Apply the conceptual knowledge of various electrical machines in relevance to industry and society.

II B. Tech. – I Semester

(16BT30431) BASIC ELECTRONICS AND DIGITAL DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Electronic Devices and Circuits, Switching Theory and Logic Design.

COURSE DESCRIPTION: Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Combinational Circuits; Realization of Flip-flops; Sequential Circuits; Demonstration on VHDL Programme.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in different electronic devices, analog and digital circuits.
- CO2. Analyze the characteristics of different electronic devices and circuits like
 - Diodes-PN Junction Diodes, Zener Diodes, SCR
 - Transistors-BJT, FET, UJT
 - Combinational Circuits-HA, FA
 - Flip Flops-JK FF, D FF
 - Sequential Circuits -Counters
- CO3. Design electronic circuits like FET Amplifiers, Combinational Circuits and Sequential Circuits.
- CO4. Solve engineering problems with better Electronic circuits.
- CO5. Work individually and also in a group in the area of Analog and Digital circuits.
- CO6. Communicate verbally and in written form in the area of Electronic Devices and circuits.

II B. Tech. – I Semester

(16BT31031) MEASUREMENTS AND TRANSDUCERS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Sensors and Transducers, Electrical and Electronic Measurements.

COURSE DESCRIPTION: Measurement of parameters like voltage, resistance, inductance, capacitance, displacement, pressure, force, temperature and weight.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
 - Measuring instruments
 - Principles of Sensors and transducers
 - AC and DC bridges
- CO2. Analyze the operation and performance of measuring instruments and transducers.
- CO3. Design circuits for measurement of Voltage, Current, resistance, capacitance and Inductance.
- CO4. Interpret and synthesize the data obtained from measurements and provide valid conclusions.
- CO5. Select and apply appropriate sensor and measuring technique to measure the physical parameter.
- CO6. Understand the working of various sensors and transducers and provide engineering solutions for societal use.
- CO7. Follow ethical principles in designing circuits for measurement of physical parameters.
- CO8. Do experiments related to measurement of electrical and physical parameters effectively as an individual and as a member in a group.
- CO9. Communicate verbally and in written form in the area of measurements and instrumentation.

II B. Tech. – I Semester (16BT30251) ELECTRICAL TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Electrical Technology.

COURSE DESCRIPTION: Construction, operation, types, performance evaluation of DC & AC machines and transformers; Necessity of starter for DC motors; Three phase power measurement.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
 - Construction, operation of DC & AC machines and transformers.
 - Starting and speed control of DC motors.
 - Testing of DC & AC machines and transformers.
 - Characteristics of DC & AC machines and transformers.
 - Measurement of three phase power.
 - Applications of DC & AC machines and transformers.
- CO2. Analyze the operation and performance of DC & AC machines, transformers and three phase system for various operating conditions.
- CO3. Design the circuit with suitable accessories / controllers for desired operation conditions of DC & AC machines.
- CO4. Interpret and synthesize the data obtained from experimentation on DC & AC machines, transformers and three phase system and provide valid conclusions.
- CO5. Select and apply appropriate technique for testing and control of DC & AC machines and transformers useful in industry.
- CO6. Apply the conceptual knowledge of electrical machines in relevance to industry and society.
- CO7. Commit to ethical principles and standards while exercising the practical investigations on electrical machines.
- CO8. Work individually or in a group while exercising practical investigations in the field of electrical machines.
- CO9. Communicate effectively in verbal and written form in relevance to electrical machines.

II B. Tech. – II Semester (16BT50201) CONTROL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Multivariable Calculus and Differential Equations, Transformation Techniques and Partial Differential Equations.

COURSE DESCRIPTION: Concepts of control system; transfer function of various physical systems; time response analysis; frequency response analysis; controller design; state space analysis.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
 - The concepts of open and closed loop control systems.
 - Stability analysis in time and frequency domain.
 - Controllers and compensators to meet the desired specifications.
 - State variable techniques.
- CO2. Analyze
 - Time and frequency response of second order systems.
 - Stability analysis using root-locus, bode and Nyquist plots.
 - Controllers and compensators to meet the desired response.
 - State space representation from transfer function.
- CO3. Design a compensator to meet the design specifications of control system.
- CO4. Solve problems pertaining to control systems to provide feasible solutions in real time environment.
- CO5. Select appropriate techniques to solve control system problems in relevance to industry.
- CO6. Apply the conceptual knowledge of control systems in domestic and industrial applications.

II B. Tech. – II Semester

(16BT30401) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Electronic Devices and Circuits.

COURSE DESCRIPTION: Single Stage Amplifiers; Multi-Stage amplifiers; Frequency Response; Feedback Amplifiers; Oscillators; Large Signal Amplifiers; Tuned Amplifiers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Single Stage Amplifiers
 - Multi Stage Amplifiers.
 - BJT Frequency Response.
 - Feedback Amplifiers.
 - Power Amplifiers.
 - Tuned Amplifiers.
- CO2. Perform analysis of electronic circuits for meeting de fined specifications.
- CO3. Design and develop electronic circuits such as Feedback Amplifiers, Oscillators and Poweramplifiers with given specifications.
- CO4. Solve problems pertaining to electronic circuit design.
- CO5. Select an Amplifier circuit for a specific electronic sub- system.
- CO6. Apply course knowledge to assess societal issues and understand the consequent responsibilities relevant to the professional engineering practice using electronic circuits.

II B. Tech. – II Semester

(16BT41001) INDUSTRIAL INSTRUMENTATION - I

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Sensors and Transducers, Electrical and Electronic Measurements.

COURSE DESCRIPTION: Measurement of Force, Weight, Torque, Pressure, Velocity, Acceleration, Sound and Temperature.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge of construction and working principles of different sensors for use in industrial instruments.
- CO2. Identify, formulate and analyze different types of sensors for various industrial applications.
- CO3. Design suitable sensors for desired parameter measure ment in industry.
- CO4. Solve engineering problems pertaining to measurement of Force, Torque, Velocity, Acceleration, Pressure and Temperature to provide feasible solutions.
- CO5. Select appropriate sensor and measuring techniques for the measurement of industrial parameters.

II B. Tech. – II Semester

(16BT41002) LINEAR AND DIGITAL ICs

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Electronic Devices and Circuits, Switching Theory and Logic Design.

COURSE DESCRIPTION: Differential Amplifier; Characteristics of Operational Amplifiers; Linear & Non-Linear Applications of Op-Amp; IC 555 timer and phase locked loops; Application of PLL; A-D & D-A Converters; CMOS and Bipolar Logic Interfacing; HDL with combinational and sequential logic design.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Op-amp operation and applications.

- Timer & PLL circuits.
 - A-D & D-A Converters
 - CMOS and Bipolar logic Interfacing.
 - HDL design and programming.
- CO2. Analyze
- Op-amp based circuits.
 - Timers for various circuits.
 - Different logic families.
- CO3. Design
- Circuits using Op-amps.
 - Logic gates using CMOS.
 - Combinational and sequential circuits.
- CO4. Solve problems in
- Evaluating parameters of Op-amp based circuits.
 - Programming of various combinational and sequential logic design.
- CO5. Apply appropriate modeling technique to suit IC Design.
- CO6. Understand the impact of design and use of Linear and Digital ICs in the development of efficient and cost effective products.

II B. Tech. – II Semester (16BT30402) SIGNALS AND SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Transformation Techniques and Partial Differential Equations.

COURSE DESCRIPTION: Analysis of signals and systems; Representation of signals using Fourier series and Fourier transforms; Time-Domain and Frequency-Domain aspects of signals and systems; concept of convolution and correlation; Sampling and types of sampling; Laplace transform of signals; Z-Transform of sequences.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Representation of signals and systems.
 - Fourier series representation of periodic signals
 - Fourier transform of signals
 - Convolution and correlation of functions
 - Laplace transform
 - Sampling Process
 - Z-Transform
- CO2. Analyze various continuous and discrete time signals and systems in time and frequency domains.
- CO3. Develop solutions to stable and causal systems.
- CO4. Solve problems pertaining to transforms and signal processing.
- CO5. Select and apply appropriate transformation techniques for understanding of the frequency content of signals at the input and output of the systems.

II B. Tech. – II Semester (16BT40406) PULSE AND DIGITAL CIRCUITS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Electronic Devices and Circuits, Network Analysis.

COURSE DESCRIPTION: Linear and non-linear Wave shaping circuits; Switching characteristics of Diode and Transistor; Design of multivibrators; Sweep circuits; Sampling and logic gates.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Apply the knowledge in
- Responses of High-pass and low-pass RC circuits for different inputs
 - Clipping and clamping operations.

- Multivibrators.
 - Methods of generating the Time-base waveforms
 - Operating Principles of Sampling gates
 - Realization of logic gates using Diodes and Transistors
- CO2. Analyze the performance of Linear and non-linear Wave shaping Circuits.
- CO3. Design and develop different Multivibrator Circuits, Sweep circuits, clipper and clamper circuits.
- CO4. Solve engineering problems pertaining to pulse and Digital circuits to provide valid conclusions.
- CO5. Apply appropriate techniques to obtain optimum solution in the field of pulse and digital circuits.
- CO6. Apply contextual knowledge in pulse and digital circuits to assess propagation delay and power dissipation parameters to the Professional engineering practice for societal use.

II B. Tech. – II Semester

(16BT41031) ANALOG ELECTRONICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Electronic Devices and Circuits, Pulse and Digital Circuits, Electronic Circuit Analysis and Design.

COURSE DESCRIPTION: Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Non-linear and Linear Wave shaping circuits; Feedback Amplifiers; Design of Multi-vibrator circuits; Power Amplifiers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Apply the knowledge in
- Diodes-PN Junction Diodes, Zener Diodes, SCR
 - Transistors-BJT, FET, UJT
 - Feedback amplifiers and oscillators
 - Clipping and Clamping Circuits
 - RC High Pass and Low Pass Circuits
 - Multi-vibrators
- CO2. Analyze different types of amplifier, oscillator and pulse circuits.
- CO3. Design different types of Electronic circuits like feedback amplifiers, Oscillators, Multi - vibrators, Schmitt Trigger.
- CO4. Provide solutions through the design and conduct of experiments, analysis and synthesis.
- CO5. Apply biasing technique for design of amplifiers.
- CO6. Function effectively as an individual and as a member in a group in the area of analog electronic circuits.
- CO7. Communicate effectively in oral and written form in the area of analog electronic circuits.

II B. Tech. – II Semester

(16BT41032) CONTROL SYSTEMS DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A Course on Control Systems.

COURSE DESCRIPTION: Open and closed loop systems; DC and AC servo motor; stability analysis electrical systems; P, I, D parameters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on the effect of feedback and different controllers.
- CO2. Develop skills to analyze
- The characteristics of servomotors
 - The stability of the system using root-locus bode and Nyquist plots
 - The time domain and frequency specifications of second or der system
- CO3. Design a transfer function of given model.
- CO4. Develop programming skills to solve open and closed loop control systems.
- CO5. Select and apply modern tools for solving complex problems in control systems.
- CO6. Function effectively as individual and as member in team.
- CO7. Communicate effectively both oral and written in relevance to control systems.

II B. Tech. – II Semester (16BT41033) LINEAR AND DIGITAL ICs LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE-REQUISITES: A course on Linear and Digital ICs.

COURSE DESCRIPTION: Op-Amp characteristics; Applications of Op-Amp; 555 timer; PLL; Digital logic families and interfacing; Digital IC Applications; Programming of digital IC's in HDL.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on analog and digital circuits.
- CO2. Apply analytical skills to determine the op-amp parameters.
- CO3. Design of analog and digital circuits for Linear & Non linear applications.
- CO4. Provide valid conclusions through analysis and synthesis of analog and digital circuits.
- CO5. Apply appropriate simulation tools for programming of analog and digital circuits.
- CO6. Work individually and also in a group to develop applications using linear and digital ICs.
- CO7. Communicate effectively with engineering community to design analog circuits.

III B. Tech. – I Semester (16BT3HS02) MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Acquire Knowledge in
 - Tools and concepts of Micro Economics.
 - Basic Principles and concepts of Accountancy.
 - Provides life skills for effective utilization of scarce resources.
 - Financial Accounting.
 - Significance of Economics and Accountancy
- CO2. Develop skills in managerial decision making of an organization.
- CO3. Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.
- CO4. Develop effective communication in Business and Accounting transactions.
- CO5. Ascertain the profitability and soundness of an organization.
- CO6. Practice Financial Accounting.

III B. Tech. – I Semester (16BT51001) BIOMEDICAL INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: A Course on Electrical and Electronic Measurements.

COURSE DESCRIPTION: Human Anatomy & Physiology; Bio-signals; Cardiovascular and Neuro-muscular Instrumentation; Therapeutic Equipment; Advanced Imaging techniques.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on human anatomy and physiology, ECG, EMG and EEG measuring systems, medical imaging and therapeutic equipment.
- CO2. Analyze various bio signals like ECG, EMG, EEG.

- CO3. Design and develop suitable interfaces for real time applications in the field of biomedical instrumentation.
- CO4. Solve problems related to extraction of bio signals.
- CO5. Choose appropriate device to solve biomedical engineering problems.
- CO6. Apply ethical principles and commit to professional ethics, responsibilities and norms of the biomedical engineering practice.

III B. Tech. – I Semester

(16BT51002) INDUSTRIAL INSTRUMENTATION – II

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Industrial Instrumentation - I.

COURSE DESCRIPTION: Measurement of Flow, Level, Moisture, Viscosity, Density; Electrical and intrinsic safety; Design of signal conditioning circuits.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge of construction and working principles of different instruments used in industry.
- CO2. Identify, formulate and analyze different types of instruments for various industrial applications.
- CO3. Design suitable sensors and signal conditioning circuits for desired parameter measurement in industrial applications.
- CO4. Solve engineering problems pertaining to measurement of Density, Viscosity, Moisture, Flow, Level and signal conditioning circuits to provide feasible solutions.
- CO5. Select appropriate sensor and measuring technique for the measurement of industrial parameters.
- CO6. Apply the knowledge of safety issues while designing measuring instruments used in industries.

III B. Tech. – I Semester

(16BT51003) PRINCIPLES OF COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Signals and Systems.

COURSE DESCRIPTION: Fundamentals of Communications; Analog and digital communications - modulation and Demodulation Techniques; Information theory and coding.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate fundamental knowledge in
- Elements of communication systems.
 - Amplitude, Frequency, and Phase Modulators and Demodulators.
 - Data transmission and detection of digital signals.
 - Information theory and coding techniques.
- CO2. Perform analysis of different modulation techniques and calculate various performance parameters
- CO3. Design and develop modulators and demodulators for communication systems.
- CO4. Solve engineering problems for feasibility and provide optimal solutions in the area of Analog and Digital Communication Systems.
- CO5. Select the appropriate modulation and demodulation techniques for transmission and reception of signals.
- CO6. Follow standards while developing the communication systems.

III B. Tech. – I Semester (16BT60402) DIGITAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: A course on Signals and Systems.

COURSE DESCRIPTION: Continuous and discrete signals and sequences; systems; DFT and FFT algorithms for the analysis of discrete sequences; design and realization of Digital IIR and FIR filters; DSP processors and architectures.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Apply the knowledge of fundamentals in
- Frequency analysis of signals and systems.
 - DFT and FFT transforms.
 - Analog & Digital Filter Design.
 - Digital Filter Realization.
 - DSP Processors.
- CO2. Analyze numerical and analytical problems of discrete time signals and systems in frequency domain using Transforms.
- CO3. Design and develop digital filters to optimize system performance and their realization.
- CO4. Interpret and synthesize the response of Digital filters to validate their characteristics.
- CO5. Apply appropriate techniques and algorithms to design digital signal processing systems with an understanding of limitations.

III B. Tech. – I Semester (16BT51004) COMPUTER ORGANIZATION AND ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: A course on Switching Theory and Logic Design.

COURSE DESCRIPTION: Basic structure of computers; computer arithmetic operations; register transfer and organization; 8085 architecture, programming and interfacing of 8085 microprocessor; Concepts of micro programmed control, pipelining and memory system.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
- Internal organization of a computer.
 - Various memories and hierarchy in a computer.
 - Architecture, instruction set and addressing modes of 8085 microprocessor.
- CO2. Analyze the performance of a computer.
- CO3. Design microprocessor based systems for real time applications.
- CO4. Solve engineering problems and arrive at solutions by developing embedded products.
- CO5. Choose appropriate hardware, algorithm and program using suitable IDE.
- CO6. Practice professional engineering to deliver efficient and cost effective embedded based products for society.

III B. Tech. – I Semester (16BT51241) OBJECT ORIENTED PROGRAMMING

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on:
- Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.

- Packages, interfaces, multithreading, exception handling, event handling.
- CO2. Analyze complex engineering problems using object oriented concepts.
- CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
- CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.
- CO5. Use advanced programming languages to develop web applications.
- CO6. Build Java Applications suitable for societal requirements.

III B. Tech. – I Semester (16BT31501) OPERATING SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.
- CO2. Identify the functionality involved in process management concepts like scheduling and synchronization.
- CO3. Design models for handling deadlock and perform memory management.
- CO4. Synthesize and apply programming API's to perform Process management.
- CO5. Use appropriate protection tools to provide access control to Operating system users.

III B. Tech. – I Semester (16BT60502) SOFT COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Concepts on Soft Computing Techniques; Artificial Neural Networks; Supervised Learning; Unsupervised Learning; Fuzzy logic; Genetic Algorithms.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
 - Artificial Neural Networks
 - Supervised Learning Networks
 - Unsupervised Learning Networks
 - Fuzzy sets, relations and measures
 - Genetic Operators
- CO2. Analyze neural network architectures, Fuzzy systems and Genetic algorithms.
- CO3. Design soft computing solutions for real life computational problems.
- CO4. Use soft computing techniques to solve complex computational problems.
- CO5. Create algorithms using soft computing techniques.
- CO6. Apply contextual knowledge to solve problems related to societal issues like Business Intelligence, Forecasting.

III B. Tech. – I Semester (16BT51031) INDUSTRIAL INSTRUMENTATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A Course on Industrial Instrumentation -II.

COURSE DESCRIPTION: Measurement of Force, Torque, Velocity, Acceleration, Pressure, Temperature, Flow Level, Moisture, Viscosity, Density; Electrical and intrinsic safety.

COURSE OUTCOME: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge for measurement of different industrial process parameters.
- CO2. Analyze the functionality of different types of instruments used for various industrial applications.
- CO3. Design suitable signal conditioning circuits for measuring instruments.
- CO4. Solve engineering problems pertaining to measurement of industrial process parameters to provide feasible solutions.
- CO5. Select appropriate sensor and measuring technique for the measurement of industrial parameters.
- CO6. Practice professionalism in engineering and deliver efficient & cost effective, maintainable products by understanding the needs of society, safety for sustainable development.
- CO7. Follow ethics while developing industrial instruments.
- CO8. Function effectively as an individual and work as part of a group in developing industrial instruments.
- CO9. Communicate effectively among people about the effects of materials, mechanical design on electrical parameters and vice versa.

III B. Tech. – I Semester **(16BT51032) SIGNAL PROCESSING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Digital Signal Processing.

COURSE DESCRIPTION: Basics of programming using any simulation software; Operations on Signals & sequences; Convolution and correlation; Pole-zero mapping; Power Spectral Density; Filter designing; Study architecture of DSP processor kits and performing basic operations on it; Real-time signal processing like digital filter design (FIR, IIR) and FFT implementation using DSP processor kits.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate fundamental Knowledge in simulation of basic concepts and algorithms such as convolution, Correlation, Digital filters, pole-zero mapping, DFT and FFT in signal processing.
- CO2. Analyze signals and Sequences using various processing techniques like Gaussian noise generation, DFT and FFT implementation.
- CO3. Design and simulation of IIR and FIR filters.
- CO4. Analyze various filter characteristics and interpret data from signal processing systems to provide valid conclusions.
- CO5. Use appropriate simulation and hardware tools to solve the complex engineering problems in the domain of signal processing.
- CO6. Function effectively as individual and as member in a team to perform operations on signals and design filters.
- CO7. Communicate effectively in verbal and written forms while processing signals and designing filters.

III B. Tech. – I Semester **(16BT4HS31) SOFT SKILLS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on English Language Lab.

COURSE DESCRIPTION: This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire knowledge in
 - Goal Setting
 - Creative Thinking
 - Leadership Skills and
 - Team Work

- CO2. Analyse the situations and develop skills for
- Body Language
 - Personality Development and
 - Stress Management
- CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal forums.

III B. Tech. –II Semester **(16BT5HS01) MANAGEMENT SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial context.
- CO2. Identify and analyse management problems in the business organizations reaching substantiated conclusions using principles of management.
- CO3. Design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
- CO4. Competently employ broad based analytical tools for decision making, system design, analysis and performance.
- CO5. Provide solution to organizations for sustainable development.
- CO6. Apply knowledge of engineering and management principles to manage the projects in multidisciplinary environments.

III B. Tech. – II Semester **(16BT61001) ARM PROCESSORS AND PIC MICROCONTROLLERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Switching Theory and Logic Design.

COURSE DESCRIPTION: ARM Processors architecture, Programming, PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, Interfacing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in ARM Processors architecture, PIC architecture, Pin out, Instruction set.
- CO2. Analyze various design issues regarding usage of on chip resources and Low power modes.
- CO3. Design embedded systems using ARM Processors and PIC microcontrollers to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing embedded Systems.
- CO5. Use on-chip resources to design embedded systems with an understanding of limitations.
- CO6. Practice professional engineering to deliver efficient and cost effective microcontroller based products.

III B. Tech. –II Semester

(16BT61002) PROCESS CONTROL INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Control Systems, Sensors and Transducers.

COURSE DESCRIPTION: Mathematical modeling of processes; different types of controllers; characteristics of controllers; design of controllers; tuning of controllers; characteristics of control valves; multi loop controllers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on process control terminology and understand about Single loop and multi loop control systems.
- CO2. Analyze the dynamic behavior of a process by developing the mathematical model.
- CO3. Design and tune the PID controllers.
- CO4. Solve the problems by interpreting the data of a process control system.
- CO5. Select and suggest to use appropriate final control elements for different process industries.
- CO6. Apply the process control concepts to real time industrial and domestic applications.

III B. Tech. – II Semester

(16BT60305) HYDRAULICS AND PNEUMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Industrial Instrumentation - II.

COURSE DESCRIPTION: Basic fluid power system; Hydraulic components and its use; Hydraulic circuits and its application; Fundamentals of pneumatics; Pneumatic components and its use; Pneumatic circuits; application; Design of hydraulic and pneumatic systems for various applications; Electro Pneumatics; Logic gates.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Demonstrate the basic mechanism of fluid power systems and automation.
- CO2. Identify and analyze engineering problems in automated environment.
- CO3. Design the pneumatic and hydraulic circuits for domestic and industrial problems.
- CO4. Investigate the issues related to the design and manufacture of pneumatic and hydraulic systems.
- CO5. Use modern tools available in automation to enhance the productivity.
- CO6. Deploy the best way of implementing the automation to have eco-friendly environment and sustainable development.

III B. Tech. – II Semester

(16B50308) MECHATRONICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Industrial Instrumentation – II.

COURSE DESCRIPTION: Mechatronics system; Sensors; Transducers; Actuating systems; DC Motors; Micro controller; Signal Conditioning; Programmable Logic Controllers; Programmable Motion Controllers; Design Approach; Case Studies.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on integrative nature of Mechatronics and different components of mechatronics systems.
- CO2. Select the appropriate sensors and actuators required for a system by identifying and analyzing real life engineering problems thoroughly.
- CO3. Design signal conditioning circuits for mechatronics systems and establish the controlling methods required for that system to meet the specified needs.
- CO4. Select, and apply appropriate programmable motion controller techniques and adaptive controllers to complex mechatronics systems with an understanding of the limitations.

- CO5. Exhibit the knowledge on design approach, keeping in view of environmental contexts, to reflect the sustainable development.
- CO6. Perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

III B. Tech. –II Semester

(16BT60341) THERMODYNAMICS AND FLUID MECHANICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Engineering Physics.

COURSE DESCRIPTION: Thermodynamic system; Energy interactions; Work transfer and Heat Transfer in flow and non-flow systems; Laws of thermodynamics; Entropy; Air cycles; Refrigeration; Properties of Fluids; Pressure Measurements; Types of flow; One-dimensional steady flow energy & momentum Equations; Flow measurements; Hydraulic turbines and its performance; Pumps.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on the concepts of thermodynamic, Heat transfer, refrigeration and fluid flow systems.
- CO2. Identify, formulate and analyze various processes in thermodynamic, Heat transfer, refrigeration and fluid flow systems.
- CO3. Design the thermodynamic and fluid flow systems to achieve the required physical process parameters.
- CO4. Conduct investigations and address the complex problems on thermodynamics and fluid flow systems.
- CO5. Use dimensional analysis tool to develop empirical formulae for the fluid flow and heat transfer systems.
- CO6. Use standard engineering norms and practices in developing thermodynamic and fluid systems for societal requirements.

III B. Tech. – II Semester

(16BT61003) INSTRUMENTATION SYSTEM DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Industrial Instrumentation - II.

COURSE DESCRIPTION: Field instruments; Switches, Pushbuttons, Keyboards; Control valves: application and selection; Pumps and control elements; Reliability.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
 - Field Instruments
 - Switches and Pushbuttons
 - Control valves
 - Pumps and control elements
 - Flow regulators
- CO2. Analyze the functionality of field instruments, control elements & regulators.
- CO3. Design field Instruments such as Orifice, Rotameter, Bourdon tube, PID controllers and measuring circuits for RTD, Thermocouple, D/P transmitters.
- CO4. Provide solution to problems & design requirements related to instrumentation systems.
- CO5. Select appropriate field instrument to furnish an Instrumentation system.
- CO6. Provide optimal instrumentation solution for societal and industrial use.

III B. Tech. – II Semester (16BT70309) INDUSTRIAL ROBOTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Matrices and Numerical Methods.

COURSE DESCRIPTION: Introduction of Robots classifications; Components; Robot drive mechanisms; Mechanical transmission methods aided in functioning of robots; Forward kinematics; inverse kinematics; Manipulator dynamics; Trajectory planning and avoidance of obstacles; Robot programming; Robot Application in Industry; Future Application and Challenges and Case Studies.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on concepts of robot, Kinematics and dynamics, Trajectory planning and programming of robot.
- CO2. Identify, analyze and interpret various methods and review the contemporary problems of robotics.
- CO3. Optimize various robotic configuration parameters to analyze the reverse and forward kinematics.
- CO4. Investigate the performance parameters on the complex robotic designs.
- CO5. Apply appropriate functional techniques, resources, and programming tools to robotic engineering activities.
- CO6. Consider safety issues in designing robots for societal applications.

III B. Tech. – II Semester (16BT70404) ADVANCED DIGITAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Digital Signal Processing

COURSE DESCRIPTION: Digital filter banks; Parametric and Non-Parametric Power Spectrum Estimation methods; Computationally efficient algorithms; Applications of DSP.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Apply knowledge in
 - Filter banks and Wavelets
 - Linear Prediction
 - Efficient power Spectral Estimation Techniques.
 - Applications of Multirate signal processing
- CO2. Analyze complex engineering problems in the Power Spectrum Estimation, Sampling rate conversion and Linear Prediction.
- CO3. Design optimum filters, multirate DSP systems and computationally efficient DSP algorithms.
- CO4. Solve Engineering problems pertaining to Digital Signal Processing.
- CO5. Apply DSP Algorithms, and algorithms related to Forward and Backward Prediction in digital system design with an understanding of the limitations.
- CO6. Apply computationally efficient DSP Algorithms, Optimum Filters and perfect reconstruction filters to address societal issues in multirate signal processing and communications.

III B. Tech. – II Semester (16BT61004) ELECTROMAGNETIC THEORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Multi-Variable Calculus and Differential Equations, Engineering Physics.

COURSE DESCRIPTION: Vector - calculus; Static Electric and Magnetic fields; time varying electromagnetic Fields; Maxwell's equations; Wave equations and wave propagation characteristics; electromagnetic interference and compatibility.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
- Coulomb's Law, Gauss's Law, Biot-Savart's Law and Ampere's Law
 - Static electric and magnetic fields
 - EM Wave equations and propagation characteristics.
 - Polarization of wave, Reflection and Refraction of Plane Waves
 - Electromagnetic Interference and Compatibility in the field of Electromagnetics
- CO2. Analyze the electric and magnetic fields in different distributions.
- CO3. Design and develop solutions for different boundary condition problems in electromagnetics.
- CO4. Solve engineering problems pertaining to Electrostatics, magnetostatics, electromagnetic wave theory, interference and compatibility to provide valid conclusions.
- CO5. Apply appropriate techniques, resources to complex engineering activities for modeling electrostatic discharge, grounding, and earthing and electromagnetic compatibility based systems with understanding of limitations.
- CO6. Apply course knowledge to assess societal issues and understand the consequent responsibilities relevant to the EMI and EMC standards.

III B. Tech. –II Semester

(16BT61005) OPTO-ELECTRONICS AND LASER INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Industrial Instrumentation-II.

COURSE DESCRIPTION: Optical fiber; components of optical fiber; fiber optic Sensors; Industrial and medical applications of laser.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge about
- Types of optical fiber, components of optical fiber.
 - Measurement of temperature, pressure, strain using fiber optic sensors.
 - Operation of laser, Industrial and biomedical applications of laser.
 - Holography and optoelectronic modulators.
- CO2. Analyze the optical parameters of various types of fibers and their characteristics.
- CO3. Design fiber optic sensors for measurement of pressure, temperature, level and velocity.
- CO4. Apply different Lasers and optical fibers for real time medical and weather forecasting.
- CO5. Use advanced lasers in the field of material processing and biomedical.
- CO6. Provides engineering solutions by using lasers and optical fibers to the society.

III B. Tech. II Semester

(16BT60207) ADVANCED CONTROL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Control systems.

COURSE DESCRIPTION: Design of compensators and controllers, state space, canonical forms, controllability and observability, describing function, phase plane analysis, Lyapunov's stability analysis, Full order observer and reduced order observer.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
- State space analysis.
 - Various compensators and controllers.
 - Stability in the sense of Lyapunov.
 - Full and reduced order observers in state space analysis.
- CO2. Analyze the stability of nonlinear system using
- Describing function approach.
 - Phase plane analysis.
 - Lyapunov's method.
- CO3. Design suitable compensator and controllers using root locus and bode plot.

- CO4. Evaluate stability of systems using pole placement and Lyapunov method to provide valid solutions.
- CO5. Select appropriate techniques for analyzing the stability of the system.
- CO6. Apply the conceptual knowledge of advanced control systems in relevance to industry and society.

III B. Tech. II Semester (16BT50403) VLSI DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Switching Theory and Logic Design, Linear and Digital ICs.

COURSE DESCRIPTION: CMOS Technology; Stick Diagrams and Layouts; Subsystem design; Programmable Interconnect structures; Synthesis and Test Principles.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Understanding the Fabrication Process of MOS Transistors
 - Electrical properties of CMOS Circuits
 - Designing Static Combinational and Sequential logic at transistor level, including Mask layout.
 - Estimating and optimizing combinational RC Circuit delay using RC delay models and logical effort.
 - Design methodology and tools.
 - Test Principles.
- CO2. Analyze characteristics and performance of CMOS circuits.
- CO3. Design solutions for subsystems to compensate tradeoff between area, speed and power requirements.
- CO4. Synthesize and extract information from designs and layouts for optimum solutions.
- CO5. Select and apply appropriate designs to overcome the limitations of CMOS devices for high speed applications.
- CO6. Assess test strategies for design and development of Integrated Circuits for societal needs.

III B. Tech. II Semester (16BT61006) AIRCRAFT INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITE: A Course on Industrial Instrumentation-II.

COURSE DESCRIPTION: Aircraft Instruments; Air Data Instruments; Gyroscopic Instruments; Engine Instruments and Electronic Flight Instrumentation System.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge about
- Aircraft instruments
 - Air data instruments
 - Gyroscopes
 - Engine instruments
 - Electronic Flight Instrumentation system
- CO2. Analyze the parameters measured in aircraft system.
- CO3. Design measurement systems pertaining to various parameters measurement in aircraft.
- CO4. Solve Engineering problems pertaining to various parameters measurement in aircraft.
- CO5. Select appropriate technique for measurement of parameters in the aircraft.

III B. Tech. II Semester (16BT61007) **TELEMETRY AND TELECONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Principles of Communications.

COURSE DESCRIPTION: Different Telemetry Principles; Frequency and Time-division Multiplexed Systems; Satellite Telemetry; Optical Telemetry and Telecontrol Methods.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on different Telemetry Principles, Satellite Telemetry and Optical Telemetry.
- CO2. Critically analyze the Telecontrol requirements to meet the specifications.
- CO3. Design transmitter and receiver circuits for data transmission.
- CO4. Analyze and solve errors during transmission.
- CO5. Apply appropriate telemetry principles for data transmission in real time.

III B. Tech. II Semester (16BT61031) **ARM PROCESSORS AND PIC MICROCONTROLLERS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on ARM Processors and PIC Microcontrollers.

COURSE DESCRIPTION: Assembly language Programming using ARM processors; Interfacing standard peripherals & Programming-DAC, Stepper Motor, ADC, DAC, Keyboard, Seven Segment Display.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on instruction set, addressing modes, of ARM processors and PIC microcontrollers.
- CO2. Analyze various programming alternatives, interfacing methods & usage of various on-chip resources like Timers, Interrupts, ADC, DAC, and Stepper Motor to build stand alone systems.
- CO3. Design and develop microcomputer and microcontroller based system to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing embedded Systems.
- CO5. Apply resources, and tools for modeling microcomputer and microcontroller based systems with understanding of limitations.
- CO6. Follow professional ethics in the design of embedded products.
- CO7. Function effectively as an individual, and as a member in developing embedded products.
- CO8. Communicate effectively in both written and verbal form in the area of processors and microcontrollers.

III B. Tech. II Semester (16BT61032) **PROCESS CONTROL LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Process Control Instrumentation.

COURSE DESCRIPTION: Tuning methods, Characteristics of control valve, Response of controllers for different processes like flow, temperature, level etc., Design of controllers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on process equipments.
- CO2. Develop the transfer function of the process and analyze the performance of the process in terms of time domain specifications.
- CO3. Design electronic PID controller and tune its controller parameters using various tuning methods.
- CO4. Give valid conclusions by analyzing the response of flow, temperature, level process.

- CO5. Use appropriate hardware/software tools to conduct the process control experiments to measure process parameters.
- CO6. Apply concepts of process control for solving real-time issues.
- CO7. Execute the experiment individually or in a team in the area of process control.
- CO8. Communicate effectively in verbal and written forms in the field of process control.

III B. Tech. II Semester (16BT61033) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PRE-REQUISITES: —

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate in-depth knowledge on the seminar topic.
- CO2. Analyze critically, the concepts relevant to the seminar topic.
- CO3. Undertake investigation of issues related to seminar topic providing valid conclusions.
- CO4. Apply techniques to consolidate the solutions relevant to the seminar topic.
- CO5. Comprehend societal issues in the context of seminar topic.
- CO6. Understand environmental issues in the context of seminar topic.
- CO7. Understand ethical issues in the context of seminar topic.
- CO8. Function effectively as individual on the chosen seminar topic.
- CO9. Develop communication skills, both in oral and written form, for preparing and presenting seminar report.
- CO10. Engage in lifelong learning to improve knowledge and competence in the chosen area of seminar.

IV B. Tech. – I Semester (16BT71001) ANALYTICAL INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Chemistry, Engineering Physics, Sensors and Transducers, Electrical and Electronic Measurements.

COURSE DESCRIPTION: Different types of Liquid and Gas analyzers, Spectroscopic techniques, chromatography, environmental pollution and nuclear radiation detectors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge of gas/liquid analyzers, radiation detectors, different Chromatography Techniques, environmental pollution and nuclear radiation detectors.
- CO2. Analyze the sample by using various analytical instruments.
- CO3. Provide valid conclusions by analyzing the different chemical samples using spectrophotometer and chromatography.
- CO4. Use appropriate method of analyzer and spectrometer to evaluate the sample.
- CO5. Use various analytical instruments like analyzers, spectrophotometer and chromatography to measure the elements of a compound for industrial applications.
- CO6. Use environmental pollution monitoring devices to compliance with environmental issues.

IV B. Tech. – I Semester

(16BT71002) BIOMEDICAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Digital Signal Processing, Biomedical Instrumentation.

COURSE DESCRIPTION: Analysis of Non Stationary signals, noise & artifact removal, Advanced Signal processing techniques, Event Detection, Spectral Analysis.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate an understanding of biomedical signals and identify the need for Biomedical signal analysis.
- CO2. Identify physiological interferences and artifacts affecting the biomedical signals and apply various filtering mechanisms for the enhancement of signals.
- CO3. Apply advanced signal processing techniques for the analysis of biomedical signals
- CO4. To analyze and detect various events and waveform complexities involved in EEG & ECG signals
- CO5. Choose appropriate hardware and IT tools to program the devices to solve Biomedical Engineering Problems.
- CO6. Perform the spectral analysis of biomedical signals as per societal needs.

IV B. Tech. – I Semester

(16BT71003) INDUSTRIAL AUTOMATION

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: A course on Switching Theory and Logical Design.

COURSE DESCRIPTION: Basics of Programmable Logic Controller (PLC); PLC Programming Languages; PLC intermediate Functions ; Concepts of SCADA; Concepts of DCS; Communication networks for DCS; Industrial Data Networks.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on Programmable Logic Controller Architecture, DCS and SCADA.
- CO2. Analyze various methods of developing algorithms for PLC, SCADA and DCS.
- CO3. Design suitable accessories in process automation.
- CO4. Analyze the information to provide effective solution for real time problems in automation of process industries.
- CO5. Select appropriate techniques/tools for providing Automation.
- CO6. To follow ethics while selecting the standards and protocols in industrial automation.

IV B. Tech. – I Semester

(16BT50501) COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sublayer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on:
 - Functionalities of Various OSI and TCP/IP layers
 - 3G Mobile phone networks, 802.11
 - TCP,UDP and SMTP
- CO2. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.
- CO3. Design and compute subnet masks and addresses for networking requirements.
- CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.

- CO5. Apply Network Standards - 802.3 and 802.11 for developing computer Networks.
 CO6. Assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.

IV B. Tech. – I Semester **(16BT71004) AUTOMOTIVE INSTRUMENTATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Industrial Instrumentation-II.

COURSE DESCRIPTION: Automobile engines; Combustion process in engines; Sensors in automotive systems; Safety, Comfort and convenience systems.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge about
- Operation of automotive Engine systems.
 - Combustion process of automotive engine systems
 - Automotive sensors
 - Safety, Comfort and Convenience systems
- CO2. Analyze various parameters measured using automotive sensors.
- CO3. Design measurement systems pertaining to various parameters of automotive systems.
- CO4. Solve Engineering problems pertaining to parameters measurement using automotive sensors to provide valid conclusions.
- CO5. Select appropriate technique for the measurement of parameters of an automotive system.
- CO6. Apply contextual knowledge to ensure safety, comfort and convenient automotive systems to meet societal needs.

IV B. Tech. – I Semester **(16BT71005) COMPUTER CONTROL OF PROCESS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Process Control Instrumentation.

COURSE DESCRIPTION: Analysis of discrete state variable system identification techniques; direct discrete design techniques; advanced control strategies used in industries; Adaptive Control.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on Z – Transform and modified Z - Transform of Sampled Data system.
- CO2. Analyze various control strategies and identify mathematical model for various systems.
- CO3. Design suitable accessories to make control strategies used in Industries.
- CO4. Analyze the information to provide effective solution for real time problems of adaptive control methods.
- CO5. Select appropriate techniques/tools for validation between continuous and discrete system.
- CO6. Follow standards and protocols while designing various models in industries.

IV B. Tech. – I Semester **(16BT71006) INDUSTRIAL ELECTRONICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Electronic Devices and Circuits.

COURSE DESCRIPTION: Silicon controlled rectifier (SCR) and its applications in power control; Electronic timers; Welding; High frequency heating; Ultrasonic generation and applications; Computer Numeric Control.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- SCR operation and characteristics
 - Electronic timers
 - Electric welding
 - Dielectric heating
 - Ultrasonic wave generation
- CO2. Analyze the performance of power supplies and power control circuits.
- CO3. Design power control circuits and power supplies using SCRs and ICs.
- CO4. Solve power control and power supply problems.
- CO5. Apply appropriate techniques for switching the power supplies to get the desired output and use modern tools for automation.
- CO6. Use SCRs for power control, and design power supplies for societal needs.

IV B. Tech. – I Semester

(16BT71007) INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Process control Instrumentation, Engineering Chemistry.

COURSE DESCRIPTION: Petroleum Processing; Measurement and unit operations; Control Loops of Petroleum Industry and Chemicals from Petroleum Industry.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on different oil recovery methods, oil gas separation and its Processing.
- CO2. Analyze different extracts from petroleum refineries.
- CO3. Provide valid conclusions of different real time petroleum products by interpreting data from various distillation techniques.
- CO4. Use modern instruments for analysis and processing of petro chemical products.
- CO5. Practice petrochemical Engineering in such a way to protect environment from Pollution.
- CO6. Follow ethical procedures while practicing petrochemical engineering.

IV B. Tech. – I Semester

(16BT71008) INTELLIGENT CONTROL

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Neural Networks for Modeling and Control; ANN Structures and Online Training Algorithms; Fuzzy Logic for Modeling and Control; Hybrid Control Schemes; Applications of intelligent systems.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on the Computer simulation of intelligent control systems to evaluate the performance.
- CO2. Analyze neural network, fuzzy logic and hybrid control schemes.
- CO3. Design neural network, fuzzy logic and hybrid control for engineering applications.
- CO4. Solve the problems pertaining to neural network, fuzzy logic and hybrid control schemes and provide valid conclusions for real time applications.
- CO5. Select appropriate neural network and fuzzy logic control techniques for modeling real time applications with an understanding of the limitations.
- CO6. Follow ethical standards while using the algorithms to train the systems for industries.

IV B. Tech. – I Semester **(16BT71009) POWER PLANT INSTRUMENTATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on Industrial Instrumentation-II.

COURSE DESCRIPTION: Different methods of power generation; Instrumentation and control in water and air-fuel circuit; Turbine monitoring and control; Power plant maintenance.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge about
 - Different methods of power generation.
 - Measurement and control in water and air-fuel circuit
 - Turbine monitoring and Control
 - Power plant management
- CO2. Analyze the various parameters like temperature, pressure, level measured in power plant.
- CO3. Design measurement system for the measurement of process parameters in power plant.
- CO4. Solve Engineering problems pertaining to process parameters measurement and control circuits in power plant to provide valid conclusions.
- CO5. Select appropriate technique for the measurement of process parameters in the power plant.
- CO6. Apply safety measures during calibration and maintenance of instruments in power plant to meet societal needs.

IV B. Tech. – I Semester **(16BT71010) SYSTEM DESIGN USING MICROCONTROLLERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on ARM Processors and PIC Microcontrollers.

COURSE DESCRIPTION: System design approaches; MSP430 Architecture; Instruction Set; Programming; Communication interfaces, Arduino, Interfacing using Arduino.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Demonstrate knowledge in Arduino, MSP430 Architecture, Pin out, Instruction set.
- CO2. Analyze various design issues regarding usage of on chip resources, Low power modes.
- CO3. Design embedded systems using Arduino microcontrollers to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing Embedded Systems to support interconnectivity.
- CO5. Use on-chip resources and appropriate software tools to design networked embedded systems with an understanding of limitations.
- CO6. Follow ethics by applying standards and protocols in embedded product development.

IV B. Tech. – I Semester **(16BT6HS01) BANKING AND INSURANCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Demonstrate Knowledge in
 - Tools and concepts of Banking and Insurance.
 - Basic Principles and concepts of Insurance and Banking.
 - e-fund transfers, e-payments and e-business models.

- CO2. Develop skills in providing solutions for
- Online banking and e – payments.
 - Risk Management through insurance benefits the society at large.
 - Money management by leveraging on technology, banking and insurance services.
- CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to more employment opportunities.
- CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

IV B. Tech. – I Semester

(16BT6HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Technical English.

COURSE DESCRIPTION: Nature and Scope of Communication; Corporate Communication; Writing Business Documents; Careers and Resumes; Interviews.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Corporate Communication
 - Main Stages of Writing Messages
 - Career Building
- CO2. Analyze the possibilities and limitations of language in
- Communication Networks
 - Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in
- Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

IV B. Tech. – I Semester

(16BT6HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Scope, Objectives and Elements of cost Accounting; Cost Sheet and Tender quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: concept of Risk and Return on Investment.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Acquire Knowledge in
- Elements of Costing.
 - Basic concepts of Financial Management.
 - Risk and Return
 - Significance of Cost Accountancy
 - Behavioral Finance
- CO2. Develop skills in
- Material, Labor, Overheads control.
 - Excellence and ability to minimize the cost of the organization
- CO3. Develop effective Communication in Cost control and Financial Management.
- CO4. Provide solutions for effective investment decisions.

IV B. Tech. – I Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Acquire Knowledge in
 - Schemes and institutions encouraging entrepreneurship.
 - Basic Principles and concepts of Accountancy.
 - Significance of entrepreneurship.
- CO2. Develop skills in providing solutions for
 - Personal excellence through financial and professional freedom.
 - Women entrepreneurship serving as contrivance in societal development
- CO3. Develop Critical thinking and evaluation ability.
- CO4. Widens knowledge and build up attitude towards trouble shooting.
- CO5. Demonstrate business acumen.

IV B. Tech. – I Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Oral communications; Basic grammar; advanced grammar; basic writing; Business French (La Francais Commercial)

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand French culture and civilization.
- CO6. Communicate effectively with the native French in day to day situation.

IV B. Tech. – I Semester

(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
- Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand German culture and civilization.
- CO6. Communicate effectively with the native German in day to day situation.

IV B. Tech. – I Semester

(16BT6HS07) INDIAN CONSTITUTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, understanding for better professional practice and good citizenry.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Gain knowledge in
- Parliamentary proceedings, laws, legislature, administration and its philosophy
 - Federal system and judiciary of India
 - Social problems and public services like central civil services and state civil services
 - Indian and international political aspects and dynamics
- CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen

IV B. Tech. – I Semester

(16BT6HS08) INDIAN ECONOMY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value Analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire the knowledge in
- Micro and Macro Economics.

- Traditional and Modern methods of Capital Budgeting.
- Five year plans and NITI Aayog.

CO2. Analyze

- Capital Budgeting.
- Value Analysis and Value Engineering.
- Economic analysis
- Law of supply and demand

CO3. Understand the nuances of project management and finance

IV B. Tech. – I Semester

(16BT6HS09) INDIAN HERITAGE AND CULTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. Acquaint knowledge in

- Human aspirations and values in Vedic culture.
- Cultural aspects of Buddhism and Jainism
- Unification of our country under Mourya's and Gupta's administrations
- Socio Religious aspects of Indian culture
- Reform movements and harmonious relations

CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts

IV B. Tech. – I Semester

(16BT6HS10) INDIAN HISTORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

CO1. Gain knowledge on evolution and history of India as a nation.

CO2. Analyze social and political situations of past and current periods.

CO3. Practice in career or at other social institutions morally and ethically.

IV B. Tech. – I Semester

(16BT6HS11) PERSONALITY DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Soft Skills Lab.

COURSE DESCRIPTION: Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

CO1. Demonstrate knowledge in

- Self-Management
- Planning Career

- CO2. Analyze the situations based on
- Attitudes
 - Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

IV B. Tech. – I Semester **(16BT6HS12) PHILOSOPHY OF EDUCATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire knowledge in
- Philosophy of Engineering education.
 - Philosophical Methods.
 - Knowledge acquiring methods.
 - Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational outcomes.
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

IV B. Tech. – I Semester **(16BT6HS13) PUBLIC ADMINISTRATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire knowledge in
- Public Policy.
 - Good Governance.
 - E-governance.
 - Development Administration.
- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance models to find and provide opportunities in e-governance.
- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing
- Bureaucracy.
 - Role of civil society.

IV B. Tech. – I Semester

(16BT60112) BUILDING MAINTENANCE AND REPAIR

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. Analyze failures, repair and rehabilitation techniques.
- CO3. Solve complex building maintenance problems through proper investigations and interpretation.
- CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. Provide solutions for building maintenance and repair problems considering health and safety.
- CO6. Consider environmental sustainability in building maintenance and repair.
- CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

IV B. Tech. – I Semester

(16BT60113) CONTRACT LAWS AND REGULATIONS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. Analyze contracts and tenders.
- CO3. Address the legal issues in contracts and tenders.
- CO4. Follow laws and regulations in the preparation of contracts and tenders.
- CO5. Prepare contract and tender documents as per the standards.
- CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

IV B. Tech. – I Semester

(16BT60114) DISASTER MITIGATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of course, students will be able to

- CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. Analyze disasters and their vulnerability.
- CO3. Design strategies for effective disaster mitigation.
- CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. Use appropriate methods in disaster mitigation and management.
- CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. Solve disaster related issues considering environment.
- CO8. Consider economical issues in disaster management.

IV B. Tech. – I Semester

(16BT60115) ENVIRONMENTAL POLLUTION AND CONTROL

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.
- CO6. Encourage sustainable development through implementation of pollution control measures.
- CO7. Maintain IS Codes for environmental quality control.

IV B. Tech. – I Semester

(16BT60116) PLANNING FOR SUSTAINABLE DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.
- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

IV B. Tech. – I Semester

(16BT60117) PROFESSIONAL ETHICS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.

- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

IV B. Tech. – I Semester **(16BT60118) RURAL TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Rural technology; Non conventional energy; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of biofertilisers and usage of agromachinery in agriculture.

IV B. Tech. – I Semester **(16BT60308) GLOBAL STRATEGY AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on Strategic management, Research & development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

IV B. Tech. – I Semester **(16BT60309) INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

IV B. Tech. – I Semester

(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3. Develop a comprehensive and well planned business structure for a new venture.
- CO4. Conduct investigation on complex problems, towards the development of Project.
- CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6. Apply ethics in constructive innovation framework.
- CO7. Exhibit professionalism by employing modern project management and financial tools.

IV B. Tech. – I Semester

(16BT60311) MATERIALS SCIENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semi conductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Demonstrate the knowledge on concepts of fundamental science and engineering principles relevant to materials.
- CO2. Analyze the structures of various types of Ferrous, Non ferrous alloys influencing various engineering applications.
- CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.

- CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
 CO5. Consider health and safety issues while providing materials to real time applications.
 CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

IV B. Tech. – I Semester **(16BT70412) GREEN TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
 CO2. Analyze various green technologies for engineering practice.
 CO3. Provide green solutions to engineering problems.
 CO4. Apply various green techniques in the engineering practice.
 CO5. Consider health and safety issues while providing green solutions to the society.
 CO6. Understand issues related to environment sustainability.
 CO7. Apply ethical standards for environmental sustainability in the engineering practice.

IV B. Tech. – I Semester **(16BT70413) INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Nanoscale technology.
 - Difference between micro and nanotechnology
 - Classification of Nanostructure and Nanomaterial
 - Fabrication of various nanomaterials and nanostructures.
- CO2. Analyze numerical and analytical problems in
- Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
- CO3. Design and fabricate devices based on nanostructures like
- Nano solar cell
 - Nano cantilever
 - Nano bio-sensor
- CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.
- CO5. Select appropriate technique for fabrication of nanostructures and nanocomposites.
- CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

IV B. Tech. – I Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in
- Systems Process and System Design
 - Systems Analysis and Modeling
 - System Development Life Cycle
 - Design Management and Maintenance Tools.
- CO2. Analyze System Process and estimate the given models by using case tools.
- CO3. Design and Develop a model to the organizational systems.
- CO4. Solve complex problems related to engineering systems and produce accurate results.
- CO5. Apply object oriented techniques for modeling dynamic systems.
- CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

IV B. Tech. – I Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators.
- CO2. Analyze the properties of materials and identify its suitability for MEMS device.
- CO3. Design MEMS devices that meet desired specifications and requirements.
- CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
- CO5. Use modern techniques in micro manufacturing process.
- CO6. Develop efficient and cost effective MEMS based products for society.

IV B. Tech. – I Semester

(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge in Cyber security, Cyber crimes and its related laws in Indian and Global Act.
- CO2. Analyze the legal perspectives and laws related to cyber crimes in Indian context.

- CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber crimes.
- CO4. Solve Cyber security issues using privacy policies.
- CO5. Use antivirus tools to minimize the impact of cyber threats.
- CO6. Follow security standards for the implementation of Cyber Security and laws.

IV B. Tech. – I Semester **(16BT61505) BIOINFORMATICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2. Analyze biological sequences for Homology Modeling.
- CO3. Apply clustering methods for Phylogenetic trees.
- CO4. Solve bio sequencing problems using dynamic programming.
- CO5. Select and apply appropriate techniques and tools to structure Prediction

IV B. Tech. – I Semester **(16BT71031) ANALYTICAL AND BIOMEDICAL INSTRUMENTATION LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Analytical Instrumentation, Biomedical Instrumentation.

COURSE DESCRIPTION: Measurements of parameters: calorific value, blood pressure, respiration rate and heart sounds; characteristics of spectrometer; gas chromatography, and flame photometer.

COURSE OUTCOMES: On Successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on measurement of heart sounds, respiration rate, pH Value and calorific value.
- CO2. Analyze the performance of spectrometers, flame photometer, gas chromatography and Geiger Muller counters.
- CO3. Design the Instrumentation Amplifier for bio-signals.
- CO4. Conduct the analytical and biomedical experiments to provide valid conclusions.
- CO5. Use appropriate hardware and software tools to conduct the analytical and biomedical experiments.
- CO6. Commit to ethical principles in the usage of biomedical equipments.
- CO7. Do experiments related to analytical and biomedical instruments effectively as an individual and as a member in a group.
- CO8. Communicate effectively in verbal and written forms in the area of analytical and biomedical instrumentation.

IV B. Tech. – I Semester (16BT71032) INDUSTRIAL AUTOMATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Process Control Instrumentation, Industrial Automation.

COURSE DESCRIPTION: Automatic control of motors; liquid level; temperature; pressure; processes using PLC based control systems and SCADA systems. P&I diagram of Feedback Control system, Cascade control system and Ratio control system.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. Demonstrate knowledge on
 - P&I diagrams
 - PLC and SCADA
 - Pneumatic and Hydraulic
- CO2. Analyze operation and performance of automation process made for Level Process, Bottle filling system, Temperature and DC motor speed control.
- CO3. Design an algorithm to automate Level Process, Bottle filling system, Temperature and DC motor speed control.
- CO4. Interpret and synthesis the data obtained from various industrial processes to provide valid conclusions.
- CO5. Select and apply appropriate techniques to make industrial process automation.
- CO6. Follow professional ethics and practices to provide automation solutions for the society.
- CO7. Commit to ethical principle in the design of process and algorithms.
- CO8. Function effectively as individual and as member in team in the field of industrial automation.
- CO9. Communicate effectively both oral and written forms in the area of industrial automation.

IV B. Tech. – I Semester (16BT71033) COMPREHENSIVE ASSESSMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PRE-REQUISITES: All the technical courses of the program up to IV B. Tech. – I Semester.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to:

- CO1. Demonstrate knowledge in the courses of the Electronics and Instrumentation
- CO2. Analyze problems in the courses of the Electronics and Instrumentation.
- CO3. Design solutions for the problems in the courses of the Electronics and Instrumentation.
- CO4. Solve complex engineering problems in the courses of the Electronics and Instrumentation.
- CO5. Apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the Electronics and Instrumentation.
- CO6. Provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the domain of Electronics and Instrumentation.
- CO7. Understand the impact of the professional engineering solutions in environmental context and need for sustainable development in the domain of Electronics and Instrumentation.
- CO8. Apply ethics and norms of the engineering practice in the courses of the Electronics and Instrumentation.
- CO9. Function effectively as an individual in the domain of Electronics and Instrumentation.
- CO10. Present views cogently and precisely in the domain of Electronics and Instrumentation.
- CO11. Engage in life-long learning in the domain of Electronics and Instrumentation.

IV B. Tech. – II Semester (16BT81031) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks
100	100	200

L	T	P	C
-	-	-	12

PRE-REQUISITES: All technical courses of the program up to IV B. Tech. – I Semester.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: On successful completion of project work, students will be able to

- CO1. Demonstrate in-depth knowledge on the project topic.
- CO2. Identify, analyze and formulate complex problem chosen for project work to attain substantiated conclusions.
- CO3. Design solutions to the chosen project problem.
- CO4. Undertake investigation of project problem to provide valid conclusions.
- CO5. Use the appropriate techniques, resources and modern engineering tools necessary for project work.
- CO6. Understand societal issues in the context of the project work.
- CO7. Understand environmental issues while executing the project work.
- CO8. Understand professional and ethical responsibilities while executing the project work.
- CO9. Function effectively as individual and a member in the project team.
- CO10. Develop communication skills, both oral and written form, for preparing and presenting project report.
- CO11. Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.
- CO12. Engage in lifelong learning to improve knowledge and competence in the chosen area of the project.

Program: B.Tech. COMPUTER SCIENCE AND ENGINEERING

I B. Tech. - I Semester (16BT1HS01) Technical English

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: *English at Intermediate level*

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Demonstrate knowledge in

- ☐ Process of communication
- ☐ Modes of listening
- ☐ Paralinguistic features
- ☐ Skimming and Scanning
- ☐ Elements of style in writing

CO2: Analyze the possibilities and limitations of language for understanding

- ☐ Barriers to Communication
- ☐ Barriers to Effective Listening
- ☐ Barriers to Speaking
- ☐ Formal and metaphorical language

CO3: Design and develop functional skills for professional practice.

CO4: Apply writing skills in preparing and presenting documents

CO5: Function effectively as an individual and as a member in diverse teams.

CO6: Communicate effectively with the engineering community and society in formal and informal situations.

I B. Tech - I Semester (16BT1BS01) ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.

CO2: Develop analytical skills in:

- a. Determination of hardness of water.
- b. Determination of viscosity, flame and fire points, cloud and pour points.

CO3: Develop designing skills in:

- a. Synthesis of engineering plastics.
- b. Chemical methods for the synthesis of Nano materials.

CO4: Develop skills for providing solutions through:

- a. Mitigation of hardness of water.
- b. Newer Nanomaterials and engineering plastics for specific applications

CO5: Acquire awareness to practice engineering in

compliance to modern techniques such as:

- a. Nalgonda technique for defluoridation of water
- b. Electroplating technique for control of corrosion.

CO6: Acquire awareness to societal issues on:

- a. Quality of water.
- b. Bio-diesel
- c. Chemical materials utility and their impact.

I B. Tech. - I Semester
(16BT1BS03) MATRICES AND NUMERICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire basic **knowledge** in
- Finding the rank of matrices and analyzing them.
 - Solving algebraic and transcendental equations by various numerical methods.
 - Fitting of various types of curves to the experimental data.
 - Estimating the missing data through interpolation methods.
 - Identification of errors in the experimental data
 - Finding the values of derivatives and integrals through various numerical methods.
 - Solving differential equations numerically when analytical methods fail.
- CO2: Develop skills in **analyzing** the
- methods of interpolating a given data
 - properties of interpolating polynomials and derive conclusions
 - properties of curves of best fit to the given data
 - algebraic and transcendental equations through their solutions
 - properties of functions through numerical differentiation and integration
 - properties of numerical solutions of differential equations
- CO3: Develop skills in **designing** mathematical models for
- Fitting geometrical curves to the given data
 - Solving differential equations
 - Constructing polynomials to the given data and drawing inferences.
- CO4: Develop numerical skills in **solving the problems** involving
- Systems of linear equations
 - Fitting of polynomials and different types of equations to the experimental data
 - Derivatives and integrals
 - Ordinary differential equations
- CO5: Use relevant numerical **techniques** for
- Diagonalising the matrices of quadratic forms
 - Interpolation of data and fitting interpolation polynomials
 - Fitting of different types of curves to experimental data
 - obtaining derivatives of required order for given experimental data
 - Expressing the functions as sum of partial fractions

I B. Tech. - I Semester
(16BT1BS04) MULTI - VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire knowledge in
- Higher order Differential equations
 - Maximum and minimum values for the functions of several variables
 - Double and triple integrals
 - Differentiation and integration of vector functions.
 - Line and surface volume
 - transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2: Develop skills in analyzing the
- methods for differential equation for obtaining appropriate solutions,
 - Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - The variations in the properties of functions near their stationary values
 - Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3: Develop skills in designing mathematical models for
- R-C and L-R-C oscillatory electrical circuits
 - Heat transfer and Newton's law of cooling
 - Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces

- CO4: Develop analytical skills in solving the problems involving
- Newton's law of cooling
 - non homogeneous linear differential equations
 - maximum and minimum values for the functions
 - lengths of curves, areas of surfaces and volumes of solids in engineering
 - transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5: Use relevant mathematical techniques for evaluating
- various types of particular integrals in differential equations
 - stationary values for multi variable functions
 - multiple integrals in change of variables
 - integrations of vector functions.

I B. Tech. - I Semester

(16BT10501) PROGRAMMING IN C

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1: Demonstrate knowledge in:
- o Elements of C Language
 - o Selection and Repetition statements.
 - o Arrays, Strings and Functional statements.
 - o Derived data types, Files and Pointers
- CO2: Analyze complex engineering problems to develop suitable solutions
- CO3: Design algorithms for specified engineering problems
- CO4: Use appropriate 'C' language constructs for solving engineering problems
- CO5: Write programs using 'C' language to implement algorithms

I B. Tech. - I Semester

(16BT1HS31) ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES: On successful completion of this course the students will be able to

- CO1: Demonstrate knowledge in
- ☐ Phonetics
 - ☐ Information Transfer
- CO2: Analyze the situations in professional context by using
- ☐ Vocabulary
 - ☐ Grammar
- CO3: Design and develop functional skills for professional practice.
- CO4: Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.
- CO5: Function effectively as an individual and as a member in diverse teams through
- ☐ Extempore talk and
 - ☐ Role Play
- CO6: Communicate effectively in public speaking in formal and informal situations.
- CO7: Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I-B. Tech - I Semester
16BT1BS31: ENGINEERING CHEMISTRY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of p^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, p^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.
- CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
- CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.
- CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, PH of a solution, determination of viscosity of lubricants and estimation of iron in cement.
- CO5: Provide solutions for environmental issues through determination of quality of water.

I B. Tech. I Semester
16BT10331: COMPUTER AIDED ENGINEERING DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	6	3

PRE-REQUISITES: None

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B. Tech. - I Semester
16BT10531: PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:-

A course on "Programming in C"

COURSE DESCRIPTION:

Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1:** Demonstrate practical knowledge of using C language constructs:
 - Selection and Repetition statements.
 - Arrays, Strings and Functional statements.
 - Derived data types, Files and Pointers
- CO2:** Analyze problems to develop suitable algorithmic solutions
- CO3:** Design Solutions for specified engineering problems
- CO4:** Use appropriate 'C' language constructs for solving engineering problems

- CO5:** Implement and execute programs using 'C' language
CO6: Document programs and communicate effectively while conducting Professional transactions.

I B.Tech. - II Semester

16BT1BS02: ENGINEERING PHYSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.
- CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
- CO3: Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
- CO4: Develop problem solving skills in engineering context.
- CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser.

I B. Tech. - II Semester

16BT2BS01: TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

- CO1: Acquire basic knowledge in
- (a) Fourier series and Fourier transforms
 - (b) Fourier integrals
 - (c) Laplace transforms and their applications
 - (d) z- transforms and their applications
 - (e) solving partial differential equations
- CO2: Develop skills in analyzing the
- (a) Properties of Fourier series for a given function
 - (b) Partial differential equations through different evaluation methods
 - (c) Difference equations through z – transforms
 - (d) Engineering systems and processes involving wave forms and heat transfer
- CO3: Develop skills in designing mathematical models for
- (a) Problems involving heat transfer and wave forms
 - (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations
- CO4: Develop analytical skills in solving the problems involving
- (a) Fourier series and Fourier transforms
 - (b) Laplace transforms
 - (c) Z-transforms and difference equations
 - (d) Heat transfer and wave motion
- CO5: Use relevant transformation techniques for
- (a) Obtaining Fourier transforms for different types of functions
 - (b) Laplace transforms
 - (c) Z- transforms
 - (d) Partial differential equations

I B.Tech. - II Semester**16BT20441: BASIC ELECTRONIC DEVICES AND CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Engineering Physics.

COURSE DESCRIPTION:

Characteristics of general and special purpose electronic devices; Rectifiers; Biasing of BJT; FET, Feedback Amplifiers, Oscillator.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Gain in-depth knowledge in

- ☐ *p-n* junction diode and its characteristics
- ☐ Zener diode and its characteristics
- ☐ Rectifiers and Filters
- ☐ Characteristics of BJT, FET, MOSFET and special purpose electronic devices.
- ☐ FET amplifiers
- ☐ Feedback amplifiers and Oscillators

CO2: Analyze numerical and analytical problems in

- ☐ Rectifiers using Filters
- ☐ Transistor biasing circuits
- ☐ FET biasing circuits and amplifiers
- ☐ Feedback amplifiers and oscillators

CO3: Design electronic circuits such as

- ☐ Rectifiers with and without filters
- ☐ BJT and FET biasing circuits
- ☐ FET amplifiers
- ☐ Feedback amplifiers and oscillators

CO4: Solve engineering problems and arrive at solutions pertaining to electronic circuits.

CO5: Select appropriate technique for transistor biasing.

I B.Tech. - II Semester**16BT21201: OBJECT ORIENTED PROGRAMMING THROUGH C++**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PREREQUISITES: A Course on "Programming in C".

COURSE DESCRIPTION:

Introduction to Object Oriented concepts and Fundamental Concepts of C++; Decision Making Statements, Looping Statements and Functions; Arrays, Pointers & References and Strings; Classes & Objects and Overloading Operators; Composition & Inheritance, Templates, Iterators & Generics and File Handling;

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1:** Demonstrate knowledge on object oriented programming concepts - Object, Class, Inheritance, Polymorphism, Encapsulation, Abstraction and Message passing.
- CO2:** Identify object oriented concepts for code reusability and optimization.
- CO3:** Design and develop solutions for given specifications.
- CO4:** Demonstrate problem solving skills to provide software solutions to real world problems.
- CO5:** Develop C++ programming to provide solutions to complex engineering problems using object oriented concepts.

I B.Tech. - II Semester**16BT21501: DIGITAL LOGIC DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -NIL-

COURSE DESCRIPTION: Introduction to number systems; logic gates; Boolean Algebra; simplification of Boolean functions; Design of combinational circuits; Design of sequential circuits, Memory and Programmable Logic

COURSE OUTCOMES:

On Successful completion of this course student will be able to:

- CO1. Demonstrate knowledge on Boolean algebra, Minimization of Boolean functions using Map Reduce method.
- CO2. Identify appropriate simplification techniques for Boolean functions.

- CO3. Design combinational and sequential logic circuits, memory and programmable logic for digital systems.
- CO4. Select and Apply Boolean algebra and gate level minimization techniques for designing combinational and sequential logic circuits.
- CO5. Learn independently new concepts, new techniques and advanced subject knowledge in the area of combinational and sequential logic circuits.

I B. Tech. - II Semester

16BT1BS32: ENGINEERING PHYSICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.
- CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.
- CO3: Develop skills in designing electronic circuits using semiconductor components.
- CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.
- CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B.Tech. - II Semester

16BT20451: ANALOG AND DIGITAL ELECTRONICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on "Basic Electronic Devices & Circuits and Digital Logic Design"

COURSE DESCRIPTION: Identification and testing of active and passive components; RPS, DMM, Function Generator, CRO; Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Realization of FFs, Combinational Circuits, sequential Circuits; Demonstration on VHDL Programme.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate knowledge in different electronic devices, analog and digital circuits
- CO2. Analyze the characteristics of different electronic devices and circuits like
- ☐ Diodes p-n Junction Diodes, Zener Diodes, SCR
 - ☐ Transistors-BJT, FET, UJT
 - ☐ Flip Flops-JK FF, D FF
 - ☐ Combinational Circuits-HA, FA
 - ☐ Sequential Circuits -Counters
- CO3. Design electronic circuits like FET Amplifiers, Feedback amplifiers, Oscillators, Combinational Circuits and Sequential Circuits.
- CO4. Solve engineering problems by proposing potential solutions through Design of better electronic circuits.
- CO5. Model an electronic circuit which fulfil the needs of the society.
- CO6: Function effectively as an individual and as a member in a group
- CO7: Communicate effectively in verbal and written form.

I B. Tech. - II Semester

16BT20531: Workshop in Computer Science

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: *NIL*

COURSE DESCRIPTION:

Hands on practice sessions on PC hardware, Internet, World Wide Web, MS-Word, Excel, Power Point, Publisher, MS Access and MS NetMeeting; Demonstration on installation of system software - Linux OS and device drivers; protecting personal computer from viruses and other cyber attacks.

COURSE OUTCOMES:

After the completion of the course the student will be able to:

- CO1. Gain Knowledge on:
- Identification of functional parts of PC
 - Internet and World Wide Web.
 - Computer security issues and preventive measures.
- CO2. Design documents and presentations effectively.
- CO3. Apply modern tools to develop IT based applications and acquire skills in PC maintenance and Office automation tools.
- CO4: Develop effective professional communication through IT Tools.
- CO5: Acquire attitude for lifelong learning of advances in computer science.

I B.Tech - II semester**16BT21232: OBJECT ORIENTED PROGRAMMING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "OOPS through C++".

COURSE DESCRIPTION:

Hands-on experience on creating Virtual machines on Windows and Linux platforms, Development of Service based web applications & their deployment and Mobile app development.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1:** Demonstrate practical knowledge on Object oriented programming concepts - Object, Class, Inheritance, Polymorphism, encapsulation, Abstraction, message passing.
- CO2:** Apply object oriented programming concepts to develop real world applications.
- CO3:** Demonstrate Problem solving skills using basic and advanced concepts of C++.
- CO4:** Work individually and in teams collaboratively in implementing the applications.
- CO5:** Demonstrate communication skills both oral and written for preparing and presenting reports

II B. Tech. I-Semester**(16BT3BS01) PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES:

Intermediate/senior secondary mathematics

COURSE DESCRIPTION:

Random variables; mathematical expectations; probability distributions; correlation and regressions; statistical quality control; sampling distributions; tests for small and large samples and their significances.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1: Acquire basic knowledge in
- probability distributions, correlation and regressions
 - statistical quality control and testing of hypotheses
 - Simple linear regression
 - Tests of significance for small and large samples
- CO2: Develop skills for analyzing the data with
- mathematical expectations for realistic results
 - probability distributions for practical situations.
 - control charts of statistical quality control
 - correlation and regression concepts
 - suitable tests of significance for practical situations.
- CO3: Develop skills in designing
- probability distributions
 - limitations of statistical quality control
 - control charts,
 - X, R, np, and c charts
- CO4: Develop analytical skills for solving problems involving
- Probability distributions, means, variances and standard deviations
 - Statistical techniques employed for quality
 - Sampling techniques for decision making
 - Tests of significances for small and large samples

- CO5: Use relevant probability and statistical techniques for
- Mathematical expectations of desired results
 - Fitting probability distributions for experimental data.
 - Quality control and testing of hypothesis.

II B. Tech. I-Semester

(16BT30501) COMPUTER ORGANIZATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A Course on "Digital Logic Design"

COURSE DESCRIPTION:

Basic structure and operation of a digital computer; Organization and functional principles of the arithmetic and logic unit, control unit, memory unit and I/O unit; Concepts of pipelining and parallel processing techniques;

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Computer Arithmetic units
- Register Transfer and Computer Instructions
- Design of Control Unit
- Input Output Organization and Memory system
- Pipelining and Multiprocessing.

CO2. Analyze the functional units of a digital computer.

CO3. Design the functional modules in a digital computer - Arithmetic Units, Memory and I/O.

CO4. Investigate the performance of memory, I/O, and pipelined processors.

CO5. Select appropriate techniques of I/O, Pipelining and Multiprocessing to solve computing problems.

CO6. Apply contextual knowledge of computer systems development to societal applications.

II B. Tech. – I Semester

(16BT30502) DATA STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A Course on "Programming in C"

COURSE DESCRIPTION:

Linked Lists; Type of lists; Operations and Applications; Stacks and Queues; Operations and Applications; Trees, Search trees and Heaps; Multiway Trees and Graphs; Searching and Hashing.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- Principles of Data Structures.
- Linear and Non-linear Data Structures.
- Sorting and hashing techniques.

CO2. Analyze and Identify suitable data structure for computational problem solving

CO3. Design solutions for complex engineering problems using linear and non-linear data structures.

CO4. Develop solutions for Complex computational problems by conducting explorative analysis.

CO5. Apply appropriate data structure to provide solutions for real time problems by using C Language.

CO6. Apply contextual knowledge of data structures to design applications for societal applications like payroll systems, web applications, banking and financial systems.

II B. Tech. - I Semester

(16BT31201) DISCRETE MATHEMATICAL STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Multivariable Calculus and Differential Equations".

COURSE DESCRIPTION:

Mathematical Logic; Predicates; Functions and Relations; Algebra Structures; Mathematical Reasoning; Recurrence Relations; Graphs; Graph Theory and its Applications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on mathematical logic, algebraic structures, relations, recurrence relations and mathematical reasoning.
- CO2. Analyze and prove given statement by contradiction and automatic theorem.
- CO3. Design network applications using Prim's and Kruskal's algorithms.
- CO4. Solve tree traversal problems using Graph Theory.
- CO5. Apply permutation, combinations, counting principle, Lagrange's theorem and graph theory in solving real-time problems.

II B. Tech. – I Semester**(16BT30503) PYTHON PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A Course on "Object Oriented Programming through C++"

COURSE DESCRIPTION:

Data types and Expressions; Control Statements; Strings; Text Files; Lists; Dictionaries; Functions; Objects and their use; Exception Handling; Design with Classes; Graphical User Interface;

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in:
 - Data Types, Variables, Expressions
 - Control statements, Strings and Text files.
 - Lists, Dictionaries and Functions.
 - Objects and Design with classes
 - Exception Handling and GUI
- CO2. Analyze complex computational problems.
- CO3. Design solutions for real life computational problems
- CO4. Solve complex problems using python scripting constructs.
- CO5. Implement python scripts using Integrated Development Environment.
- CO6. Apply Python programming knowledge to solve problems related to societal applications like Medical and Weather Forecasting.

II B. Tech. - I Semester**(16BT31501) OPERATING SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —**COURSE DESCRIPTION:**

Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.
- CO2. Identify the functionality involved in process management concepts like scheduling and synchronization.
- CO3. Design models for handling deadlock and perform memory management.
- CO4. Synthesize and apply programming API's to perform Process management.
- CO5. Use appropriate protection tools to provide access control to Operating system users.

II B. Tech. – I Semester**(16BT30531) DATA STRUCTURES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A Course on "Data Structures"

COURSE DESCRIPTION:

Hands on practice on Linked Lists; Type of lists; Stacks and Queues; Trees and Search trees; Graphs; Searching and Hashing.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge on Stacks, Queues, Linked lists, Trees Sorting and Hashing Techniques.
- CO2. Analyze suitable data structure to solve real world computing problems.
- CO3. Design solutions for complex computational problems using linear and non-linear data structures.
- CO4. Solve for Complex computational problems by conducting explorative analysis.
- CO5. Use C language for implementing linear and non-linear data structures.
- CO6. Apply contextual knowledge of data structures to design applications for societal requirements.
- CO7. Communicate effectively using data structures with engineering community, being able to comprehend and write effective programs and Prepare Reports.

II B. Tech. – I Semester**(16BT30532) PYTHON PROGRAMMING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A Course on "Python Programming"

COURSE DESCRIPTION:

Hands on practice – Scripting using Python Programming constructs; Conditional statements; Loops; Text Files; Lists; Dictionaries; Strings; Functions; GUI.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge of using python scripting constructs:
 - Selection and Repetition statements.
 - Lists, Dictionaries, Strings and Functions.
 - Text Files and GUI.
- CO2. Analyze the complexity of computer hardware.
- CO3. Design solutions for specified computational problems using Object Oriented Programming concepts
- CO4. Use appropriate python scripts and functions for solving complex problems.
- CO5. Create window based applications using tkinter package
- CO6. Apply contextual knowledge to computational problems related to societal applications like Medical and Weather Forecasting.
- CO7. Work effectively to contribute individually to solve real world problems.
- CO8. Communicate effectively in both oral and written to develop Python scripts.

II B. Tech. - I Semester**(16BT31531) OPERATING SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A Course on "Operating Systems"

COURSE DESCRIPTION: Hands on practice in simulating algorithms for CPU Scheduling, Memory Management, I/O Management, Deadlock Handling mechanisms; Implementing Synchronization problems; practice on UNIX commands.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge of the following algorithms to solve problems:
 - ☐ CPU Scheduling
 - ☐ Memory Management
 - ☐ I/O Management
- CO2. Formulate and analyze solutions to problems pertaining to Memory and I/O.
- CO3. Designing models for deadlock handling mechanisms.
- CO4. Develop skills in basic UNIX commands.
- CO5. Use appropriate APIs available in modern operating systems (such as threads, system calls, semaphores, etc...) for software development.
- CO6. Communicate effectively on complex operating system problems with implication to User-friendliness.
- CO7. Develop and demonstrate user defined libraries to communicate with the kernel for effective implementation of projects across multidisciplinary environments.

II B. Tech - II semester
(16BT3HS01) ENVIRONMENTAL STUDIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A Course on "Engineering Chemistry"

COURSE DESCRIPTION:

Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. Develop strategies for environmental pollution control and natural resource management.
- CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. Understand the impact of social issues and population on environment.
- CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. Follow environmental protection laws for sustainable development.
- CO9. Communicate effectively on environmental issues in the form reports.

II B. Tech. – II Semester
(16BT40501) COMPUTER GRAPHICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

Courses on "Matrices and Numerical Methods" and "Programming in C"

COURSE DESCRIPTION:

Introduction to Computer Graphics; Output Primitives; 2-D Geometric Transformations and Viewing; 3-D Geometric Transformations and Viewing; 3-D Object Representation; Visible Surface Detection Methods and Rendering Methods.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
 - ☐ Graphical interactive devices
 - ☐ Viewing transformations
 - ☐ 2-D & 3-D object representations and
 - ☐ Surface detection methods
- CO2. Analyze Transformations and Clipping algorithms for 2-D and 3-D objects.
- CO3. Design algorithms to generate points, lines, and polygons for 2-D and 3-D objects.
- CO4. Develop innovative methods and techniques for 2-D and 3-D modeling.
- CO5. Apply appropriate techniques and tools for surface detection and rendering methods.
- CO6. Use contextual knowledge to develop interactive user interfaces and animations related to societal applications.

II B. Tech. – II Semester
(16BT40502) DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION:

Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- ☐ Data models and Database Languages
- ☐ Database design
- ☐ Normal forms
- ☐ Storage and Indexing

CO2. Analyze databases using normal forms to provide solutions for real time applications.

CO3. Design solutions for database problems using database design, views design and framing queries.

CO4. Use database techniques for designing databases, managing databases and its security.

CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.

CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

II B. Tech. – II Semester**(16BT41201) DESIGN AND ANALYSIS OF ALGORITHMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on “Data Structures”.

COURSE DESCRIPTION:

Introduction to Algorithms and Asymptotic Notations; Disjoint Sets and Graphs; Divide and Conquer, Greedy Method; Dynamic Programming, Back Tracking; Branch and Bound.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- ☐ Algorithm Complexities and Asymptotic notations.
- ☐ Algorithm Design techniques-Divide and Conquer, Greedy Method, dynamic programming, Back tracking, Branch and Bound.

CO2. Analyze the performance of algorithms with respect to Time and Space complexities.

CO3. Design the algorithms for solving real world problems.

CO4. Solve sorting and searching problems using Divide and Conquer method.

CO5. Use dynamic programming and backtracking in finding shortest paths.

II B. Tech. – II Semester**(16BT41202) JAVA PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on “Object Oriented Programming through C++”.

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- ☐ Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
- ☐ Packages, interfaces, multithreading, exception handling, event handling.

CO2. Analyze complex engineering problems using object oriented concepts.

CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.

CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.

CO5. Use advanced programming languages to develop web applications.

CO6. Build Java Applications suitable for societal requirements.

II B. Tech. – II Semester
(16BT41203) SOFTWARE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - ☐ Fundamental concepts of software engineering.
 - ☐ Process models.
 - ☐ Software development life cycle.
- CO2. Analyze software requirements and process models required to develop a software system.
- CO3. Design and develop a quality software product using design engineering principles.
- CO4. Develop software product as per user and societal requirements.
- CO5. Follow standards for software development and quality management.
- CO6. Demonstrate skills in applying risk and quality management principles for effective management of software projects.

II B. Tech. II Semester
(16BT40531) DATABASE MANAGEMENT SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A course on "Database Management Systems"

COURSE DESCRIPTION:

Hands on experience on - DDL, DML commands; Query processing using operators; Joins, Views, Single Row functions, Group Functions and SET functions; PL/SQL concepts - Basic Programs, Triggers, Functions, Cursors and Stored Procedures.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge on creation and alteration of tables, insertion and Querying of data.
- CO2. Analyze and evaluate the databases using SQL DML/DDL commands.
- CO3. Design database schemas for the sales database, customer database and product database.
- CO4. Develop solutions for database problems using stored procedures, stored functions, cursors and triggers.
- CO5. Implement DDL and DML commands in SQL and PL/SQL, ORACLE to manage data in databases.
- CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.
- CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports on databases.

II B. Tech. – II Semester
(16BT31231) JAVA PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Java Programming".

COURSE DESCRIPTION: Hands on experience on Polymorphism; Inheritance and Interfaces; Exception Handling; Multithreading; Event Handling; AWT; Applets; Servlets.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on basic concepts of Java programming.
- CO2. Design and develop efficient programs with multitasking ability and handle exceptions.
- CO3. Demonstrate independent problem solving skills in developing interactive applications.
- CO4. Apply object oriented approach to develop user friendly interface and learn how to communicate with systems over the network.
- CO5. Build Java applications suitable for societal requirements.
- CO6. Work effectively as an individual and as a member in team for case studies implementation.
- CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports.

II B. Tech. – II Semester
(16BT4HS31) **SOFT SKILLS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

English Language Laboratory in I B.Tech. or English Laboratory at Diploma Level.

COURSE DESCRIPTION:

This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1: Acquire knowledge in
- ☐ Goal Setting
 - ☐ Creative Thinking
 - ☐ Leadership Skills and
 - ☐ Team Work
- CO2: Analyse the situations and develop skills for
- ☐ Body Language
 - ☐ Personality Development and
 - ☐ Stress Management
- CO3: Apply the techniques of soft skills in a problem situation enhanced through multimedia software
- CO4: Function effectively as an individual and as a member in diverse teams
- CO5: Communicate effectively in public speaking in formal and informal forums.

III B. Tech. I-Semester
(16BT5HS01) **MANAGEMENT SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION:

Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1: Demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial context.
- CO2: Identify and analyse management problems in the business organizations reaching substantiated conclusions using principles of management.
- CO3: Design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
- CO4: Competently employ broad based analytical tools for decision making, system design, analysis and performance.
- CO5: Provide solution to organizations for sustainable development.
- CO6: Apply knowledge of engineering and management principles to manage the projects in multidisciplinary environments.

III B. Tech. – I Semester
(16BT50501) **COMPUTER NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

Courses on “Computer Organization” and “Operating Systems”

COURSE DESCRIPTION:

Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sub layer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
- ☐ Functionalities of Various OSI and TCP/IP layers

- ☐ 3G Mobile phone networks, 802.11
- ☐ TCP,UDP and SMTP
- CO2. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.
- CO3. Design and compute subnet masks and addresses for networking requirements.
- CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.
- CO5. Apply Network Standards - 802.3 and 802.11 for developing computer Networks.
- CO6. Assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.

III B. Tech. – I Semester

(16BT50502) LINUX PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A Course on "Operating Systems"

COURSE DESCRIPTION:

Concepts on Linux Programming; Shell Programming; Process, Signals and File System Structure; Inter process Communications and Socket Programming for Client-Server Interaction.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
 - ☐ Shell programming
 - ☐ File Structure and System Calls
 - ☐ Processes management and handling signals,
 - ☐ IPC and Sockets
- CO2. Analyze shell scripts and system calls related to Linux Environment.
- CO3. Design shell scripts and system calls for specified computational problems
- CO4. Use appropriate shell scripts and system calls for solving complex problems.
- CO5. Provide appropriate Linux solutions for real time applications
- CO6. Apply contextual knowledge to solve problems related to societal issues.

III B. Tech. – I Semester

(16BT51202) OBJECT ORIENTED ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Software Engineering" and "Object Oriented Programming through C++".

COURSE DESCRIPTION: Introduction to UML, Basic structural modeling; Advanced structural modeling, Class and object diagrams; Basic behavioral modeling; Advanced behavioral modeling; Architectural modeling.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on principles of object oriented analysis and design through UML Diagrams.
- CO2. Analyze user requirements and identify suitable structural and behavioral modeling components.
- CO3. Design and develop UML models for real time software applications.
- CO4. Solve real world problems by applying structural and behavioral modeling techniques.
- CO5. Use unified modeling language in preparing blue prints for software solutions.
- CO6. Design and develop UML models to solve societal problems.

III B. Tech. - I Semester

(16BT41204) THEORY OF COMPUTATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Discrete Mathematical Structures".

COURSE DESCRIPTION: Fundamentals of Computation; Finite State Automaton; Regular Expressions; Grammars; Push Down Automaton; Turing Machine.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on Formal languages and automata.
- CO2. Analyze the classification of languages, automata's and their computing power.

- CO3. Design grammars and automata (recognizers) for regular expressions and formal languages.
 CO4. Solve computational problems using automata.
 CO5. Apply theorems to translate automata's and identify the class of languages.

III B. Tech. – I Semester
 (16BT50442) **MICROPROCESSORS AND INTERFACING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on 'Digital Logic Design' and 'Computer Organization'.

COURSE DESCRIPTION: INTEL 8086 & 8051- Architectures; Instruction set; Programmable Interfacing Concepts; ADC, DAC, 8255, 8257, 8259, 8279, 8251, Advanced peripheral Interfacing; Applications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1: Demonstrate knowledge in:

- ☐ Internal Hardware details of Intel 8086, 8051 & programming devices like 8255, 8257, 8259, 8279 and 8251.
- ☐ Interfacing various peripherals to build standalone systems

CO2: Analyze various peripherals and interfacing techniques.

CO3: Design application based Microcomputer system using 8086 and 8051.

CO4: Solve problems by providing microcomputer-based real time solutions.

CO5: Apply programming tools, appropriate techniques and resources to complex engineering activities for microprocessor and microcontroller based systems with understanding of limitations.

CO6: Solving societal problems by applying concepts of microprocessors and microcontrollers.

III B. Tech. I-Semester
 (16BT50503) **COMPUTER VISION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A course on "Computer Graphics"

COURSE DESCRIPTION:

Introduction to Computer Vision; Geometric Camera Models, Light, Color, Texture; Stereopsis; Segmentation by Clustering, Classification; Detection of Objects; Object Recognition and Information Retrieval.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on geometric camera models, light, color, texture, stereopsis, segmentation, and classification, detection of objects, object recognition and information retrieval procedures.

CO2. Analyze the digital image by Texture and Stereopsis methods.

CO3. Design solutions for image analysis problems by segmentation and classification techniques.

CO4. Develop novel techniques and efficient algorithms for image synthesis.

CO5. Apply clustering, classification, object recognition and information retrieval techniques for image analysis.

CO6. Use Contextual knowledge to solve problems related to societal issues.

III B. Tech. – I Semester
 (16BT50504) **DATA COMMUNICATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

Courses on "Digital Logic Design" and "Basic Electronic Devices and Circuits"

COURSE DESCRIPTION:

Concepts of Data Communication; Transmission Media-metallic and optical fiber, Digitization techniques-PCM; Multiplexing, Wireless Communication Systems; Telephone and Cellular Concepts; Data Communication Equipment

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- Data communication and networking
- Digital transmission and multiplexing
- Telephone and cellular concepts
- Data communication codes and equipment

- CO2. Analyze various types of modulation and multiplexing techniques.
- CO3. Design wireless communication equipment to fulfill networking requirements.
- CO4. Solve problems pertaining to analog or digital communication system in terms of complexity of the transmitters and receivers.
- CO5. Use Data communication hardware and equipment for data communication.
- CO6. Contribute towards societal issues and responsibilities in designing and developing sustainable networks.

III B. Tech. - I Semester

(16BT51541) MODELING AND SIMULATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A Course on "Probability Distributions and Statistical Methods"

COURSE DESCRIPTION:

Discrete event simulation; Useful statistical models; Queueing systems; Properties of random numbers, Test for random numbers; Data collection, Types of simulations with respect to output analysis.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on functional modeling of system design.
- CO2. Analyze the performance of queueing systems in real world applications.
- CO3. Design dynamic system operations using simulation results.
- CO4. Apply mathematical foundations and computer science theory in modeling and designing of experiments for real time systems.
- CO5. Select suitable simulation software tools for solving problems related to computer based systems.
- CO6. Relate appropriate professional principles and norms of engineering practice for designing the simulation models.

III B. Tech. – I Semester

(16BT50531) COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION:

Hands on Practice on Data Link Layer Framing Methods; Routing Algorithms; Congestion Control Algorithms; Connection Management in Transport Layer;

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate Knowledge on:
 - ☐ Framing methods for data link layer,
 - ☐ Shortest path using Dijkstra's routing algorithms
- CO2. Identify suitable algorithm to find shortest path in a given network
- CO3. Design and compute subnet masks and addresses for networking Requirements.
- CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.
- CO5. Apply Latest software tools and technologies for designing simple to complex applications in computer networks.
- CO6. Assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.
- CO7. Work effectively as an individual to implement mini-project.
- CO8. Demonstrate communication skills both oral and written for preparing and generating reports.

III B. Tech. – I Semester
(16BT50532) **LINUX PROGRAMMING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A Course on "Linux Programming"

COURSE DESCRIPTION:

Hands on Practice with - Shell Programs; System Calls; Environment Variables; Inter Process Communication; File System and Socket Programming.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge on
- ☐ Shell programming
 - ☐ File Structure and System Calls
 - ☐ Processes management and handling signals,
 - ☐ IPC and Sockets
- CO2. Analyze shell scripts and system calls in Linux operating system.
- CO3. Design shell scripts for specified computational problems.
- CO4. Use appropriate shell scripts and system calls for solving complex problems
- CO5. Create shell scripts and system calls for real time Linux applications.
- CO6. Apply contextual knowledge to solve problems related to societal issues.
- CO7. Communicate effectively using Linux with engineering community being able to comprehend and write effective programs and prepare reports.

III B. Tech. – I Semester
(16BT50533) **OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A Course on "Object Oriented Analysis and Design"

COURSE DESCRIPTION:

Hands on Practice to Design and Implement - Automated Teller Machine, Library Information System, Online Ticket Reservation System, Point of Sales, Airport Simulation, Course Registration System, Home Appliance Control System and Hospital Management System using Object-Oriented Language.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge on principles of object oriented analysis and design through UML diagrams.
- CO2. Analyze user requirements and identify suitable structural and behavioral modeling components.
- CO3. Design and develop UML models for real time applications.
- CO4. Solve real world problems by applying structural and behavioral modeling techniques.
- CO5. Use UML to design the software system.
- CO6. Apply contextual knowledge of UML models to assess societal issues.
- CO7. Involve as individual to solve case studies.
- CO8. Develop a model for complex computational activities by preparing and presenting reports through effective communication.

III B.Tech. – II Semester
(16BT3HS02) **MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

Prerequisite: —

COURSE DESCRIPTION:

Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

Course outcomes:

On successful completion of the course, students will be able to:

- CO1: Acquire Knowledge in
- ☐ Tools and concepts of Micro Economics.
 - ☐ Basic Principles and concepts of Accountancy.

- ☐ Provides life skills for effective utilization of scarce resources.
 - ☐ Financial Accounting.
 - ☐ Significance of Economics and Accountancy
- CO2: Develop skills in managerial decision making of an organization.
 CO3: Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.
 CO4: Develop effective communication in Business and Accounting transactions.
 CO5: Ascertain the profitability and soundness of an organization.
 CO6: Practice Financial Accounting

III B. Tech. – II Semester

(16BT61501) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A Course on “Database Management Systems”

COURSE DESCRIPTION: Data Mining Fundamentals; Data Preprocessing; Operational Database Systems and Data Warehouses; Mining Frequent Patterns; Classification and Prediction; Clustering; New Trends and Research Frontiers.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on Concepts of data warehousing and data mining.
- CO2. Analyze using data mining techniques to find useful and potential Knowledge.
- CO3. Design of Data Warehouse for OLAP applications and deployment.
- CO4. Evaluate the usage of association mining techniques on complex data objects.
- CO5. Select appropriate techniques to measure the interesting patterns from heterogeneous databases.
- CO6. Apply appropriate evolutionary data mining algorithms to find solutions of Real time Applications.

III B. Tech. – II Semester

(16BT60501) SOFTWARE TESTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A course on “Software Engineering”

COURSE DESCRIPTION:

Software Testing Basics: Goals, Defects, Terminology, Methodology, STLC in SDLC, Verification & Validation; Software Testing Techniques: White box testing, Black Box Testing, Regression testing; Test Management: Test Planning, Design & Specifications; Test Automation: Tool selection & Guidelines.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
 - ☐ Software Testing Life Cycle.
 - ☐ Testing Techniques.
 - ☐ Test Management & Metrics.
 - ☐ Regression Testing
 - ☐ Test Automation
- CO2. Analyze testing circumstances and their resultants in software development.
- CO3. Design and develop the appropriate test cases in accordance to the software development model.
- CO4. Use problem solving skills to control and monitor the testing process
- CO5. Apply testing tools for testing the software quality.
- CO6. Apply contextual knowledge to perform testing on software related to societal applications

III B. Tech. II Semester

(16BT70402) EMBEDDED SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on ‘Digital Logic Design’ and ‘Computer Organization’

COURSE DESCRIPTION:

Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Apply knowledge in
- ☐ MSP430 Architecture, Pin out, Instruction set
 - ☐ High level programming
 - ☐ Usage of On-chip resources like ADC, DAC, Timers
 - ☐ Internet of Things related issues
- CO2. Analyze various design issues regarding
- ☐ Usage of on chip resources
 - ☐ Low power modes
 - ☐ Communication support
- CO3. Design embedded systems using MSP430 series microcontrollers to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.
- CO5. Apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.
- CO6. Reason out and practice professional engineering to deliver efficient and cost effective embedded based products to society.

III B. Tech. – II Semester**(16BT50341) OPTIMIZATION TECHNIQUES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

A course on "Multi variable calculus and differential equations"

COURSE DESCRIPTION:

Introduction to optimization; classical optimization techniques; classification of optimization problems; linear programming; transportation and assignment problem; non-linear programming; un-constrained non-linear programming; constrained non-linear programming; dynamic programming.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate the knowledge on Optimization techniques for Linear, Non linear and Dynamic programming problems.
- CO2. Analyze and quantify a system architecture or product design problem for selecting appropriate objective function, design variables, parameters and constraints.
- CO3. Develop mathematical models for real time optimization problems.
- CO4. Conduct investigations on complex problems and make recommendations based on solutions, analysis and limitations of models.
- CO5. Use optimization techniques for solving complex problems of real time applications.
- CO6. Optimize the resources in organizations for sustainable development.

III B. Tech. II Semester**(16BT60502) SOFT COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —**COURSE DESCRIPTION:**

Concepts on Soft Computing Techniques; Artificial Neural Networks; Supervised Learning; Unsupervised Learning; Fuzzy logic; Genetic Algorithms.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
- ☐ Artificial Neural Networks
 - ☐ Supervised Learning Networks
 - ☐ Unsupervised Learning Networks
 - ☐ Fuzzy sets, relations and measures
 - ☐ Genetic Operators
- CO2. Analyze neural network architectures, Fuzzy systems and Genetic algorithms.
- CO3. Design soft computing solutions for real life computational problems.
- CO4. Use soft computing techniques to solve complex computational problems.
- CO5. Create algorithms using soft computing techniques.
- CO6. Apply contextual knowledge to solve problems related to societal issues like Business Intelligence, Forecasting.

III B. Tech. – II Semester
(16BT60503) **WIRELESS NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on “Computer Networks”

COURSE DESCRIPTION:

Generations of Wireless Networks; Voice and Data Processing; Wireless Network Topology; GSM; TDMA; CDMA; Wireless LANs; Wireless WANs; Wireless PAN;

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
 - ☐ Wireless Medium Access methods.
 - ☐ Network Topology
 - ☐ Wireless LAN, HIPERLAN
 - ☐ GSM, CDMA, GPRS
- CO2. Analyze the network topologies in Wireless Networks
- CO3. Design solutions for network communications at physical and transport layers
- CO4. Solve complex problems related to network communications and wireless networks
- CO5. Apply GSM, CDMA, GPRS and Bluetooth to create Home Access Networks and wireless Personal Area Network.
- CO6. Apply contextual knowledge to solve problems using societal applications like health care devices, Internet of Things.

III B. Tech. – II Semester
(16BT71210) **HIGH PERFORMANCE COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on “Computer Organization”

COURSE DESCRIPTION: Cache-based Microprocessor Architecture; Memory Hierarchies; Multithreaded Processors; Common Sense Optimizations; The Role of Compilers; Data Access Optimization; Shared-memory Computers; Parallel Scalability; Introduction to OpenMP; Parallel Jacobi Algorithm; Introduction to MPI; MPI Performance Tools; MPI Parallelization of Jacobi Solver.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - ☐ Modern Processors and code Optimization.
 - ☐ Parallel computing paradigms.
- CO2. Analyze computation problems and identify the suitable parallel processing approaches to achieve optimum computation.
- CO3. Design Parallel processing algorithms for achieving high performance computing.
- CO4. Solve shared memory problems using Parallel Programming.
- CO5. Use OpenMP and MPI tools in Parallel Programming.

III B. Tech. – II Semester
(16BT71202) **MOBILE APPLICATION DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on ‘Java Programming’ and ‘Web Technologies’.

COURSE DESCRIPTION: Mobile platforms; Mobile User Interface and tools; Introduction to Android; Activities; Views; Menus; Database Storage; SMS; e-mail; Displaying Maps; Building a Location Tracker Web Services Using HTTP; Sockets Programming; Communication between a Service and an Activity; Introduction to iOS.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - ☐ Mobile platforms and Mobile User Interface
 - ☐ Android Activities and Intents
 - ☐ Messaging, Networking, Location based Services, Android Services
 - ☐ Basics of iOS
- CO2. Analyze the context of complex problems and identify user interface design requirements.

- CO3. Design and develop solutions for real world problems with android mobile applications.
 CO4. Demonstrate problem solving skills to create applications for mobile devices.
 CO5. Apply Android studio and iOS tools to develop mobile applications
 CO6. Create mobile applications as per societal needs.

III B. Tech. – II Semester
 (16BT71204) **MOBILE COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks"

COURSE DESCRIPTION: Introduction to Mobile Computing, GSM; Medium Access Control, Wireless LAN; Mobile Network and Transport Layers; Data Dissemination; Mobile Ad-Hoc Networks (MANETs), Wireless Application Protocol (WAP).

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
- GSM, GPRS, 3G, 4G, Wireless LAN, MANETs.
 - Protocols in Data Link, Network, Transport and Application layer.
- CO2. Analyze the issues related to database design and data retrieval in mobile applications.
 CO3. Apply routing algorithms for finding shortest path in MANETs
 CO4. Use protocols of Wireless Technologies for security implementation in mobile computing.
 CO5. Follow standards in the usage of mobile communications.

III B. Tech. – II Semester
 (16BT60504) **PRINCIPLES OF PROGRAMMING LANGUAGES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION:

Concepts of Programming Languages, Paradigms; Different Data Types; Arithmetic and Boolean Expressions, Programming Statements; Fundamental of Subprograms; Data Abstraction; Exception Handlers; Logic and Functional Programming Languages;

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Gain knowledge on
- Data types,
 - Expressions, statements,
 - Subprograms and abstract data types,
 - Exceptional handling in object oriented programming languages
- CO2. Analyze the constructs of procedural, object-oriented, functional and logic programming languages.
 CO3. Design functional forms, structures, control flow, list and predicate functions for the development of interpreted functional languages.
 CO4. Use appropriate programming language to develop software applications.
 CO5. Select appropriate technique in logic and functional based programming languages to develop effective programs.
 CO6. Apply Contextual knowledge in programming languages for societal issues.

III B.Tech. – II Semester
 (16BT6HS01) **BANKING AND INSURANCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate Knowledge in
- a) Tools and concepts of Banking and Insurance.
 - b) Basic Principles and concepts of Insurance and Banking.

- c) e-fund transfers, e-payments and e-business models.
- CO2. Develop skills in providing solutions for
 - a) Online banking and e – payments.
 - b) Risk Management through insurance benefits the society at large.
 - c) Money management by leveraging on technology, banking and insurance services.
- CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to more employment opportunities.
- CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

III B. Tech. – II Semester

(16BT6HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Technical English or English at Diploma level

COURSE DESCRIPTION: Nature and Scope of Communication; Corporate Communication; Writing Business Documents; Careers and Resumes; Interviews.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Corporate Communication
 - b) Main Stages of Writing Messages
 - c) Career Building
- CO2. Analyze the possibilities and limitations of language in
 - a) Communication Networks
 - b) Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in
 - a) Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

III B.Tech. – II Semester

(16BT6HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Scope, Objectives and Elements of Cost Accounting; Cost Sheet and Tender Quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: Concept of Risk and Return on Investment.

Course outcomes: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 - a) Elements of Costing.
 - b) Basic concepts of Financial Management.
 - c) Risk and Return
 - d) Significance of Cost Accountancy
 - e) Behavioral Finance
- CO2. Develop skills in
 - a) Material, Labor, Overheads control.
 - b) Excellence and ability to minimize the cost of the organization
- CO3. Develop effective Communication in Cost control and Financial Management.
- CO4. Provide solutions for effective investment decisions.

III B.Tech. – II Semester**(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: -

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

Course outcomes: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 - a) Schemes and institutions encouraging entrepreneurship
 - b) Basic Principles and concepts of Accountancy
 - c) Significance of entrepreneurship
- CO2. Develop skills in providing solutions for
 - a) Personal excellence through financial and professional freedom
 - b) Women entrepreneurship serving as contrivance in societal development
- CO3. Develop Critical thinking and evaluation ability.
- CO4. Widens knowledge and build up attitude towards trouble shooting.
- CO5. Demonstrate business acumen.

III B.Tech. – II Semester**(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communications; Basic grammar; Advanced grammar; Basic writing; Business French (La Francais Commercial).

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Process of communication
 - b) Modes of listening
 - c) Paralinguistic features
 - d) Skimming and Scanning
 - e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - a) Barriers to Communication
 - b) Barriers to Effective Listening
 - c) Barriers to Speaking
 - d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand French culture and civilization.
- CO6. Communicate effectively with the native French in day to day situation

III B.Tech. – II Semester**(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Process of communication
 - b) Modes of listening
 - c) Paralinguistic features
 - d) Skimming and Scanning
 - e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - a) Barriers to Communication
 - b) Barriers to Effective Listening

- c) Barriers to Speaking
- d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand German culture and civilization.
- CO6. Communicate effectively with the native German in day to day situation.

III B.Tech. – II Semester
(16BT6HS07) **INDIAN CONSTITUTION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, Understanding for better professional practice and good citizenry.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge in
 - a) parliamentary proceedings, laws, legislature, administration and its philosophy
 - b) federal system and judiciary of India
 - c) social problems and public services like central civil services and state civil services
 - d) Indian and international political aspects and dynamics
- CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen.

III B.Tech. – II Semester
(16BT6HS08) **INDIAN ECONOMY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquire the knowledge in
 - a) Micro and Macro Economics.
 - b) Traditional and Modern methods of Capital Budgeting.
 - c) Five year plans and NITI Aayog.
- CO2. Analyze
 - a) Capital Budgeting.
 - b) Value Analysis and Value Engineering.
 - c) Economic analysis
 - d) Law of supply and demand
- CO3. Understand the nuances of project management and finance.

III B.Tech. - II Semester
(16BT6HS09) **INDIAN HERITAGE AND CULTURE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquaint knowledge in
 - a) human aspirations and values in Vedic culture.
 - b) cultural aspects of Buddhism and Jainism
 - c) unification of our country under Mourya's and Gupta's administrations
 - d) socio Religious aspects of Indian culture
 - e) reform movements and harmonious relations.
- CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts.

III B.Tech. – II Semester
(16BT6HS10) INDIAN HISTORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge on evolution and history of India as a nation.
- CO2. Analyze social and political situations of past and current periods.
- CO3. Practice in career or at other social institutions morally and ethically.

III B.Tech. – II Semester
(16BT6HS11) PERSONALITY DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Soft Skills Lab

COURSE DESCRIPTION: Self-esteem & Self-improvement; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Self-Management
 - b) Planning Career
- CO2. Analyze the situations based on
 - a) Attitudes
 - b) Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

III B.Tech. – II Semester
(16BT6HS12) PHILOSOPHY OF EDUCATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
 - a) Philosophy of engineering education.
 - b) Philosophical methods.
 - c) Knowledge acquiring methods.
 - d) Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational Outcomes.
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

III B.Tech. – II Semester
(16BT6HS13) PUBLIC ADMINISTRATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in

- a) Public Policy.
 - b) Good Governance.
 - c) E-governance.
 - d) Development Administration.
- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance models to find and provide opportunities in e-governance.
- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing
- a) Bureaucracy.
 - b) Role of civil society.

III B.Tech. – II Semester

(16BT60112) BUILDING MAINTENANCE AND REPAIR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. Analyze failures, repair and rehabilitation techniques.
- CO3. Solve complex building maintenance problems through proper investigations and interpretation.
- CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. Provide solutions for building maintenance and repair problems considering health and safety.
- CO6. Consider environmental sustainability in building maintenance and repair.
- CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

III B.Tech. – II Semester

(16BT60113) CONTRACT LAWS AND REGULATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. Analyze contracts and tenders.
- CO3. Address the legal issues in contracts and tenders.
- CO4. Follow laws and regulations in the preparation of contracts and tenders.
- CO5. Prepare contract and tender documents as per the standards.
- CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

III B.Tech. - II Semester

(16BT60114) DISASTER MITIGATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. Analyze disasters and their vulnerability.
- CO3. Design strategies for effective disaster mitigation.
- CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. Use appropriate methods in disaster mitigation and management.
- CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. Solve disaster related issues considering environment.
- CO8. Consider economical issues in disaster management.

III B.Tech - II Semester
(16BT60115) ENVIRONMENTAL POLLUTION AND CONTROL

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.
- CO6. Encourage sustainable development through implementation of pollution control measures.
- CO7. Maintain IS Codes for environmental quality control.

III B.Tech - II Semester
(16BT60116) PLANNING FOR SUSTAINABLE DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.
- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

III B.Tech. – II Semester
(16BT60117) PROFESSIONAL ETHICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.
- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

III B.Tech. - II Semester
(16BT60118) **RURAL TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Rural technology; Non conventional energy; Technologies for rural development; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of biofertilisers and usage of agromachinery in agriculture.

III B.Tech - II Semester
(16BT60308) **GLOBAL STRATEGY AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on Strategic management, Research & Development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

III B.Tech - II Semester
(16BT60309) **INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

III B.Tech – II Semester**(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1: Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2: Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3: Develop a comprehensive and well planned business structure for a new venture.
- CO4: Conduct investigation on complex problems, towards the development of Project.
- CO5: Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6: Apply ethics in constructive innovation framework.
- CO7: Exhibit professionalism by employing modern project management and financial tools.

III B. Tech – II Semester**(16BT60311) MATERIALS SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semi conductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on concepts of fundamental science and Engineering principles relevant to materials.
- CO2. Analyze the structures of various types of Ferrous, Non ferrous alloys influencing various engineering applications.
- CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.
- CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
- CO5. Consider health and safety issues while providing materials to real time applications.
- CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

III B.Tech - II Semester**(16BT70412) GREEN TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
- CO2. Analyze various green technologies for engineering practice.
- CO3. Provide green solutions to engineering problems.
- CO4. Apply various green techniques in the engineering practice.
- CO5. Consider health and safety issues while providing green solutions to the society.
- CO6. Understand issues related to environment sustainability.
- CO7. Apply ethical standards for environmental sustainability in the engineering practice.

III B.Tech. - II Semester

(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Nanoscale technology.
 - b) Difference between micro and nanotechnology
 - c) Classification of Nanostructure and Nanomaterial
 - d) Fabrication of various nanomaterials and nanostructures.
- CO2. Analyze numerical and analytical problems in
 - a) Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
- CO3. Design and fabricate devices based on nanostructures like
 - a) Nano solar cell
 - b) Nano cantilever
 - c) Nano bio-sensor
- CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.
- CO5. Select appropriate technique for fabrication of nanostructures and nanocomposites.
- CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

III B.Tech. – II Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate knowledge in
 - a) Systems Process and System Design
 - b) Systems Analysis and Modeling
 - c) System Development Life Cycle
 - d) Design Management and Maintenance Tools.
- CO2. Analyze System Process and estimate the given models by using case tools.
- CO3. Design and Develop a model to the organizational systems.
- CO4. Solve complex problems related to engineering systems and produce accurate results.
- CO5. Apply object oriented techniques for modeling dynamic systems.
- CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

III B.Tech. – II Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators.
- CO2. Analyze the properties of materials and identify its suitability for MEMS devices.
- CO3. Design MEMS devices that meet desired specifications and requirements.
- CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
- CO5. Use modern techniques in micro manufacturing process.
- CO6. Develop efficient and cost effective MEMS based products for society.

III B.Tech. – II Semester
(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in Cyber security, Cyber crimes and its related laws in Indian and Global Act.
- CO2. Analyze the legal perspectives and laws related to cyber crimes in Indian context.
- CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber crimes.
- CO4. Solve Cyber security issues using privacy policies.
- CO5. Use antivirus tools to minimize the impact of cyber threats.
- CO6. Follow security standards for the implementation of Cyber Security and laws

III B.Tech. – II Semester
(16BT61505) BIOINFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: -

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2. Analyze biological sequences for Homology Modeling.
- CO3. Apply clustering methods for Phylogenetic trees.
- CO4. Solve bio sequencing problems using dynamic programming.
- CO5. Select and apply appropriate techniques and tools to structure Prediction

III B. Tech. - II Semester
(16BT61531) DATA WAREHOUSING AND DATA MINING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A Course "Data Warehousing and Data Mining"

COURSE DESCRIPTION:

Hands on practical experience on Warehouse design; OLAP operation; Data pre-processing techniques; Association rule mining; classification of data; Naïve Bayes classifier; Decision tree; Clustering technique using WEKA-Open source machine learning tool.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on the creation and usage of data warehouses.
- CO2. Analyze and interpret the results using data mining techniques.
- CO3. Design and develop transformations such as filter, join and rank on data warehouses.
- CO4. Use classification and clustering techniques to find interesting patterns in large databases.
- CO5. Choose and deploy modern tools to handle large, missing and noisy data in datasets.
- CO6. Use appropriate data mining algorithms to find solutions for real time societal applications.
- CO7. Function effectively as an individual to perform operations on different databases using *Informatica*.
- CO8. Communicate effectively using report generation tools on business data.

III B. Tech. – II Semester
(16BT60531) **SOFTWARE TESTING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:

A course on "Software Testing"

COURSE DESCRIPTION:

Hands on Practice to Develop Functional, System, Regression and Acceptance tests; White Box Testing & Black Box Testing; Test Automation.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge of
- ☐ White Box Testing
 - ☐ Black Box Testing
 - ☐ Regression Testing
 - ☐ Test Automation
- CO2. Analyze the software requirements and report the bugs.
- CO3. Design test cases using relevant testing techniques for an application.
- CO4. Demonstrate decision making skills for testing desktop applications.
- CO5. Use software testing tools and technologies for testing desktop applications.
- CO6. Apply contextual knowledge to perform testing on software related to societal applications.
- CO7. Work effectively as an individual and member of a team for testing software applications.

III B. Tech. – II Semester
(16BT60532) **SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PREREQUISITES:

All the courses of the program up to III B. Tech. I-Semester

COURSE DESCRIPTION:

Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation

COURSE OUTCOMES:

On successful completion of the seminar work, the student will be able to demonstrate:

- CO1. Knowledge on the seminar topic
- CO2. Analytical ability exercised during the seminar work.
- CO3. Ability to investigate and solve complex engineering problems faced during the Seminar work
- CO4. Ability to apply techniques to complex engineering activities with an Understanding of limitations as applied in the seminar work.
- CO5. Ability to function effectively as an individual as experienced during the Seminar Work
- CO6. Ability to present views cogently and precisely on the seminar topic
- CO7. Ability to engage in life-long learning as experience during the seminar work.

IV B. Tech. – I Semester
(16BT61201) **CLOUD COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Computer Networks" and "Operating Systems".

COURSE DESCRIPTION: Virtualization, Virtualization Technologies; Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security, Cloud Disaster Recovery; Working with Clouds; and Case Studies.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and virtualization.
- CO2. Analyze the issues in cloud computing Data, Network and Host security.
- CO3. Apply API development skills in web applications for Cloud deployment.
- CO4. Use research based knowledge to build cloud applications.
- CO5. Use advanced programming languages to access cloud services.
- CO6. Build cloud environment suitable for societal requirements.

IV B. Tech. - I Semester
(16BT51501) COMPILER DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on "Theory of Computation"

COURSE DESCRIPTION:

Lexical analysis; Parsers; Run Time Environments; Syntax Directed Translation; Type checking; Code Optimization; Code Generation and Compiler tools.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on the phases involved in design of compilers.
- CO2. Analyze code optimization Techniques.
- CO3: Design experiments for implementing parsing techniques.
- CO4. Synthesize rules in compiler to demonstrate semantic attribution during Parsing.
- CO5: Use compiler construction tools such as LEX and YACC for designing a Parser.
- CO6: Apply Ethical principles for usage of stack and other storage memory.

IV B. Tech. – I Semester
(16BT51203) WEB TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Java Programming".

COURSE DESCRIPTION:

Hyper Text Markup Language (HTML); Features of HTML5; Cascading Style Sheets (CSS); JavaScript; JQuery; Bootstrap; Hypertext Preprocessor (PHP); MySQL.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on web page design elements, dynamic content and database interaction.
- CO2. Analyze user requirements to develop web applications.
- CO3. Design client-server applications using web technologies.
- CO4. Demonstrate problem solving skills to develop enterprise web applications.
- CO5. Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.
- CO6. Apply Web Technologies to develop interactive, dynamic and scalable web applications for societal needs.

IV B. Tech. – I Semester
(16BT70501) BIG DATA ANALYTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course "Data Warehousing and Data Mining"

COURSE DESCRIPTION:

Big Data; Types of Data Elements; Introduction to Hadoop; MapReduce; Building Blocks of Hadoop; Big Data Analytics Applications; Predictive and Descriptive Analytics.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge in
 - ☐ Big Data Characteristics,
 - ☐ Hadoop & Hadoop Distributed File System
 - ☐ Hadoop Framework & Hadoop Release
 - ☐ Map Reduce work flow
 - ☐ Hive and Hive Services.
- CO2. Analyze large data sets by using Hadoop, Map Reduce, Hive, Pig tools.
- CO3. Design and develop Map Reduce models for data sets.
- CO4. Solve complex problems and store the results of the large data sets.
- CO5. Select Hive and Hive services techniques for effective database models.
- CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing Big Data systems.

IV B. Tech. – I Semester
(16BT71205) **CRYPTOGRAPHY AND NETWORK SECURITY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Principles and Practice of Cryptography and Network Security; Classical Systems; Symmetric Block Ciphers; Public-key Cryptography; Hash Functions; Authentication; Key Management; Key Exchange; Signature Schemes; E-mail; Web Security; Malicious Software; Intrusion Detection; Phishing and Identity Theft.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- ☐ Cryptographic algorithms and their mathematical models
- ☐ Message Authentication
- ☐ Digital Signatures
- ☐ Malicious Software
- ☐ Intrusion Detection
- ☐ Phishing and Identity Theft

CO2. Analyze vulnerabilities and threats on information systems based on various security parameters.

CO3. Apply security and privacy methods to protect and prevent cyber crimes.

CO4. Solve information privacy issues using encryption and digital signatures.

CO5. Use firewall and PGP to protect network and e-mail respectively.

CO6. Follow standards in implementation of network security.

IV B. Tech. – I Semester
(16BT70502) **ETHICAL HACKING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on "Computer networks"

COURSE DESCRIPTION:

Network and Computer Attacks; Foot Printing and Social Engineering; Port Scanning; Enumeration; Desktop and Server Operating System vulnerabilities; Hacking Web Servers; Cryptography; Network Protection System; Hacking Wireless Network.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate Knowledge on

- ☐ Network and Computer attacks
- ☐ OS Vulnerabilities
- ☐ Hacking web servers, Hacking wireless network

CO2. Analyze system and network vulnerabilities.

CO3. Design security solutions for risks that arise from hacking.

CO4. Use appropriate ethical hacking technique to solve security problems.

CO5. Apply contextual knowledge to assess safety and legal issues in applications like cyber crime, social engineering.

CO6. Inculcate use of ethical hacking practices while maintaining professional ethics.

IV B. Tech. - I Semester
(16BT61503) **SOFTWARE PROJECT MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A Course on "Software Engineering".

COURSE DESCRIPTION:

Conventional Software Management; Evolution of Software Economics; Improving Software Economics; Lifecycle Phases; Artifacts of the Process; Workflow of the Process; Checkpoints of the Process; Software Economics; Iterative Process Planning; Project Organization and Responsibilities; Project Control and Project Instrumentation; Agile Overview.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on software effort estimation techniques, Agile life cycle, project control and instrumentation.

CO2. Analyze the major and minor milestones, artifacts, metrics from management and technical perspectives.

- CO3. Design and develop software products using conventional and modern principles of software project management. CO4. Effectively implement project management through appropriate planning of Work flows and Work Breakdown Structures of the process.
- CO5. Select appropriate techniques to evaluate progress of software project in terms of milestones and check points.
- CO6. Apply appropriate ethical principles to be followed in management of software economics.

IV B. Tech. – I Semester
(16BT70503) **COMPUTER FORENSICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on “Computer Networks”

COURSE DESCRIPTION:

Computer Forensic Technologies; Evidence Collection and Data Seizure; Duplication and Preservation of Digital Evidence; E-mail Investigations; Data Analysis and Validation; Processing Crime and Incident Scenes; Mobile Device and Network Forensics; Computer Forensic Tools; Report Writing for Investigations

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
- ☐ Occurrence of Cyber Crime, Cyber Detectives.
 - ☐ Evidence and Data Capture and Computer Forensic Analysis.
 - ☐ Law Enforcement crime and incident scenes.
- CO2. Analyze and present computer forensic evidence.
- CO3. Design solutions for a wide range of computer forensic problems - attack on routers and e-mail crimes.
- CO4. Conduct investigations on forensic data.
- CO5. Utilize appropriate forensic tools to collect digital evidence.
- CO6. Apply contextual knowledge to assess the computer crimes relevant to cyber crime detection.

IV B. Tech. – I Semester
(16BT70504) **DESIGN PATTERNS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A Course on “Object Oriented Analysis and Design”

COURSE DESCRIPTION:

Introduction to Design Patterns; Creational Patterns; Structural Patterns; Behavioral Patterns.

COURSE OUTCOMES:

After successful completion of the course, the student will be able to:

- CO1. Demonstrate knowledge on
- ☐ Creational patterns
 - ☐ Structural Patterns
 - ☐ Behavioral Patterns
- CO2. Analyze various object oriented concepts using Design Patterns.
- CO3. Implement Design Pattern in C++ or Java.
- CO4. Use Appropriate design Pattern to solve computational problems.
- CO5. Create Design Pattern to enhance software quality of a system.
- CO6. Apply contextual knowledge of design patterns to address human computer interaction in societal applications.

IV B. Tech. I-Semester
(16BT71508) **INTERNET OF THINGS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A Course on Computer Networks

COURSE DESCRIPTION:

Internet of Things Components; Communication models; Prototyping; Hardware; Design models; Analytics for IoT.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on Protocols, functional blocks and communication models of Internet of things.

- CO2. Identify appropriate sensors and communication modes used in IoT based systems.
 CO3. Design appropriate solutions for IoT applications using Raspberry Pi and Arduino kits.
 CO4. Appropriately synthesize the models and applications for usage in Home automation and cities.
 CO5. Apply evolutionary techniques to perform analytics on the data integrated from IoT based systems.
 CO6. Use advances in IoT technology to design and develop applications.

IV B. Tech. – I Semester

(16BT71208) SERVICE ORIENTED ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Web Services; Principles of SOA; Service Layers; Simple Object Access Protocol (SOAP); Web Services Description Language (WSDL).

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
- ☐ Principles, services and policies of service orientation.
 - ☐ Fundamentals of web services.
 - ☐ XML, WSDL related to SOA.
- CO2. Analyze complex business process critically in identifying appropriate service model logic.
- CO3. Design service oriented architecture suitable for different environments.
- CO4. Use XML, SOAP and service interface design tools for building service oriented architecture.

IV B. Tech. – I Semester

(16BT70505) HUMAN COMPUTER INTERACTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Graphics".

COURSE DESCRIPTION:

Graphical User Interface; Design Process; Screen Designing; Windows; Components; Software Tools; Interaction Devices.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on principles, characteristics, tools and devices of Human Computer Interaction.
- CO2. Analyze the user requirements, technological and physical characteristics of users for better interface design.
- CO3. Design appropriate user interface for desktop and web applications.
- CO4. Conduct investigations on User requirements to provide an effective user interface.
- CO5. Utilize user interface mockup tools and input, output and pointing devices for designing user interfaces.
- CO6. Apply Contextual knowledge to develop interfaces for differently abled people.

IV B. Tech. – I Semester

(16BT71203) INFORMATION RETRIEVAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Data Structures" and "Database Management Systems".

COURSE DESCRIPTION: Architecture of Information Retrieval Systems; Functional Capabilities; Data Structures; Mathematical Algorithms; Indexing; Similarity and Clustering; Human Perception and Presentation; Text Search Techniques and Evaluation Measures.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1: Demonstrate knowledge on:
- ☐ Information Retrieval System Architecture
 - ☐ Functional capabilities
 - ☐ Indexing and data presentation methods.
 - ☐ Evaluation measures of Information Retrieval Systems.
- CO2: Analyze indexing methods and clustering algorithms to group similar data items for efficient search.

- CO3: Design and develop data structures used to store and retrieve data items.
 CO4: Demonstrate problem solving skills in the usage of mathematical algorithms for information retrieval.
 CO5: Use text search algorithms and collaborative filtering techniques for information retrieval and visualization methods for information presentation.

IV B. Tech. – I Semester
 (16BT70506) **MULTIMEDIA APPLICATION DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

Courses on “Object Oriented Programming through C++” and “Computer Graphics”

COURSE DESCRIPTION:

Multimedia; Fundamental Concepts in Audio and Video; Action Script 3.0; Multimedia Data Compression; Multimedia Network Communications and Applications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on
- Multimedia and Hypermedia
 - Action Script 3.0
 - Video representations and standards
 - Multimedia Network Communications.
- CO2. Analyze Action Script 3.0 principles, functions and components for developing multimedia authoring applications.
- CO3. Design multimedia software for developing Internet applications and flash animations.
- CO4. Develop solutions for simple to complex real life multimedia applications.
- CO5. Use compression techniques and Action script 3.0 for development of multimedia applications.
- CO6. Apply contextual knowledge to address issues like data compression, network communications in societal applications.

IV B. Tech. – I Semester
 (16BT61204) **SEMANTIC WEB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on “Web Technologies”.

COURSE DESCRIPTION: Semantic web fundamentals; Semantic web technology; Ontology web language; Swoogle; Semantic web services.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
- Semantic web search
 - RDF and SWOOGLE
 - Semantic web services
 - RDFS and OWL
- CO2. Analyze layers of web architecture for describing web content.
- CO3. Design semantic web search engine for capturing information on the current web.
- CO4. Select RDF and SWOOGLE for search engine usage.

IV B. Tech. - I Semester
 (16BT61231) **CLOUD COMPUTING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on “Cloud Computing”.

COURSE DESCRIPTION: Hands-on experience on creating virtual machines on Windows and Linux platforms; Development of service based web applications and their deployment.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate hands-on experience on Virtualization models and Cloud Environment.
- CO2. Analyze the given experiment and relate to existing cloud architectures.
- CO3. Apply API development skills in web applications for cloud deployment.

- CO4. Demonstrate independent problem solving skills in developing dynamic web applications.
- CO5. Use advanced programming languages to access cloud services.
- CO6. Build suitable cloud environment for societal requirements.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

IV B. Tech. – I Semester

(16BT51233) WEB TECHNOLOGIES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on “Web Technologies”.

COURSE DESCRIPTION: Hands-on experience on HTML, HTML5, CSS, JavaScript, JQuery, Bootstrap, PHP and MySQL.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on web page design elements, dynamic content and database Interaction.
- CO2. Analyze user requirements to develop web applications.
- CO3. Design client-server applications using web technologies.
- CO4. Demonstrate problem solving skills to develop enterprise web applications.
- CO5. Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.
- CO6. Apply web technologies to develop interactive, dynamic and scalable web applications for societal needs.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

IV B. Tech. – I Semester

(16BT70531) COMPREHENSIVE ASSESSMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	2	

PREREQUISITES: All the courses of the program

COURSE DESCRIPTION:

Assessment of student learning outcomes in all the courses of the program

COURSE OUTCOMES:

On successful completion of Comprehensive Assessment, the student will be able to demonstrate:

- CO1. Knowledge in the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Ability to engage in life-long in the courses of the program.

IV B. Tech. – II Semester
(16BT80531) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
100	100	200	-	-	-	12	

PREREQUISITES: All the courses of the program

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES:

On successful completion of the project work, the student will be able to demonstrate:

- CO1. Knowledge on the project topic
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex engineering problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the engineering practice as applied in the project work.
- CO9. Ability to function effectively as an individual as experienced during the project work.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO12. Ability to engage in life-long learning as experience during the project work.

Program: B.Tech. INFORMATION TECHNOLOGY

I B.Tech. - I Semester (16BT1HS01) TECHNICAL ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: English at Intermediate level

COURSE DESCRIPTION:

Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate knowledge in:
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
2. Analyze the possibilities and limitations of language for understanding.
 - Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
3. Design and develop functional skills for professional practice.
4. Apply writing skills in preparing and presenting documents.
5. Function effectively as an individual and as a member in diverse teams.
6. Communicate effectively with the engineering community and society in formal and informal situations.

I B.Tech. - I Semester (16BT1BS01) ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
- CO2: Develop analytical skills in:
- a. Determination of hardness of water.
 - b. Determination of viscosity, flame and fire points, cloud and pour points.
- CO3: Develop designing skills in:
- a. Synthesis of engineering plastics.
 - b. Chemical methods for the synthesis of Nano materials.
- CO4: Develop skills for providing solutions through:

- a. Mitigation of hardness of water.
 - b. Newer Nanomaterials and engineering plastics for specific applications
- CO5: Acquire awareness to practice engineering in compliance to modern techniques such as:
- a. Nalgonda technique for defluoridation of water
 - b. Electroplating technique for control of corrosion.
- CO6: Acquire awareness to societal issues on:
- a. Quality of water.
 - b. Bio-diesel
 - c. Chemical materials utility and their impact.

I B.Tech. - I Semester

(16BT1BS03) MATRICES AND NUMERICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire basic **knowledge** in
- (a) Finding the rank of matrices and analyzing them.
 - (b) Solving algebraic and transcendental equations by various numerical methods.
 - (c) Fitting of various types of curves to the experimental data.
 - (d) Estimating the missing data through interpolation methods.
 - (e) Identification of errors in the experimental data
 - (f) Finding the values of derivatives and integrals through various numerical methods.
 - (g) Solving differential equations numerically when analytical methods fail.
- CO2: Develop skills in **analyzing** the
- (a) methods of interpolating a given data
 - (b) properties of interpolating polynomials and derive conclusions
 - (c) properties of curves of best fit to the given data
 - (d) algebraic and transcendental equations through their solutions
 - (e) properties of functions through numerical differentiation and integration
 - (f) properties of numerical solutions of differential equations
- CO3: Develop skills in **designing** mathematical models for
- (a) Fitting geometrical curves to the given data
 - (b) Solving differential equations
 - (c) Constructing polynomials to the given data and drawing inferences.
- CO4: Develop numerical skills in **solving the problems** involving
- (a) Systems of linear equations
 - (b) Fitting of polynomials and different types of equations to the experimental data
 - (c) Derivatives and integrals
 - (d) Ordinary differential equations
- CO5: Use relevant numerical **techniques** for
- (a) Diagonalising the matrices of quadratic forms
 - (b) Interpolation of data and fitting interpolation polynomials
 - (c) Fitting of different types of curves to experimental data
 - (d) obtaining derivatives of required order for given experimental data
 - (e) Expressing the functions as sum of partial fractions

I B.Tech. - I Semester

(16BT1BS04) MULTI-VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire knowledge in
- (a) Higher order Differential equations
 - (b) Maximum and minimum values for the functions of several variables
 - (c) Double and triple integrals
 - (d) Differentiation and integration of vector functions.
 - (e) Line and surface volume
 - (f) transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2: Develop skills in analyzing the
- (a) methods for differential equation for obtaining appropriate solutions,
 - (b) Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - (c) The variations in the properties of functions near their stationary values
 - (d) Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3: Develop skills in designing mathematical models for
- (a) R-C and L-R-C oscillatory electrical circuits
 - (b) Heat transfer and Newton's law of cooling
 - (c) Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces
- CO4: Develop analytical skills in solving the problems involving
- (a) Newton's law of cooling
 - (b) non homogeneous linear differential equations
 - (c) maximum and minimum values for the functions
 - (d) lengths of curves, areas of surfaces and volumes of solids in engineering
 - (e) transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5: Use relevant mathematical techniques for evaluating
- (a) various types of particular integrals in differential equations
 - (b) stationary values for multi variable functions
 - (c) multiple integrals in change of variables
 - (d) integrations of vector functions.

I B.Tech. - I Semester

(16BT10501) PROGRAMMING IN C

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1: Demonstrate knowledge in:
- o Elements of C Language
 - o Selection and Repetition statements.
 - o Arrays, Strings and Functional statements.
 - o Derived data types, Files and Pointers
- CO2: Analyze complex engineering problems to develop suitable solutions
- CO3: Design algorithms for specified engineering problems
- CO4: Use appropriate 'C' language constructs for solving engineering problems
- CO5: Write programs using 'C' language to implement algorithms

I B.Tech. - I Semester
(16BT1HS31) ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate knowledge in
 - Phonetics
 - Information Transfer
2. Analyze the functional knowledge in
 - Vocabulary
 - Grammar
3. Design and develop functional skills for professional practice.
4. Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.
5. Function effectively as an individual and as a member in diverse teams to demonstrate
 - Extempore talk and
 - Role Play
6. Communicate effectively in public speaking in formal and informal situations.
7. Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I B.Tech. - I Semester
(16BT1BS31) ENGINEERING CHEMISTRY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.
- CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
- CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.
- CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.
- CO5: Provide solutions for environmental issues through determination of quality of water.

I B.Tech. - I Semester

(16BT10331) COMPUTER AIDED ENGINEERING DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	6	3

PRE-REQUISITES: None

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B.Tech - I Semester

(16BT10531) PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Programming in C"

COURSE DESCRIPTION: Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

1. Demonstrate practical knowledge of using C language constructs:
 - Selection and Repetition statements.
 - Arrays, Strings and Functional statements.
 - Derived data types, Files and Pointers
2. Analyze problems to develop suitable algorithmic solutions
3. Design Solutions for specified engineering problems
4. Use appropriate 'C' language constructs for solving engineering problems
5. Implement and execute programs using 'C' language
6. Document programs and communicate effectively while conducting Professional transactions.

I B.Tech. - II Semester

(16BT1BS02) ENGINEERING PHYSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION: Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.

2. Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
3. Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
4. Develop problem solving skills in engineering context.
5. Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser.

I B.Tech. - II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z – transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

CO1: Acquire basic knowledge in

- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations

CO2: Develop skills in analyzing the

- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO3: Develop skills in designing mathematical models for

- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z- transforms and difference equations

CO4: Develop analytical skills in solving the problems involving

- (a) Fourier series and Fourier transforms
- (b) Laplace transforms
- (c) Z-transforms and difference equations
- (d) Heat transfer and wave motion

CO5: Use relevant transformation techniques for

- (a) Obtaining Fourier transforms for different types of functions
- (b) Laplace transforms
- (c) Z- transforms
- (d) Partial differential equations

I B.Tech. - II Semester

(16BT20441) BASIC ELECTRONIC DEVICES AND CIRCUITS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Engineering Physics.

COURSE DESCRIPTION:

Characteristics of general and special purpose electronic devices; Rectifiers; Biasing of BJT; FET, Feedback Amplifiers, Oscillator.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Gain in-depth knowledge in

- p-n junction diode and its characteristics
- Zener diode and its characteristics
- Rectifiers and Filters

- Characteristics of BJT, FET, MOSFET and special purpose electronic devices.
 - FET amplifiers
 - Feedback amplifiers and Oscillators
- CO2:** Analyze numerical and analytical problems in
- Rectifiers using Filters
 - Transistor biasing circuits
 - FET biasing circuits and amplifiers
 - Feedback amplifiers and oscillators
- CO3:** Design electronic circuits such as
- Rectifiers with and without filters
 - BJT and FET biasing circuits
 - FET amplifiers
 - Feedback amplifiers and oscillators
- CO4:** Solve engineering problems and arrive at solutions pertaining to electronic circuits.
- CO5:** Select appropriate technique for transistor biasing.

I B.Tech. - II Semester

(16BT21201) OBJECT ORIENTED PROGRAMMING THROUGH C++

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PREREQUISITES: A Course on "Programming in C".

COURSE DESCRIPTION:

Introduction to Object Oriented concepts and Fundamental Concepts of C++; Decision Making Statements, Looping Statements and Functions; Arrays, Pointers & References and Strings; Classes & Objects and Overloading Operators; Composition & Inheritance, Templates, Iterators & Generics and File Handling;

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1:** Demonstrate knowledge on object oriented programming concepts - Object, Class, Inheritance, Polymorphism, Encapsulation, Abstraction and Message passing.
- CO2:** Identify object oriented concepts for code reusability and optimization.
- CO3:** Design and develop solutions for given specifications.
- CO4:** Demonstrate problem solving skills to provide software solutions to real world problems.
- CO5:** Develop C++ programming to provide solutions to complex engineering problems using object oriented concepts.

I B.Tech. - II Semester

(16BT21501) DIGITAL LOGIC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -NIL-

COURSE DESCRIPTION: Introduction to number systems; logic gates; Boolean Algebra; simplification of Boolean functions; Design of combinational circuits; Design of sequential circuits, Memory and Programmable Logic

COURSE OUTCOMES:

On Successful completion of this course student will be able to:

- CO1. Demonstrate knowledge on Boolean algebra, Minimization of Boolean functions using Map Reduce method.
- CO2. Identify appropriate simplification techniques for Boolean functions.
- CO3. Design combinational and sequential logic circuits, memory and programmable logic for digital systems.
- CO4. Select and Apply Boolean algebra and gate level minimization techniques for designing combinational and sequential logic circuits.
- CO5. Learn independently new concepts, new techniques and advanced subject knowledge in the area of combinational and sequential logic circuits.

I B.Tech. - II Semester (16BT1BS32) ENGINEERING PHYSICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.
- CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.
- CO3: Develop skills in designing electronic circuits using semiconductor components.
- CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.
- CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B.Tech II semester (16BT20451) ANALOG AND DIGITAL ELECTRONICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on "Basic Electronic Devices & Circuits and Digital Logic Design"

COURSE DESCRIPTION: Identification and testing of active and passive components; RPS, DMM, Function Generator, CRO; Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Realization of FFs, Combinational Circuits, sequential Circuits; Demonstration on VHDL Programme.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate knowledge in different electronic devices, analog and digital circuits
- CO2. Analyze the characteristics of different electronic devices and circuits like
 - Diodes p-n Junction Diodes, Zener Diodes, SCR
 - Transistors-BJT, FET, UJT
 - Flip Flops-JK FF, D FF
 - Combinational Circuits-HA, FA
 - Sequential Circuits -Counters
- CO3. Design electronic circuits like FET Amplifiers, Feedback amplifiers, Oscillators, Combinational Circuits and Sequential Circuits.
- CO4. Solve engineering problems by proposing potential solutions through Design of better electronic circuits.
- CO5. Model an electronic circuit which fulfil the needs of the society.
- CO6: Function effectively as an individual and as a member in a group
- CO7: Communicate effectively in verbal and written form.

I B.Tech. - II Semester **(16BT21231) IT Workshop**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: —Nil—

COURSE DESCRIPTION:

Practice sessions on PC hardware, Internet, World Wide Web, LibreOffice Suite. Demonstrations on installations of system software such as MS-Windows, Linux and device drivers, hardware and software troubleshooting, and protecting the personal computer from viruses and other cyber attacks are include.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate analytical skills in:
 - Identification of functional parts of PC
 - Internet and World Wide Web.
 - Computer security issues and preventive measures.
 - Operating Systems.
2. Design document and presentations effectively.
3. Apply modern tools to develop IT based applications.
4. Demonstrate effective communication skills through IT tools.
5. Update knowledge and skills in PC maintenance and usage of latest Operating Systems and Office automation tools.

I B.Tech. - II Semester **(16BT21232) OBJECT ORIENTED PROGRAMMING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "OOPS through C++".

COURSE DESCRIPTION:

Hands-on experience on creating Virtual machines on Windows and Linux platforms, Development of Service based web applications & their deployment and Mobile app development.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate practical knowledge on Object oriented programming concepts - Object, Class, Inheritance, Polymorphism, encapsulation, Abstraction, message passing.
2. Apply object oriented programming concepts to develop real world applications.
3. Demonstrate Problem solving skills using basic and advanced concepts of C++.
4. Work individually and in teams collaboratively in implementing the applications.
5. Demonstrate communication skills both oral and written for preparing and presenting reports.

II B.Tech. - I Semester

(16BT3BS01) PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate/senior secondary mathematics.

COURSE DESCRIPTION: Random variables; Mathematical expectations; Probability distributions; Correlation and regressions; Statistical quality control; Sampling distributions; Tests for small and large samples and their significances.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire basic knowledge on:
 - Probability distributions, correlation and regressions.
 - Statistical quality control and testing of hypotheses.
 - Simple linear regression.
 - Tests of significance for small and large samples.
- CO2. Develop skills for analyzing the data with:
 - Mathematical expectations for realistic results.
 - Probability distributions for practical situations.
 - Control charts of statistical quality control. Correlation and regression concepts.
 - Suitable tests of significance for practical situations.
- CO3. Develop skills in designing:
 - Probability distributions.
 - Limitations of statistical quality control.
 - Control charts.
 - X, R, np, and c charts
- CO4. Develop analytical skills for solving problems involving:
 - Probability distributions, means, variances and standard deviations.
 - Statistical techniques employed for quality.
 - Sampling techniques for decision making.
 - Tests of significances for small and large samples.
- CO5. Use relevant probability and statistical techniques for:
 - Mathematical expectations of desired results.
 - Fitting probability distributions for experimental data.
 - Quality control and testing of hypothesis.

II B.Tech. - I Semester

(16BT30501) COMPUTER ORGANIZATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Digital Logic Design".

COURSE DESCRIPTION: Basic structure and operation of a digital computer; Organization and functional principles of the arithmetic and logic unit, control unit, memory unit and I/O unit; Concepts of pipelining and parallel processing techniques.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Computer Arithmetic units
 - Register Transfer and Computer Instructions
 - Design of Control Unit
 - Input Output Organization and Memory system
 - Pipelining and Multiprocessing.
- CO2. Analyze the functional units of a digital computer.
- CO3. Design the functional modules in a digital computer - Arithmetic Units, Memory and I/O.
- CO4. Investigate the performance of memory, I/O, and pipelined processors.
- CO5. Select appropriate techniques of I/O, Pipelining and Multiprocessing to solve computing problems.
- CO6. Apply contextual knowledge of computer systems development to societal applications.

II B.Tech. - I Semester (16BT30502) DATA STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Programming in C".

COURSE DESCRIPTION: Linked Lists; Type of lists; Operations and Applications; Stacks and Queues; Operations and Applications; Trees, Search trees and Heaps; Multiway Trees and Graphs; Searching and Hashing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Principles of Data Structures.
 - Linear and Non-linear Data Structures.
 - Sorting and hashing techniques.
- CO2. Analyze and Identify suitable data structure for computational problem solving.
- CO3. Design solutions for complex engineering problems using linear and non-linear data structures.
- CO4. Develop solutions for Complex computational problems by conducting explorative analysis.
- CO5. Apply appropriate data structure to provide solutions for real time problems by using C Language.
- CO6. Apply contextual knowledge of data structures to design applications for societal applications like payroll systems, web applications, banking and financial systems.

II B.Tech. - I Semester (16BT31201) DISCRETE MATHEMATICAL STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Multivariable Calculus and Differential Equations".

COURSE DESCRIPTION: Mathematical Logic; Predicates; Functions and Relations; Algebra Structures; Mathematical Reasoning; Recurrence Relations; Graphs; Graph Theory and its Applications.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on mathematical logic, algebraic structures, relations, recurrence relations and mathematical reasoning.
- CO2. Analyze and prove given statement by contradiction and automatic theorem.
- CO3. Design network applications using Prim's and Kruskal's algorithms.
- CO4. Solve tree traversal problems using Graph Theory.
- CO5. Apply permutation, combinations, counting principle, Lagrange's theorem and graph theory in solving real-time problems.

II B.Tech. - I Semester

(16BT50502) LINUX PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Operating Systems".

COURSE DESCRIPTION: Concepts on Linux Programming; Shell Programming; Process, Signals and File System Structure; Inter process Communications and Socket Programming for Client-Server Interaction.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Shell programming
- File Structure and System Calls
- Processes management and handling signals,
- IPC and Sockets

CO2. Analyze shell scripts and system calls related to Linux Environment.

CO3. Design shell scripts and system calls for specified computational problems.

CO4. Use appropriate shell scripts and system calls for solving complex problems.

CO5. Provide appropriate Linux solutions for real time applications.

CO6. Apply contextual knowledge to solve problems related to societal issues.

II B.Tech. - I Semester

(16BT31501) OPERATING SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.

CO2. Identify the functionality involved in process management concepts like scheduling and synchronization.

CO3. Design models for handling deadlock and perform memory management.

CO4. Synthesize and apply programming API's to perform Process management.

CO5. Use appropriate protection tools to provide access control to Operating system users.

II B.Tech. - I Semester

(16BT30531) DATA STRUCTURES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Data Structures".

COURSE DESCRIPTION: Hands on practice on Linked Lists; Type of lists; Stacks and Queues; Trees and Search trees; Graphs; Searching and Hashing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on Stacks, Queues, Linked lists, Trees Sorting and Hashing Techniques.
- CO2. Analyze suitable data structure to solve real world computing problems.
- CO3. Design solutions for complex computational problems using linear and non-linear data structures.
- CO4. Solve for Complex computational problems by conducting explorative analysis.
- CO5. Use C language for implementing linear and non-linear data structures.
- CO6. Apply contextual knowledge of data structures to design applications for societal requirements.
- CO7. Communicate effectively using data structures with engineering community, being able to comprehend and write effective programs and Prepare Reports.

II B.Tech. - I Semester**(16BT50532) LINUX PROGRAMMING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Linux Programming".

COURSE DESCRIPTION: Hands on Practice with - Shell Programs; System Calls; Environment Variables; Inter Process Communication; File System and Socket Programming.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on
 - Shell programming
 - File Structure and System Calls
 - Processes management and handling signals,
 - IPC and Sockets
- CO2. Analyze shell scripts and system calls in Linux operating system.
- CO3. Design shell scripts for specified computational problems.
- CO4. Use appropriate shell scripts and system calls for solving complex problems.
- CO5. Create shell scripts and system calls for real time Linux applications.
- CO6. Apply contextual knowledge to solve problems related to societal issues.
- CO7. Communicate effectively using Linux with engineering community being able to comprehend and write effective programs and prepare reports.

II B.Tech. - I Semester**(16BT31531) OPERATING SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Operating Systems".

COURSE DESCRIPTION: Hands on practice in simulating algorithms for CPU Scheduling, Memory Management, I/O Management, Deadlock Handling mechanisms; Implementing Synchronization problems; practice on UNIX commands.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate of the following algorithms to solve problems:
 - CPU Scheduling
 - Memory Management
 - I/O Management
- CO2. Formulate and analyze solutions to problems pertaining to Memory and I/O.
- CO3. Designing models for deadlock handling mechanisms.
- CO4. Develop skills in basic UNIX commands.

- CO5. Use appropriate APIs' available in modern operating systems (such as threads, system calls, semaphores, etc.) for software development.
- CO6. Communicate effectively on complex operating system problems with implication to User-friendliness.
- CO7. Develop and demonstrate user defined libraries to communicate with the kernel for effective implementation of projects across multidisciplinary environments.

II B.Tech. - II Semester **(16BT3HS01) ENVIRONMENTAL STUDIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	3	-	-	3

PRE-REQUISITES: A course on "Engineering Chemistry".

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. Develop strategies for environmental pollution control and natural resource management.
- CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. Understand the impact of social issues and population on environment.
- CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. Follow environmental protection laws for sustainable development.
- CO9. Communicate effectively on environmental issues in the form of reports.

II B.Tech. - II Semester **(16BT41204) THEORY OF COMPUTATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Discrete Mathematical Structures".

COURSE DESCRIPTION: Fundamentals of Computation; Finite State Automaton; Regular Expressions; Grammars; Push Down Automaton; Turing Machine.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Formal languages and automata.
- CO2. Analyze the classification of languages, automata's and their computing power.
- CO3. Design grammars and automata (recognizers) for regular expressions and formal languages.
- CO4. Solve computational problems using automata.
- CO5. Apply theorems to translate automata's and identify the class of languages.

II B.Tech. - II Semester

(16BT40502) DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Data models and Database Languages
- Database design
- Normal forms
- Storage and Indexing

CO2. Analyze databases using normal forms to provide solutions for real time applications.

CO3. Design solutions for database problems using database design, view design and framing queries.

CO4. Use database techniques for designing databases, managing databases and its security.

CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.

CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

II B.Tech. - II Semester

(16BT41201) DESIGN AND ANALYSIS OF ALGORITHMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Data Structures".

COURSE DESCRIPTION: Introduction to Algorithms and Asymptotic Notations; Disjoint Sets and Graphs; Divide and Conquer, Greedy Method; Dynamic Programming, Back Tracking; Branch and Bound.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Algorithm Complexities and Asymptotic notations.
- Algorithm Design techniques-Divide and Conquer, Greedy Method, dynamic programming, Back tracking, Branch and Bound.

CO2. Analyze the performance of algorithms with respect to Time and Space complexities.

CO3. Design the algorithms for solving real world problems.

CO4. Solve sorting and searching problems using Divide and Conquer method.

CO5. Use dynamic programming and backtracking in finding shortest paths.

II B.Tech. - II Semester

(16BT41202) JAVA PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Object Oriented Programming through C++".

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
 - Packages, interfaces, multithreading, exception handling, event handling.
- CO2. Analyze complex engineering problems using object oriented concepts.
- CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
- CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.
- CO5. Use advanced programming languages to develop web applications.
- CO6. Build Java Applications suitable for societal requirements.

II B.Tech. - II Semester**(16BT41203) SOFTWARE ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Fundamental concepts of software engineering.
 - Process models.
 - Software development life cycle.
- CO2. Analyze software requirements and process models required to develop a software system.
- CO3. Design and develop a quality software product using design engineering principles.
- CO4. Develop software product as per user and societal requirements.
- CO5. Follow standards for software development and quality management.
- CO6. Demonstrate skills in applying risk and quality management principles for effective management of software projects.

II B.Tech. - II Semester**(16BT40531) DATABASE MANAGEMENT SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Database Management Systems".

COURSE DESCRIPTION: Hands on experience on - DDL, DML commands; Query processing using operators; Joins, Views, Single Row functions, Group Functions and SET functions; PL/SQL concepts - Basic Programs, Triggers, Functions, Cursors and Stored Procedures.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on creation and alteration of tables, insertion and Querying of data.
- CO2. Analyze and evaluate the databases using SQL DML/DDL commands.
- CO3. Design database schemas for the sales database, customer database and product database.
- CO4. Develop solutions for database problems using stored procedures, stored functions, cursors and triggers.

- CO5. Implement DDL and DML commands in SQL and PL/SQL, ORACLE to manage data in databases.
- CO6. Apply contextual knowledge to develop database applications related to societal issues.
- CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports on databases.

II B.Tech. - II Semester (16BT31231) JAVA PROGRAMMING LAB'

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Java Programming".

COURSE DESCRIPTION: Hands-on experience on Polymorphism; Inheritance and Interfaces; Exception Handling; Multithreading; Event Handling; AWT; Applets; Servlets.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on basic concepts of Java programming.
- CO2. Design and develop efficient programs with multitasking ability and handle exceptions.
- CO3. Demonstrate independent problem solving skills in developing interactive applications.
- CO4. Apply object oriented approach to develop user friendly interface and learn how to communicate with systems over the network.
- CO5. Build Java applications suitable for societal requirements.
- CO6. Work effectively as an individual and as a member in team for case studies implementation.
- CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports.

II B.Tech. - II Semester (16BT4HS31) SOFT SKILLS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English Language Laboratory in I B.Tech.

COURSE DESCRIPTION: This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire knowledge on
- Goal Setting
 - Creative Thinking
 - Leadership Skills and
 - Team Work
- CO2. Analyze the situations and develop skills for
- Body Language
 - Personality Development and
 - Stress Management
- CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal forums.

III B.Tech. - I Semester

(16BT51201) COMPUTER GRAPHICS AND MULTIMEDIA

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: A course on "Matrices and Numerical Methods".

COURSE DESCRIPTION: Introduction to Computer Graphics, Output Primitives; 2D Geometric Transformations and Viewing; 3D object representation and Visible Surface Detection Methods; Introduction to Multimedia, Audio and Video; Multimedia Data Compression.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Graphical interactive devices
- Viewing transformations
- 3-D object representations
- Surface detection methods
- Image, audio, video representations and standards.

CO2. Analyze multimedia compression issues using image, audio and video compression techniques.

CO3. Design algorithms to generate points, lines, polygons for 2-D, 3-D objects.

CO4. Apply Transformations and Clipping algorithms for 2-D and 3-D objects, various lossy / lossless coding techniques on text and images for compression and decompression.

CO5. Build multimedia applications for societal requirements.

III B.Tech. - I Semester

(16BT50501) COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: A Course on "Operating Systems".

COURSE DESCRIPTION: Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sublayer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Functionalities of Various OSI and TCP/IP layers
- 3G Mobile phone networks, 802.11
- TCP,UDP and SMTP

CO2. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.

CO3. Design and compute subnet masks and addresses for networking requirements.

CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.

CO5. Apply Network Standards - 802.3 and 802.11 for developing computer Networks.

CO6. Assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.

III B.Tech. - I Semester (16BT51501) **COMPILER DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Theory of Computation".

COURSE DESCRIPTION: Lexical analysis; Parsers; Run Time Environments; Syntax Directed Translation; Type checking; Code Optimization; Code Generation and Compiler tools.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on the phases involved in design of compilers.
- CO2. Analyze code optimization Techniques.
- CO3. Design experiments for implementing parsing techniques.
- CO4. Synthesize rules in compiler to demonstrate semantic attribution during Parsing.
- CO5. Use compiler construction tools such as LEX and YACC for designing a Parser.
- CO6. Apply ethical principles for usage of stack and other storage memory.

III B.Tech. - I Semester (16BT51202) **OBJECT ORIENTED ANALYSIS AND DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Software Engineering" and "Object Oriented Programming through C++".

COURSE DESCRIPTION: Introduction to UML, Basic structural modeling; Advanced structural modeling, Class and object diagrams; Basic behavioral modeling; Advanced behavioral modeling; Architectural modeling.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on principles of object oriented analysis and design through UML Diagrams.
- CO2. Analyze user requirements and identify suitable structural and behavioral modeling components.
- CO3. Design and develop UML models for real time software applications.
- CO4. Solve real world problems by applying structural and behavioral modeling techniques.
- CO5. Use unified modeling language in preparing blue prints for software solutions.
- CO6. Design and develop UML models to solve societal problems.

III B.Tech. - I Semester (16BT51203) **WEB TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Java Programming".

COURSE DESCRIPTION: Hyper Text Markup Language (HTML); Features of HTML5; Cascading Style Sheets (CSS); JavaScript; JQuery; Bootstrap; Hypertext Preprocessor (PHP); MySQL.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on web page design elements, dynamic content and database interaction.

- CO2. Analyze user requirements to develop web applications.
 CO3. Design client-server applications using web technologies.
 CO4. Demonstrate problem solving skills to develop enterprise web applications.
 CO5. Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.
 CO6. Apply Web Technologies to develop interactive, dynamic and scalable web applications for societal needs.

III B.Tech. - I Semester (16BT50341) OPTIMIZATION TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Multi Variable Calculus and Differential Equations".

COURSE DESCRIPTION: Introduction to optimization; classical optimization techniques; classification of optimization problems; linear programming; transportation and assignment problem; non-linear programming; un-constrained non-linear programming; constrained non-linear programming; dynamic programming.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on Optimization techniques for Linear, Non linear and Dynamic programming problems.
 CO2. Analyze and quantify a system architecture or product design problem for selecting appropriate objective function, design variables, parameters and constraints.
 CO3. Develop mathematical models for real time optimization problems.
 CO4. Conduct investigations on complex problems and make recommendations based on solutions, analysis and limitations of models.
 CO5. Use optimization techniques for solving complex problems of real time applications.
 CO6. Optimize the resources in organizations for sustainable development.

III B.Tech. - I Semester (16BT50442) MICROPROCESSORS AND INTERFACING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Digital Logic Design" and "Computer Organization".

COURSE DESCRIPTION: INTEL 8086 and 8051- Architectures; Instruction set; Programmable Interfacing Concepts; ADC, DAC, 8255, 8257, 8259, 8279, 8251, Advanced peripheral Interfacing; Applications.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
- Internal Hardware details of Intel 8086, 8051 and programming devices like 8255, 8257, 8259, 8279 and 8251.
 - Interfacing various peripherals to build standalone systems.
- CO2: Analyze various peripherals and interfacing techniques.
 CO3: Design application based Microcomputer system using 8086 and 8051.
 CO4: Solve problems by providing microcomputer-based real time solutions.
 CO5: Apply programming tools, appropriate techniques and resources to complex engineering activities for microprocessor and microcontroller based systems with understanding of limitations.
 CO6: Solving societal problems by applying concepts of microprocessors and microcontrollers.

III B.Tech. - I Semester (16BT60404) IMAGE PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Fundamentals of image processing; Image transforms; Image enhancement techniques in spatial and frequency domains; Restoration techniques; Image segmentation techniques; Image compression techniques.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
 - Image Fundamentals
 - Image Enhancement and Restoration Techniques
 - Image Segmentation and Compression Techniques
 - Color image processing
- CO2. Analyze different images using various processing techniques.
- CO3. Design and Develop various image processing algorithms to process the images in various Real Time Applications.
- CO4. Solve problems related to images for feasible and optimal solutions in the core area of Image Processing.
- CO5. Apply appropriate techniques to complex engineering activities in the field of image processing.
- CO6. Understand the impact of the image processing for societal needs.

III B.Tech. - I Semester (16BT60503) WIRELESS NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Generations of Wireless Networks; Voice and Data Processing; Wireless Network Topology; GSM; TDMA; CDMA; Wireless LANs; Wireless WANs; Wireless PAN.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
 - Wireless Medium Access methods.
 - Network Topology
 - Wireless LAN, HIPERLAN
 - GSM, CDMA, GPRS
- CO2. Analyze the network topologies in Wireless Networks.
- CO3. Design solutions for network communications at physical and transport layers.
- CO4. Solve complex problems related to network communications and wireless networks.
- CO5. Apply GSM, CDMA, GPRS and Bluetooth to create Home Access Networks and wireless Personal Area Network.
- CO6. Apply contextual knowledge to solve problems using societal applications like health care devices, Internet of Things.

III B.Tech. - I Semester

(16BT51231) CASE TOOLS AND COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on "Object Oriented Analysis and Design", "Computer Networks" and "Java Programming".

COURSE DESCRIPTION: Modeling case studies -Online Ticket Reservation system; Point of sales; Hands-on Experience on data link Framing methods; CRC; Routing algorithms; Congestion Control Algorithms; Substitution Techniques and Network Simulation using NS-2.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- UML architecture
- Routing algorithms
- Error detection and correction techniques.

CO2. Analyze real world problems and study the applicability of UML design.

CO3. Apply Unified Modeling Language to design software and design routing algorithms Shortest path using Dijkstra's, and Distance vector.

CO4. Demonstrate independent problem solving skills in designing and developing software solutions.

CO5. Use NS-2 tool for simulating computer network processes.

CO6. Build network models and UML models suitable for societal needs.

CO7. Work effectively as an individual and as a member in team for mini-project implementation.

CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

III B.Tech. - I Semester

(16BT51232) COMPUTER GRAPHICS AND MULTIMEDIA LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on "Computer Graphics and Multimedia" and "Java Programming".

COURSE DESCRIPTION: Hands on experience in developing graphics, Animating Flash Movies and Developing Applications using a Flash Tool.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on creation of 2D, 3D objects and compression techniques.

CO2. Analyze real world problems and identify solutions based on computer graphics and multimedia concepts.

CO3. Design and develop various algorithms for graphics, user authoring applications and animation movies.

CO4. Demonstrate independent problem solving in developing multimedia applications.

CO5. Apply various programming principles to implement graphics and to animate interactive flash movies for presenting multimedia content.

CO6. Build multimedia applications suitable for societal requirements.

CO7. Work effectively as an individual and as a member in team for mini-project implementation.

CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

III B.Tech. - I Semester (16BT51233) WEB TECHNOLOGIES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Web Technologies".

COURSE DESCRIPTION: Hands-on experience on HTML, HTML5, CSS, JavaScript, JQuery, Bootstrap, PHP and MySQL.

COURSE OUTCOMES:

On Successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on web page design elements, dynamic content and database Interaction.
- CO2. Analyze user requirements to develop web applications.
- CO3. Design client-server applications using web technologies.
- CO4. Demonstrate problem solving skills to develop enterprise web applications.
- CO5. Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.
- CO6. Apply web technologies to develop interactive, dynamic and scalable web applications for societal needs.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

III B.Tech. - II Semester (16BT3HS02) MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire knowledge on:
 - Tools and concepts of Micro Economics.
 - Basic Principles and concepts of Accountancy.
 - Provides life skills for effective utilization of scarce resources.
 - Financial Accounting.
 - Significance of Economics and Accountancy
- CO2. Develop skills in managerial decision making of an organization.
- CO3. Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.
- CO4. Develop effective communication in Business and Accounting transactions.
- CO5. Ascertain the profitability and soundness of an organization.
- CO6. Practice Financial Accounting.

III B.Tech. - II Semester

(16BT61501) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Database Management Systems".

COURSE DESCRIPTION: Data Mining Fundamentals; Data Preprocessing; Operational Database Systems and Data Warehouses; Mining Frequent Patterns; Classification and Prediction; Clustering; New Trends and Research Frontiers.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate Concepts of knowledge in data warehousing and data mining.
- CO2. Analyze using data mining techniques to find useful and potential Knowledge.
- CO3. Design Data Warehouse for OLAP applications for deployment.
- CO4. Evaluate the usage of association mining techniques on complex data objects.
- CO5. Select appropriate techniques to measure the interesting patterns from heterogeneous databases.
- CO6. Apply appropriate evolutionary data mining algorithms to find solutions of Real time Applications.

III B.Tech. - II Semester

(16BT61201) CLOUD COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Computer Networks" and "Operating Systems".

COURSE DESCRIPTION: Virtualization, Virtualization Technologies; Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security, Cloud Disaster Recovery; Working with Clouds; and Case Studies.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and virtualization.
- CO2. Analyze the issues in cloud computing Data, Network and Host security.
- CO3. Apply API development skills in web applications for Cloud deployment.
- CO4. Use research based knowledge to build cloud applications.
- CO5. Use advanced programming languages to access cloud services.
- CO6. Build cloud environment suitable for societal requirements.

III B.Tech. - II Semester

(16BT60441) PATTERN RECOGNITION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Importance of pattern recognition; Baye's Decision Theory; Linear and non linear classifiers; Feature selection based on statistical hypothesis testing; Feature Generation; KL Transform; SVD; ICA; Clustering of features and clustering algorithms.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Apply the knowledge of engineering fundamentals on:
- Classifying the features and patterns.
 - Feature selection and generation.
 - Clustering patterns of objects.
- CO2. Analyze numerical and analytical problems of features and patterns of object using pattern recognition algorithms.
- CO3. Design and develop algorithms to optimize classification of patterns, feature selection and generation and clustering of objects.
- CO4. Interpretation and synthesis the features of objects to validate the performances of pattern recognition algorithms.
- CO5. Apply appropriate techniques and algorithms to identify patterns of objects with an understanding of limitations.
- CO6. Use pattern recognition techniques for societal needs.

III B.Tech. - II Semester (16BT70402) EMBEDDED SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Digital Logic Design" and "Computer Organization".

COURSE DESCRIPTION: Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Apply knowledge on:
- MSP430 Architecture, Pin out, Instruction set
 - High level programming
 - Usage of On-chip resources like ADC, DAC, Timers
 - Internet of Things related issues
- CO2. Analyze various designing issues regarding:
- Usage of on chip resources
 - Low power modes
 - Communication support
- CO3. Design embedded systems using MSP430 series microcontrollers to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.
- CO5. Apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.
- CO6. Reason out and practice professional engineering to deliver efficient and cost effective embedded based products to society.

III B.Tech. - II Semester (16BT60502) SOFT COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts on Soft Computing Techniques; Artificial Neural Networks; Supervised Learning; Unsupervised Learning; Fuzzy logic; Genetic Algorithms.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:

- Artificial Neural Networks
- Supervised Learning Networks
- Unsupervised Learning Networks
- Fuzzy sets, relations and measures
- Genetic Operators

CO2. Analyze neural network architectures, Fuzzy systems and Genetic algorithms.

CO3. Design soft computing solutions for real life computational problems.

CO4. Use soft computing techniques to solve complex computational problems.

CO5. Create algorithms using soft computing techniques.

CO6. Apply contextual knowledge to solve problems related to societal issues like Business Intelligence, Forecasting.

III B.Tech. - II Semester

(16BT61202) AD-HOC AND WIRELESS SENSOR NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Ad-hoc Wireless Networks; MAC Protocols; Routing Protocols; Transport Layer Protocols; Quality of Service and Energy Management; Wireless Sensor Networks.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Ad-hoc and sensor networks
- MAC Protocols and Routing Protocols
- TCP over Ad-hoc wireless networks
- QoS in Ad-hoc wireless networks.
- Sensor networks.

CO2. Analyze the issues in MAC, Routing and Transport Layer in Ad-hoc and wireless sensor networks.

CO3. Apply routing and energy management techniques in Ad-hoc wireless networks.

CO4. Demonstrate problem solving skills in the implementation of secured and optimum QoS wireless networks.

CO5. Use routing algorithms in ad-hoc wireless networks.

III B.Tech. - II Semester

(16BT30503) PYTHON PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Object Oriented Programming through C++"

COURSE DESCRIPTION: Data types and Expressions; Control Statements; Strings; Text Files; Lists; Dictionaries; Functions; Objects and their use; Exception Handling; Design with Classes; Graphical User Interface.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Data Types, Variables, Expressions
- Control statements, Strings and Text files.
- Lists, Dictionaries and Functions.
- Objects and Design with classes
- Exception Handling and GUI

CO2. Analyze complex computational problems.

CO3. Design solutions for real life computational problems.

- CO4. Solve complex problems using python scripting constructs.
 CO5. Implement python scripts using Integrated Development Environment.
 CO6. Apply Python programming knowledge to solve problems related to societal applications like Medical and Weather Forecasting.

III B.Tech. - II Semester (16BT61203) **ADVANCED DATABASES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Database Management Systems" and "Computer Networks".

COURSE DESCRIPTION: Parallel Databases; Object based Databases; Distributed Databases; Distributed Transaction Management; Emerging Database Technologies and Applications.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Parallel databases.
 - Object based and Object Relational databases.
 - Distributed databases, horizontal and vertical data fragmentations.
 - Mobile databases, Geographic Information Systems, Genome Data Management, Multimedia Database and NoSQL.
- CO2. Demonstrate skills in Query optimization, Data Fragmentation, Transaction Management and Concurrency Control for Distributed Transactions.
- CO3. Design Parallel, Object-Oriented, Object-Relational and NoSQL databases.
- CO4. Solve Concurrency Problems in Distributed Transactions.
- CO5. Use database techniques for Mobile, Geographic Information Systems, Genome Data Management, and Multimedia Data.
- CO6. Create databases as per societal needs.

III B.Tech. - II Semester (16BT61204) **SEMANTIC WEB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Web Technologies".

COURSE DESCRIPTION: Semantic web fundamentals; Semantic web technology; Ontology web language; Swoogle; Semantic web services.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Semantic web search
 - RDF and SWOOGLE
 - Semantic web services
 - RDFS and OWL
- CO2. Analyze layers of web architecture for describing web content.
- CO3. Design semantic web search engine for capturing information on the current web.
- CO4. Select RDF and SWOOGLE for search engine usage.

III B.Tech. - II Semester

(16BT61503) SOFTWARE PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Conventional Software Management; Evolution of Software Economics; Improving Software Economics; Lifecycle Phases; Artifacts of the Process; Workflow of the Process; Checkpoints of the Process; Software Economics; Iterative Process Planning; Project Organization and Responsibilities; Project Control and Project Instrumentation; Agile Overview.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on software effort estimation techniques, Agile life cycle, project control and instrumentation.
- CO2. Analyze the major and minor milestones, artifacts, metrics from management and technical perspectives.
- CO3. Design and develop software products using conventional and modern principles of software project management.
- CO4. Effectively implement project management through appropriate planning of Work flows and Work Breakdown Structures of the process.
- CO5. Select appropriate techniques to evaluate progress of software project in terms of milestones and check points.
- CO6. Apply appropriate ethical principles to be followed in management of software economics.

III B.Tech. - II Semester

(16BT6HS01) BANKING AND INSURANCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate Knowledge in
 - Tools and concepts of Banking and Insurance.
 - Basic Principles and concepts of Insurance and Banking.
 - e-fund transfers, e-payments and e-business models.
- CO2. Develop skills in providing solutions for
 - Online banking and e – payments.
 - Risk Management through insurance benefits the society at large.
 - Money management by leveraging on technology, banking and insurance services.
- CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to More employment opportunities.
- CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

III B.Tech. - II Semester

(16BT6HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Nature and scope of communication; Corporate communication; Writing business documents; Careers and resumes; Interviews.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Corporate Communication
 - Main Stages of Writing Messages
 - Career Building
- CO2. Analyze the possibilities and limitations of language in
 - Communication Networks
 - Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

III B.Tech. – II Semester

(16BT6HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Scope, Objectives and Elements of cost Accounting; Cost Sheet and Tender quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: concept of Risk and Return on Investment.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire Knowledge in
 - Elements of Costing.
 - Basic concepts of Financial Management.
 - Risk and Return
 - Significance of Cost Accountancy
 - Behavioral Finance
- CO2. Develop skills in
 - Material, Labor, Overheads control.
 - Excellence and ability to minimize the cost of the organization
- CO3. Develop effective Communication in Cost control and Financial Management.
- CO4. Provide solutions for effective investment decisions.

III B.Tech. – II Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire Knowledge in
 - Schemes and institutions encouraging entrepreneurship.
 - Basic Principles and concepts of Accountancy.
 - Significance of entrepreneurship.
- CO2. Develop skills in providing solutions for
 - Personal excellence through financial and professional freedom.
 - Women entrepreneurship serving as contrivance in societal development
- CO3. Develop critical thinking and evaluation ability.
- CO4. Widens knowledge and build up attitude towards trouble shooting.
- CO5. Demonstrate business acumen.

III B. Tech. – II Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Oral communications; Basic grammar; advanced grammar; basic writing; Business French (La Francais Commercial)

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand French culture and civilization.
- CO6. Communicate effectively with the native French in day to day situation.

III B.Tech. - II Semester

(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand German culture and civilization.
- CO6. Communicate effectively with the native German in day to day situation.

III B.Tech. - II Semester

(16BT6HS07) INDIAN CONSTITUTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, understanding for better professional practice and good citizenry.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Gain knowledge in
 - Parliamentary proceedings, laws, legislature, administration and its philosophy Federal system and judiciary of India.
 - Social problems and public services like central civil services and state civil services
 - Indian and international political aspects and dynamics.
- CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen.

III B.Tech. - II Semester

(16BT6HS08) INDIAN ECONOMY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire the knowledge in
 - Micro and Macro Economics.
 - Traditional and Modern methods of Capital Budgeting.
 - Five year plans and NITI Aayog.
- CO2. Analyze
 - Capital Budgeting.
 - Value Analysis and Value Engineering.
 - Economic analysis
 - Law of supply and demand
- CO3. Understand the nuances of project management and finance

III B.Tech. - II Semester**(16BT6HS09) INDIAN HERITAGE AND CULTURE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —**COURSE DESCRIPTION:**

Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquaint knowledge in
 - Human aspirations and values in Vedic culture.
 - Cultural aspects of Buddhism and Jainism
 - Unification of our country under Mourya's and Gupta's administrations
 - Socio Religious aspects of Indian culture
 - Reform movements and harmonious relations.
- CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts

III B.Tech. - II Semester**(16BT6HS10) INDIAN HISTORY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Gain knowledge on evolution and history of India as a nation
- CO2. Analyze social and political situations of past and current periods
- CO3. Practice in career or at other social institutions morally and ethically

III B.Tech. - II Semester

(16BT6HS11) PERSONALITY DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Self-Management
 - Planning Career
- CO2. Analyze the situations based on
 - Attitudes
 - Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

III B.Tech. - II Semester

(16BT6HS12) PHILOSOPHY OF EDUCATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire knowledge in
 - Philosophy of Engineering education.
 - Philosophical Methods.
 - Knowledge acquiring methods.
 - Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational outcomes
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

III B.Tech. - II Semester

(16BT6HS13) PUBLIC ADMINISTRATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire knowledge in
 - Public Policy.
 - Good Governance.
 - E-governance.
 - Development Administration.

- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance models to find and provide opportunities in e-governance.
- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing
 - Bureaucracy.
 - Role of civil society.

III B.Tech. - II Semester

(16BT60112) BUILDING MAINTENANCE AND REPAIR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. Analyze failures, repair and rehabilitation techniques.
- CO3. Solve complex building maintenance problems through proper investigations and interpretation.
- CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. Provide solutions for building maintenance and repair problems considering health and safety.
- CO6. Consider environmental sustainability in building maintenance and repair.
- CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

III B.Tech. - II Semester

(16BT60113) CONTRACT LAWS AND REGULATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. Analyze contracts and tenders.
- CO3. Address the legal issues in contracts and tenders.
- CO4. Follow laws and regulations in the preparation of contracts and tenders.
- CO5. Prepare contract and tender documents as per the standards.
- CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

III B.Tech. - II Semester

(16BT60114) **DISASTER MITIGATION AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. Analyze disasters and their vulnerability.
- CO3. Design strategies for effective disaster mitigation.
- CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. Use appropriate methods in disaster mitigation and management.
- CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. Solve disaster related issues considering environment.
- CO8. Consider economical issues in disaster management.

III B.Tech - II Semester

(16BT60115) **ENVIRONMENTAL POLLUTION AND CONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.
- CO6. Encourage sustainable development through implementation of pollution control measures.
- CO7. Maintain IS Codes for environmental quality control.

III B.Tech - II Semester

(16BT60116) **PLANNING FOR SUSTAINABLE DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.

- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

III B.Tech. - II Semester (16BT60117) PROFESSIONAL ETHICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.
- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

III B.Tech. - II Semester (16BT60118) RURAL TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION:

Rural technology; Non conventional energy; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of bio-fertilisers and usage of agro machinery in agriculture.

III B.Tech - II Semester

(16BT60308) GLOBAL STRATEGY AND TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on Strategic management, Research & development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

III B.Tech - II Semester

(16BT60309) INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

III B.Tech. - II Semester

(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3. Develop a comprehensive and well planned business structure for a new venture.
- CO4. Conduct investigation on complex problems, towards the development of Project.
- CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6. Apply ethics in constructive innovation framework.
- CO7. Exhibit professionalism by employing modern project management and financial tools.

III B.Tech. - II Semester

(16BT60311) MATERIALS SCIENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semiconductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on concepts of fundamental science and engineering principles relevant to materials.
- CO2. Analyze the structures of various types of Ferrous, Non-ferrous alloys influencing various engineering applications.
- CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.
- CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
- CO5. Consider health and safety issues while providing materials to real time applications.
- CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

III B.Tech. - II Semester

(16BT70412) GREEN TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
- CO2. Analyze various green technologies for engineering practice.
- CO3. Provide green solutions to engineering problems.
- CO4. Apply various green techniques in the engineering practice.
- CO5. Consider health and safety issues while providing green solutions to the society.
- CO6. Understand issues related to environment sustainability.
- CO7. Apply ethical standards for environmental sustainability in the engineering practice.

III B.Tech. - II Semester

(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Nanoscale technology.
 - Difference between micro and nanotechnology
 - Classification of Nanostructure and Nanomaterial
 - Fabrication of various nanomaterials and nanostructures.
- CO2. Analyze numerical and analytical problems in
 - Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
- CO3. Design and fabricate devices based on nanostructures like
 - Nano solar cell
 - Nano cantilever
 - Nano bio-sensor
- CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.
- CO5. Select appropriate technique for fabrication of nanostructures and Nano composites.
- CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

III B.Tech. - II Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Systems Process and System Design
 - Systems Analysis and Modeling
 - System Development Life Cycle
 - Design Management and Maintenance Tools.
- CO2. Analyze system Process and estimate the given models by using case tools.
- CO3. Design and develop a model to the organizational systems.
- CO4. Solve complex problems related to engineering systems and produce accurate results
- CO5. Apply object oriented techniques for modeling dynamic systems.
- CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

III B.Tech.- II Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators
- CO2. Analyze the properties of materials and identify its suitability for MEMS devices.
- CO3. Design MEMS devices that meet desired specifications and requirements.
- CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
- CO5. Use modern techniques in micro manufacturing process.
- CO6. Develop efficient and cost effective MEMS based products for society.

III B.Tech. – II Semester

(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION:

Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in Cyber security, Cybercrimes and its related laws in Indian and Global Act.
- CO2. Analyze the legal perspectives and laws related to cybercrimes in Indian context.
- CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cybercrimes.
- CO4. Solve Cyber security issues using privacy policies.
- CO5. Use antivirus tools to minimize the impact of cyber threats.
- CO6. Follow security standards for the implementation of Cyber Security and laws.

III B.Tech. - II Semester

(16BT61505) BIO-INFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION:

Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2. Analyze biological sequences for Homology Modeling.
- CO3. Apply clustering methods for Phylogenetic trees.
- CO4. Solve bio sequencing problems using dynamic programming.
- CO5. Select and apply appropriate techniques and tools to structure Prediction.

III B.Tech. - II semester (16BT61231) CLOUD COMPUTING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Cloud Computing".

COURSE DESCRIPTION: Hands-on experience on creating virtual machines on Windows and Linux platforms; Development of service based web applications and their deployment.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate hands-on experience on Virtualization models and Cloud Environment.
- CO2. Analyze the given experiment and relate to existing cloud architectures.
- CO3. Apply API development skills in web applications for cloud deployment.
- CO4. Demonstrate independent problem solving skills in developing dynamic web applications.
- CO5. Use advanced programming languages to access cloud services.
- CO6. Build suitable cloud environment for societal requirements.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

III B.Tech. - II semester (16BT61232) KNOWLEDGE ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Data Warehousing and Data Mining".

COURSE DESCRIPTION: Hands-on experience on Data preprocessing techniques; Mining frequent patterns; classification and clustering techniques using Weka and R Studio tools.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on: preprocessing techniques, Descriptive and predictive mining tasks.
- CO2. Identify suitable algorithms to mine knowledge from real-time databases.
- CO3. Classify and predict the information for forecasting applications.
- CO4. Demonstrate independent decision making skills for business analysis applications.
- CO5. Apply Weka and R tools to extract interesting patterns from large databases.
- CO6. Prepare analytical reports suitable for societal requirements.
- CO7. Work effectively as an individual and member of a team to implement mini-project.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

III B.Tech. - II semester (16BT61233) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PRE-REQUISITES: All the courses of the program up to III B. Tech. – I Semester.

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES:

Completion of the seminar work enables a successful student to demonstrate:

- CO1. Demonstrate in-depth knowledge on the seminar topic.
- CO2. Analyze critically, the concepts relevant to the seminar topic.
- CO3. Understand methodology relevant to seminar topic.
- CO4. Undertake investigation of issues related to seminar topic providing valid conclusions.
- CO5. Use techniques and tools to consolidate the solutions relevant to the seminar topic.
- CO6. Comprehend societal issues in the context of seminar topic.
- CO7. Understand ethical issues in the context of seminar topic.
- CO8. Function effectively as individual on the chosen seminar topic.
- CO9. Develop communication skills, both in oral and written form, for preparing and presenting seminar report.
- CO10. Engage in lifelong learning to improve knowledge and competence in the chosen area of seminar.

IV B.Tech. - I semester (16BT5HS01) MANAGEMENT SCIENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1: Demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial context.
- CO2: Identify and analyse management problems in the business organizations reaching substantiated conclusions using principles of management.
- CO3: Design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
- CO4: Competently employ broad based analytical tools for decision making, system design, analysis and performance.
- CO5: Provide solution to organizations for sustainable development.
- CO6: Apply knowledge of engineering and management principles to manage the projects in multidisciplinary environments.

IV B.Tech. - I semester
(16BT71201) BIG DATA TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Data Warehousing and Data Mining".

COURSE DESCRIPTION: Introduction to Big Data, Hadoop; Hadoop Distributed File Systems; Hadoop I/O; MapReduce; Hive; Pig; HBase; Zookeeper; Sqoop and Case studies.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Big Data characteristics, storage, processing, querying and reporting.
- CO2. Analyze large dataset issues and solve using data analytic techniques.
- CO3. Design and Develop classification and clustering models for dataset analysis.
- CO4. Use research knowledge to manage large datasets.
- CO5. Apply MapReduce, Hive, Pig, Sqoop, HBase, and Zookeeper tools for data analytics.
- CO6. Use data analytics tools to solve societal problems.

IV B.Tech. - I semester
(16BT71202) MOBILE APPLICATION DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Java Programming" and "Web Technologies".

COURSE DESCRIPTION: Mobile platforms; Mobile User Interface and tools; Introduction to Android; Activities; Views; Menus; Database Storage; SMS; e-mail; Displaying Maps; Building a Location Tracker Web Services Using HTTP; Sockets Programming; Communication between a Service and an Activity; Introduction to iOS.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Mobile platforms and Mobile User Interface
 - Android Activities and Intents
 - Messaging, Networking, Location based Services, Android Services
 - Basics of iOS
- CO2. Analyze the context of complex problems and identify user interface design requirements.
- CO3. Design and develop solutions for real world problems with android mobile applications.
- CO4. Demonstrate problem solving skills to create applications for mobile devices.
- CO5. Apply Android studio and iOS tools to develop mobile applications.
- CO6. Create mobile applications as per societal needs.

IV B.Tech. - I semester
(16BT71203) INFORMATION RETRIEVAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Data Structures" and "Database Management Systems".

COURSE DESCRIPTION: Architecture of Information Retrieval Systems; Functional Capabilities; Data Structures; Mathematical Algorithms; Indexing; Similarity and Clustering; Human Perception and Presentation; Text Search Techniques and Evaluation Measures.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Information Retrieval System Architecture
 - Functional capabilities
 - Indexing and data presentation methods.
 - Evaluation measures of Information Retrieval Systems.
- CO2. Analyze indexing methods and clustering algorithms to group similar data items for efficient search.
- CO3. Design and develop data structures used to store and retrieve data items.
- CO4. Demonstrate problem solving skills in the usage of mathematical algorithms for information retrieval.
- CO5. Use text search algorithms and collaborative filtering techniques for information retrieval and visualization methods for information presentation.

IV B.Tech. - I semester

(16BT71204) MOBILE COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Introduction to Mobile Computing, GSM; Medium Access Control, Wireless LAN; Mobile Network and Transport Layers; Data Dissemination; Mobile Ad-Hoc Networks (MANETs), Wireless Application Protocol (WAP).

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- GSM, GPRS, 3G, 4G, Wireless LAN, MANETs.
 - Protocols in Data Link, Network, Transport and Application layer.
- CO2. Analyze the issues related to database design and data retrieval in mobile applications.
- CO3. Apply routing algorithms for finding shortest path in MANETs.
- CO4. Use protocols of Wireless Technologies for security implementation in mobile computing.
- CO5. Follow standards in the usage of mobile communications.

IV B.Tech. - I semester

(16BT71505) NETWORK PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: OSI model, Unix standards; Normal startup, terminate and signal handling server process termination; lost datagram, summary of UDP example, Lack of flow control with UDP; Function and IPV6 support, uname function ,IPV4 Client- IPV6 Server ;FIFO's, streams and messages, RPC.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on concepts of sockets, inter process communication and remote login.
- CO2. Identify appropriate TCP Echo server functions and Socket options used in Network based systems.
- CO3. Analyze networking protocols such as TCP and UDP for connection establishment between client and server.
- CO4. Design appropriate solutions for network applications based on UNIX.
- CO5. Apply modern tools to create cooperating processes in network based Systems.
- CO6. Relate suitable ethical principles to design and develop applications related to Network Traffic Monitoring.

IV B.Tech. - I semester (16BT60501) SOFTWARE TESTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Software Testing Basics: Goals, Defects, Terminology, Methodology, STLC in SDLC, Verification and Validation; Software Testing Techniques: White box testing, Black Box Testing, Regression testing; Test Management: Test Planning, Design and Specifications; Test Automation: Tool selection and Guidelines.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Software Testing Life Cycle.
 - Testing Techniques.
 - Test Management and Metrics.
 - Regression Testing
 - Test Automation
- CO2. Analyze testing circumstances and their resultants in software development.
- CO3. Design and develop the appropriate test cases in accordance to the software development model.
- CO4. Use problem solving skills to control and monitor the testing process.
- CO5. Apply testing tools for testing the software quality.
- CO6. Apply contextual knowledge to perform testing on software related to societal applications.

IV B.Tech. - I semester (16BT71205) CRYPTOGRAPHY AND NETWORK SECURITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Principles and Practice of Cryptography and Network Security; Classical Systems; Symmetric Block Ciphers; Public-key Cryptography; Hash Functions; Authentication; Key Management; Key Exchange; Signature Schemes; E-mail; Web Security; Malicious Software; Intrusion Detection; Phishing and Identity Theft.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Cryptographic algorithms and their mathematical models
 - Message Authentication
 - Digital Signatures
 - Malicious Software
 - Intrusion Detection
 - Phishing and Identity Theft
- CO2. Analyze vulnerabilities and threats on information systems based on various security parameters.
- CO3. Apply security and privacy methods to protect and prevent cyber crimes.
- CO4. Solve information privacy issues using encryption and digital signatures.
- CO5. Use firewall and PGP to protect network and e-mail respectively.
- CO6. Follow standards in implementation of network security.

IV B.Tech. - I semester (16BT71206) NET TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Web Technologies".

COURSE DESCRIPTION: Introduction to .NET Framework and C# Programming; Object-oriented concepts with C#, Exception handling; Interfaces, Generics, Delegates and Events in C#; Database access with ADO.NET; Web application development using ASP.NET Web forms and Web controls.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Basics of .NET platform.
 - Building C# applications, designing ASP.NET websites, perform Data access, building ASP.NET applications.
- CO2. Analyze complex problems and identify .NET components for client-server environment.
- CO3. Design and develop Graphical User Interface and Web applications using .NET technologies.
- CO4. Demonstrate problem solving skills for developing interactive web applications.
- CO5. Use C#, ADO.NET and ASP.NET technologies for website design.
- CO6. Create websites as per societal needs.

IV B.Tech. - I semester (16BT71207) E – COMMERCES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Electronic Commerce Framework; Consumer Oriented Electronic Commerce; Electronic Payment Systems; Inter and Intra Organizational Commerce; Corporate Digital Library; Advertising and Marketing on Internet; Consumer Search and Resource Discovery; Multimedia and Digital Video.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- The basic concepts and technologies used in the field of E-Commerce.
 - E-Payment systems
 - Inter and Intra Organizational E-Commerce
 - Advertising and Marketing on Internet
 - Key Multimedia Concepts
- CO2. Analyze the Mercantile Process Models in different views.
- CO3. Apply compression and decompression techniques and codec required for Video Conferencing.
- CO4. Solve security issues in E-Commerce using encryption mechanisms.
- CO5. Follow ethics in the usage of E-Commerce.

IV B.Tech. - I semester (16BT71207) SERVICE ORIENTED ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Web Services; Principles of SOA; Service Layers; Simple Object Access Protocol (SOAP); Web Services Description Language (WSDL).

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Principles, services and policies of service orientation.

- Fundamentals of web services.
- XML, WSDL related to SOA.

- CO2. Analyze complex business process critically in identifying appropriate service model logic.
- CO3. Design service oriented architecture suitable for different environments.
- CO4. Use XML, SOAP and service interface design tools for building service oriented architecture.

IV B.Tech. - I semester

(16BT71209) MACHINE LEARNING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Probability and Statistics" and "Data Warehousing and Data Mining".

COURSE DESCRIPTION: Introduction to Machine Learning; Planning for Machine Learning; Bayesian Techniques; Decision Trees; Bayesian Networks; Artificial Neural Networks; Association Rules Learning; Support Vector Machines; Clustering; Machine Learning as a Batch Process; Case Studies, Data Science Fundamentals.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Decision Trees and Bayesian Networks
 - Artificial Neural Networks and Association Rules
 - Support Vector Machines, Data Science fundamentals.
- CO2. Analyze complex datasets and identify suitable machine learning algorithms.
- CO3. Design decision making algorithms using supervised and unsupervised approaches.
- CO4. Solve complex data analytical problems using machine learning and data science techniques.
- CO5. Use Apache Spark and R tools for real-time and batch processing applications.
- CO6. Develop machine learning based solutions as per societal needs.

IV B.Tech. - I semester

(16BT71508) INTERNET OF THINGS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: Internet of Things Components; Communication models; Prototyping; Hardware; Design models; Analytics for IoT.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Protocols, functional blocks and communication models of Internet of things.
- CO2. Identify appropriate sensors and communication modes used in IoT based systems.
- CO3. Design appropriate solutions for IoT applications using Raspberry Pi and Arduino kits.
- CO4. Appropriately synthesize the models and applications for usage in Home automation and cities.
- CO5. Apply evolutionary techniques to perform analytics on the data integrated from IoT based systems.
- CO6. Use advances in IoT technology to design and develop applications.

IV B.Tech. - I semester

(16BT71210) HIGH PERFORMANCE COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Organization".

COURSE DESCRIPTION: Cache-based Microprocessor Architecture; Memory Hierarchies; Multithreaded Processors; Common Sense Optimizations; The Role of Compilers; Data Access Optimization; Shared-memory Computers; Parallel Scalability; Introduction to OpenMP; Parallel Jacobi Algorithm; Introduction to MPI; MPI Performance Tools; MPI Parallelization of Jacobi Solver.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Modern Processors and code Optimization.
- Parallel computing paradigms.

CO2. Analyze computation problems and identify the suitable parallel processing approaches to achieve optimum computation.

CO3. Design Parallel processing algorithms for achieving high performance computing.

CO4. Solve shared memory problems using Parallel Programming.

CO5. Use OpenMP and MPI tools in Parallel Programming.

IV B.Tech. - I semester

(16BT70505) HUMAN COMPUTER INTERACTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on "Computer Graphics".

COURSE DESCRIPTION: Graphical User Interface; Design Process; Screen Designing; Windows; Components; Software Tools; Interaction Devices.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on principles, characteristics, tools and devices of Human Computer Interaction.

CO2. Analyze the user requirements, technological and physical characteristics of users for better interface design.

CO3. Design appropriate user interface for desktop and web applications.

CO4. Conduct investigations on User requirements to provide an effective user interface.

CO5. Utilize user interface mockup tools and input, output and pointing devices for designing user interfaces.

CO6. Apply Contextual knowledge to develop interfaces for differently abled people.

IV B.Tech. - I semester

(16BT71231) BIG DATA TECHNOLOGIES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on "Big Data Technologies" and "Java Programming".

COURSE DESCRIPTION: Hands-on experience in Big data storage, processing, querying, reporting, predictive analytics, classification, clustering, recommendation system using Data-parallel programming model of Hadoop, MapReduce, HDFS, Hive, Pig, HBase, Zookeeper and Sqoop Big Data Tools.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Big Data characteristics, storage, processing, querying and reporting.
- CO2. Analyze large dataset issues and solve using data analytic techniques.
- CO3. Design and Develop classification and clustering models for dataset analysis.
- CO4. Solve large data analysis problems using Big data techniques.
- CO5. Apply Big Data Tools: Sqoop, HBase, Hive, Pig, MapReduce and Zookeeper for large data management and knowledge extraction.
- CO6. Build Hadoop environment suitable for societal requirements.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

IV B.Tech. - I semester

(16BT71232) MOBILE APPLICATION DEVELOPMENT LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A Course on "Mobile Application Development".

COURSE DESCRIPTION: Hands-on experience on development of Android Mobile applications with Submenus; Context menus; Layouts; Buttons; Date Picker and database access with Android SQLite.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Mobile platforms and Mobile User Interface
 - Android Activities and Intents
 - Messaging, Networking, Location based Services, Android Services
 - Basics of iOS
- CO2. Analyze the context of complex problems and identify user interface design requirements.
- CO3. Design and develop solutions for real world problems with android mobile applications.
- CO4. Demonstrate problem solving skills to create applications for mobile devices.
- CO5. Apply Android studio and iOS tools to develop mobile applications.
- CO6. Create mobile applications as per societal needs.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

IV B.Tech. - I semester

(16BT71233) COMPREHENSIVE ASSESSMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PRE-REQUISITES: All the technical courses of the program upto IV B. Tech. - I Semester.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables successful students to demonstrate:

- CO1. Knowledge in the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.

- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Ability to engage in life-long learning in the courses of the program.

IV B.Tech. - II semester **(16BT81231) PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PRE-REQUISITES: All technical courses of the program up to IV B. Tech. - I Semester.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: Completion of the project work enables successful students to:

- CO1. Demonstrate knowledge on the topic of project work.
- CO2. Demonstrate analytical ability exercised in the project work.
- CO3. Apply design skills for the project implementation.
- CO4. Investigate and solve chosen project problem with optimum solution.
- CO5. Use techniques and modern engineering tools for the development of project work.
- CO6. Provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the project work.
- CO7. Understand environmental issues while executing the project work
- CO8. Understand professional and ethical responsibilities while executing the project work.
- CO9. Function effectively as an individual and a member in the project team.
- CO10. Present views cogently and precisely on the project work.
- CO11. Demonstrate project management skills and estimate time and cost required for carrying out the project work.
- CO12. Engage lifelong learning to improve knowledge and competence in the chosen area of the project work.

Program: B.Tech. COMPUTER SCIENCE AND SYSTEMS ENGINEERING

I B.Tech. - I Semester

16BT1HS01: TECHNICAL ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

1. Demonstrate knowledge in
 - a) Process of communication
 - b) Modes of listening
 - c) Paralinguistic features
 - d) Skimming and Scanning
 - e) Elements of style in writing
2. Analyze the possibilities and limitations of language for understanding
 - a) Barriers to Communication
 - b) Barriers to Effective Listening
 - c) Barriers to Speaking
 - d) Formal and metaphorical language
3. Design and develop functional skills for professional practice.
4. Apply writing skills in preparing and presenting documents
5. Function effectively as an individual and as a member in diverse teams.
6. Communicate effectively with the engineering community and society in formal and informal situations.

I B.Tech. - I Semester

16BT1BS01: ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
- CO2: Develop analytical skills in:
- a. Determination of hardness of water.
 - b. Determination of viscosity, flame and fire points, cloud and pour points.
- CO3: Develop designing skills in:
- a. Synthesis of engineering plastics.
 - b. Chemical methods for the synthesis of Nano materials.
- CO4: Develop skills for providing solutions through:
- a. Mitigation of hardness of water.
 - b. Newer Nanomaterials and engineering plastics for specific applications
- CO5: Acquire awareness to practice engineering in compliance to modern techniques such as:
- a. Nalgonda technique for defluoridation of water
 - b. Electroplating technique for control of corrosion.
- CO6: Acquire awareness to societal issues on:
- a. Quality of water.
 - b. Bio-diesel
 - c. Chemical materials utility and their impact.

I B.Tech. - I Semester**16BT1BS03: MATRICES AND NUMERICAL METHODS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics**COURSE DESCRIPTION:** Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.**COURSE OUTCOMES:** After completion of the course a successful student is able toCO1: Acquire basic **knowledge** in

- (a) Finding the rank of matrices and analyzing them.
- (b) Solving algebraic and transcendental equations by various numerical methods.
- (c) Fitting of various types of curves to the experimental data.
- (d) Estimating the missing data through interpolation methods.
- (e) Identification of errors in the experimental data
- (f) Finding the values of derivatives and integrals through various numerical methods.
- (g) Solving differential equations numerically when analytical methods fail.

CO2: Develop skills in **analyzing** the

- (a) methods of interpolating a given data
- (b) properties of interpolating polynomials and derive conclusions
- (c) properties of curves of best fit to the given data
- (d) algebraic and transcendental equations through their solutions
- (e) properties of functions through numerical differentiation and integration
- (f) properties of numerical solutions of differential equations

CO3: Develop skills in **designing** mathematical models for

- (a) Fitting geometrical curves to the given data
- (b) Solving differential equations
- (c) Constructing polynomials to the given data and drawing inferences.

CO4: Develop numerical skills in **solving the problems** involving

- (a) Systems of linear equations
- (b) Fitting of polynomials and different types of equations to the experimental data
- (c) Derivatives and integrals
- (d) Ordinary differential equations

CO5: Use relevant numerical **techniques** for

- (a) Diagonalising the matrices of quadratic forms
- (b) Interpolation of data and fitting interpolation polynomials
- (c) Fitting of different types of curves to experimental data
- (d) obtaining derivatives of required order for given experimental data
- (e) Expressing the functions as sum of partial fractions

I B. Tech. - I Semester**16BT1BS04: MULTI - VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics**COURSE DESCRIPTION:** First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.**COURSE OUTCOMES:** After completion of the course a successful student is able to

CO1: Acquire knowledge in

- (a) Higher order Differential equations
- (b) Maximum and minimum values for the functions of several variables
- (c) Double and triple integrals
- (d) Differentiation and integration of vector functions.
- (e) Line and surface volume
- (f) transforming integrals from three dimensional surfaces and volumes on to plane surfaces

CO2: Develop skills in analyzing the

- (a) methods for differential equation for obtaining appropriate solutions,
- (b) Properties of oscillatory electrical circuits and heat transfer in engineering systems
- (c) The variations in the properties of functions near their stationary values
- (d) Flow patterns of fluids, electrical and magnetic flux and related aspects

CO3: Develop skills in designing mathematical models for

- (a) R-C and L-R-C oscillatory electrical circuits
- (b) Heat transfer and Newton's law of cooling
- (c) Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces

- CO4: Develop analytical skills in solving the problems involving
- Newton's law of cooling
 - non homogeneous linear differential equations
 - maximum and minimum values for the functions
 - lengths of curves, areas of surfaces and volumes of solids in engineering
 - transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5: Use relevant mathematical techniques for evaluating
- various types of particular integrals in differential equations
 - stationary values for multi variable functions
 - multiple integrals in change of variables
 - integrations of vector functions.

I B. Tech. - I Semester

(16BT10501) PROGRAMMING IN C

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1: Demonstrate knowledge in:
- Elements of C Language
 - Selection and Repetition statements.
 - Arrays, Strings and Functional statements.
 - Derived data types, Files and Pointers
- CO2: Analyze complex engineering problems to develop suitable solutions
- CO3: Design algorithms for specified engineering problems
- CO4: Use appropriate 'C' language constructs for solving engineering problems
- CO5: Write programs using 'C' language to implement algorithms

I B.Tech. - I Semester

16BT1HS31: ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

- Demonstrate knowledge in
 - Phonetics
 - Information Transfer
- Analyze the situations in professional context by using
 - Vocabulary
 - Grammar
- Design and develop functional skills for professional practice.
- Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.
- Function effectively as an individual and as a member in diverse teams through
 - Extempore talk and
 - Role Play
- Communicate effectively in public speaking in formal and informal situations.
- Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I B.Tech. - I Semester
16BT1BS31: ENGINEERING CHEMISTRY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of p^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, p^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.
- CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
- CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.
- CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, PH of a solution, determination of viscosity of lubricants and estimation of iron in cement.
- CO5: Provide solutions for environmental issues through determination of quality of water.

I B.Tech. - I Semester
16BT10331: COMPUTER AIDED ENGINEERING DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	6	3

PRE-REQUISITES: None

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B.Tech. - I Semester
16BT10531: PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Programming in C"

COURSE DESCRIPTION: Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

1. Demonstrate practical knowledge of using C language constructs:
 - a) Selection and Repetition statements.
 - b) Arrays, Strings and Functional statements.
 - c) Derived data types, Files and Pointers
2. Analyze problems to develop suitable algorithmic solutions
3. Design Solutions for specified engineering problems
4. Use appropriate 'C' language constructs for solving engineering problems
5. Implement and execute programs using 'C' language
6. Document programs and communicate effectively while conducting Professional transactions.

I B.Tech. - II Semester**16BT1BS02: ENGINEERING PHYSICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate/senior secondary Physics

COURSE DESCRIPTION: Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

1. Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and anomaterials.
2. Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
3. Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
4. Develop problem solving skills in engineering context.
5. Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser.

I B.Tech. - II Semester**16BT2BS01: TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

CO1: Acquire basic knowledge in

- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations

CO2: Develop skills in analyzing the

- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO3: Develop skills in designing mathematical models for

- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO4: Develop analytical skills in solving the problems involving

- (a) Fourier series and Fourier transforms
- (b) Laplace transforms
- (c) Z-transforms and difference equations
- (d) Heat transfer and wave motion

CO5: Use relevant transformation techniques for

- (a) Obtaining Fourier transforms for different types of functions
- (b) Laplace transforms
- (c) Z- transforms
- (d) Partial differential equations

I B.Tech. - II Semester**16BT20441: BASIC ELECTRONIC DEVICES AND CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Engineering Physics.

COURSE DESCRIPTION:

Characteristics of general and special purpose electronic devices; Rectifiers; Biasing of BJT; FET, Feedback Amplifiers, Oscillator.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Gain in-depth knowledge in

- ☐ p - n junction diode and its characteristics
- ☐ Zener diode and its characteristics
- ☐ Rectifiers and Filters
- ☐ Characteristics of BJT, FET, MOSFET and special purpose electronic devices.
- ☐ FET amplifiers
- ☐ Feedback amplifiers and Oscillators

CO2: Analyze numerical and analytical problems in

- ☐ Rectifiers using Filters
- ☐ Transistor biasing circuits
- ☐ FET biasing circuits and amplifiers
- ☐ Feedback amplifiers and oscillators

CO3: Design electronic circuits such as

- ☐ Rectifiers with and without filters
- ☐ BJT and FET biasing circuits
- ☐ FET amplifiers
- ☐ Feedback amplifiers and oscillators

CO4: Solve engineering problems and arrive at solutions pertaining to electronic circuits.

CO5: Select appropriate technique for transistor biasing.

I B.Tech. - II Semester**16BT21201: OBJECT ORIENTED PROGRAMMING THROUGH C++**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PREREQUISITES: A Course on "Programming in C".

COURSE DESCRIPTION:

Introduction to Object Oriented concepts and Fundamental Concepts of C++; Decision Making Statements, Looping Statements and Functions; Arrays, Pointers & References and Strings; Classes & Objects and Overloading Operators; Composition & Inheritance, Templates, Iterators & Generics and File Handling;

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1:** Demonstrate knowledge on object oriented programming concepts - Object, Class, Inheritance, Polymorphism, Encapsulation, Abstraction and Message passing.
- CO2:** Identify object oriented concepts for code reusability and optimization.
- CO3:** Design and develop solutions for given specifications.
- CO4:** Demonstrate problem solving skills to provide software solutions to real world problems.
- CO5:** Develop C++ programming to provide solutions to complex engineering problems using object oriented concepts.

I B.Tech. - II Semester**16BT21501: DIGITAL LOGIC DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -NIL-

COURSE DESCRIPTION: Introduction to number systems; logic gates; Boolean Algebra; simplification of Boolean functions; Design of combinational circuits; Design of sequential circuits, Memory and Programmable Logic

COURSE OUTCOMES:

On Successful completion of this course student will be able to:

- CO1. Demonstrate knowledge on Boolean algebra, Minimization of Boolean functions using Map Reduce method.
- CO2. Identify appropriate simplification techniques for Boolean functions.

- CO3. Design combinational and sequential logic circuits, memory and programmable logic for digital systems.
 CO4. Select and Apply Boolean algebra and gate level minimization techniques for designing combinational and sequential logic circuits.
 CO5. Learn independently new concepts, new techniques and advanced subject knowledge in the area of combinational and sequential logic circuits.

I B.Tech. - II Semester

16BT1BS32: ENGINEERING PHYSICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.
 CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.
 CO3: Develop skills in designing electronic circuits using semiconductor components.
 CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.
 CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B.Tech. - II Semester

16BT20451: ANALOG AND DIGITAL ELECTRONICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on "Basic Electronic Devices & Circuits and Digital Logic Design"

COURSE DESCRIPTION: Identification and testing of active and passive components; RPS, DMM, Function Generator, CRO; Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Realization of FFs, Combinational Circuits, sequential Circuits; Demonstration on VHDL Programme.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate knowledge in different electronic devices, analog and digital circuits
 CO2. Analyze the characteristics of different electronic devices and circuits like
 ☐ Diodes p-n Junction Diodes, Zener Diodes, SCR
 ☐ Transistors-BJT, FET, UJT
 ☐ Flip Flops-JK FF, D FF
 ☐ Combinational Circuits-HA, FA
 ☐ Sequential Circuits -Counters
 CO3. Design electronic circuits like FET Amplifiers, Feedback amplifiers, Oscillators, Combinational Circuits and Sequential Circuits.
 CO4. Solve engineering problems by proposing potential solutions through Design of better electronic circuits.
 CO5. Model an electronic circuit which fulfil the needs of the society.
 CO6: Function effectively as an individual and as a member in a group
 CO7: Communicate effectively in verbal and written form.

I B.Tech. - II Semester

16BT21231: IT WORKSHOP

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: -

COURSE DESCRIPTION:

Practice sessions on PC hardware, Internet, World Wide Web, LibreOffice Suite. Demonstrations on installations of system software such as MS-Windows, Linux and device drivers, hardware and software troubleshooting, and protecting the personal computer from viruses and other cyber attacks are include.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

1. Demonstrate analytical skills in:
 - a) Identification of functional parts of PC
 - b) Internet and World Wide Web.
 - c) Computer security issues and preventive measures.
 - d) Operating Systems.
2. Design document and presentations effectively.
3. Apply modern tools to develop IT based applications.
4. Demonstrate effective communication skills through IT tools.
5. Update knowledge and skills in PC maintenance and usage of latest Operating Systems and Office automation tools.

I B.Tech. - II Semester**16BT21232: OBJECT ORIENTED PROGRAMMING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "OOPS through C++".

COURSE DESCRIPTION: Hands-on experience on creating Virtual machines on Windows and Linux platforms, Development of Service based web applications & their deployment and Mobile app development.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

1. Demonstrate practical knowledge on Object oriented programming concepts - Object, Class, Inheritance, Polymorphism, encapsulation, Abstraction, message passing.
2. Apply object oriented programming concepts to develop real world applications.
3. Demonstrate Problem solving skills using basic and advanced concepts of C++.
4. Work individually and in teams collaboratively in implementing the applications.
5. Demonstrate communication skills both oral and written for preparing and presenting reports.

II B. Tech. – I Semester**(16BT3BS01) PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: Intermediate/senior secondary mathematics

COURSE DESCRIPTION: Random variables; mathematical expectations; probability distributions; correlation and regressions; statistical quality control; sampling distributions; tests for small and large samples and their significances.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1.Acquire basic knowledge in
- (a) probability distributions, correlation and regressions
 - (b) statistical quality control and testing of hypotheses
 - (c) Simple linear regression
 - (d) Tests of significance for small and large samples
- CO2.Develop skills for analyzing the data with
- (a) mathematical expectations for realistic results
 - (b) probability distributions for practical situations.
 - (c) control charts of statistical quality control
 - (d) correlation and regression concepts
 - (e) suitable tests of significance for practical situations.
- CO3. Develop skills in designing
- (a) probability distributions
 - (b) limitations of statistical quality control
 - (c) control charts,
 - (d) X, R, np, and c charts
- CO4. Develop analytical skills for solving problems involving
- (a) probability distributions, means, variances and standard deviations
 - (b) statistical techniques employed for quality
 - (c) sampling techniques for decision making
 - (d) Tests of significances for small and large samples
- CO5. Use relevant probability and statistical techniques for
- (a) Mathematical expectations of desired results
 - (b) Fitting probability distributions for experimental data.
 - (c) Quality control and testing of hypothesis.

II B. Tech. – I Semester
(16BT30501) **COMPUTER ORGANIZATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Digital Logic Design

COURSE DESCRIPTION:

Basic structure and operation of a digital computer; Organization and functional principles of the arithmetic and logic unit, control unit, memory unit and I/O unit; Concepts of pipelining and parallel processing techniques;

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on:

- Computer Arithmetic units
- Register Transfer and Computer Instructions
- Design of Control Unit
- Input Output Organization and Memory system
- Pipelining and Multiprocessing.

CO2. Analyze the functional units of a digital computer.

CO3. Design the functional modules in a digital computer - Arithmetic Units, Memory and I/O.

CO4. Investigate the performance of memory, I/O, and pipelined processors.

CO5. Select appropriate techniques of I/O, Pipelining and Multiprocessing to solve computing problems.

CO6. Apply contextual knowledge of computer systems development to societal applications.

II B. Tech. – I Semester
(16BT30502) **DATA STRUCTURES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Programming in C

COURSE DESCRIPTION:

Linked Lists; Type of lists; Operations and Applications; Stacks and Queues; Operations and Applications; Trees, Search trees and Heaps; Multi-way Trees and Graphs; Searching and Hashing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on

- Principles of Data Structures.
- Linear and Non-linear Data Structures.
- Sorting and hashing techniques.

CO2. Analyze and Identify suitable data structure for computational problem solving.

CO3. Design solutions for complex engineering problems using linear and non-linear data structures.

CO4. Develop solutions for Complex computational problems by conducting explorative analysis.

CO5. Apply appropriate data structure to provide solutions for real time problems by using C Language.

CO6. Apply contextual knowledge of data structures to design applications for societal applications like payroll systems, web applications, banking and financial systems.

II B. Tech. - I Semester
(16BT31201) **DISCRETE MATHEMATICAL STRUCTURES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Multivariable Calculus and Differential Equations.

COURSE DESCRIPTION: Mathematical Logic; Predicates; Functions and Relations; Algebra Structures; Mathematical Reasoning; Recurrence Relations; Graphs; Graph Theory and its Applications.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on mathematical logic, algebraic structures, relations, recurrence relations and mathematical reasoning.

CO2. Analyze and prove given statement by contradiction and automatic theorem.

CO3. Design network applications using Prim's and Kruskal's algorithms.

CO4. Solve tree traversal problems using Graph Theory.

CO5. Apply permutation, combinations, counting principle, Lagrange's theorem and graph theory in solving real-time problems.

II B. Tech. – I Semester
(16BT41202) **JAVA PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Object Oriented Programming through C++.

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
 - Packages, interfaces, multithreading, exception handling, event handling.
- CO2. Analyze complex engineering problems using object oriented concepts.
- CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
- CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.
- CO5. Use advanced programming languages to develop web applications.
- CO6. Build Java Applications suitable for societal requirements.

II B. Tech. - I Semester
(16BT31501) **OPERATING SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.
- CO2. Identify the functionality involved in process management concepts like scheduling and synchronization.
- CO3. Design models for handling deadlock and perform memory management.
- CO4. Synthesize and apply programming API's to perform Process management.
- CO5. Use appropriate protection tools to provide access control to Operating system users.

II B. Tech. – I Semester
(16BT30531) **DATA STRUCTURES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Data Structures

COURSE DESCRIPTION:

Hands on practice on Linked Lists; Type of lists; Stacks and Queues; Trees and Search trees; Graphs; Searching and Hashing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on Stacks, Queues, Linked lists, Trees Sorting and Hashing Techniques.
- CO2. Analyze suitable data structure to solve real world computing problems.
- CO3. Design solutions for complex computational problems using linear and non-linear data structures.
- CO4. Solve for Complex computational problems by conducting explorative analysis.
- CO5. Use C language for implementing linear and non-linear data structures.
- CO6. Apply contextual knowledge of data structures to design applications for societal requirements.
- CO7. Communicate effectively using data structures with engineering community, being able to comprehend and write effective programs and Prepare Reports.
- CO8. Engage in learning advances in Data structures.

II B. Tech. – I Semester
(16BT31231) JAVA PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Java Programming.

COURSE DESCRIPTION: Hands on experience on Polymorphism; Inheritance and Interfaces; Exception Handling; Multithreading; Event Handling; AWT; Applets; Servlets.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on basic concepts of Java programming.
- CO2. Design and develop efficient programs with multitasking ability and handle exceptions.
- CO3. Demonstrate independent problem solving skills in developing interactive applications.
- CO4. Apply object oriented approach to develop user friendly interface and learn how to communicate with systems over the network.
- CO5. Build Java applications suitable for societal requirements.
- CO6. Work effectively as an individual and as a member in team for case studies implementation.
- CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports.

II B. Tech. - I Semester
(16BT31531) OPERATING SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Operating Systems.

COURSE DESCRIPTION: Hands on practice in simulating algorithms for CPU Scheduling, Memory Management, I/O Management, Deadlock Handling mechanisms; Implementing Synchronization problems; practice on UNIX commands.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge of the following algorithms to solve problems:
 - i. CPU Scheduling
 - ii. Memory Management
 - iii. I/O Management
- CO2. Formulate and analyze solutions to problems pertaining to Memory and I/O.
- CO3. Designing models for deadlock handling mechanisms.
- CO4. Develop skills in basic UNIX commands.
- CO5. Use appropriate APIs available in modern operating systems (such as threads, system calls, semaphores, etc...) for software development.
- CO6. Communicate effectively on complex operating system problems with implication to User-friendliness.
- CO7. Develop and demonstrate user defined libraries to communicate with the kernel or effective implementation of projects across multidisciplinary environments

II B.Tech - II Semester
(16BT3HS01) ENVIRONMENTAL STUDIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	-	3

PRE-REQUISITE: A course on Engineering Chemistry

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. Develop strategies for environmental pollution control and natural resource management.
- CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. Understand the impact of social issues and population on environment.

- CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. Follow environmental protection laws for sustainable development.
- CO9. Communicate effectively on environmental issues in the form reports.

II B. Tech. - II Semester
(16BT41204) **THEORY OF COMPUTATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Discrete Mathematical Structures.

COURSE DESCRIPTION: Fundamentals of Computation; Finite State Automaton; Regular Expressions; Grammars; Push Down Automaton; Turing Machine.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Formal languages and automata.
- CO2. Analyze the classification of languages, automata's and their computing power.
- CO3. Design grammars and automata (recognizers) for regular expressions and formal languages.
- CO4. Solve computational problems using automata.
- CO5. Apply theorems to translate automata's and identify the class of languages.

II B. Tech. – II Semester
(16BT40502) **DATABASE MANAGEMENT SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION:

Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
- Data models and Database Languages
 - Database design
 - Normal forms
 - Storage and Indexing
- CO2. Analyze databases using normal forms to provide solutions for real time applications.
- CO3. Design solutions for database problems using database design, views design and framing queries.
- CO4. Use database techniques for designing databases, managing databases and its security.
- CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.
- CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

II B. Tech. – II Semester
(16BT41201) **DESIGN AND ANALYSIS OF ALGORITHMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Data Structures.

COURSE DESCRIPTION: Introduction to Algorithms and Asymptotic Notations; Disjoint Sets and Graphs; Divide and Conquer Greedy Method; Dynamic Programming, Back Tracking; Branch and Bound.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Algorithm Complexities and Asymptotic notations.
 - Algorithm Design techniques-Divide and Conquer, Greedy Method, dynamic programming, Back tracking, Branch and Bound.
- CO2. Analyze the performance of algorithms with respect to Time and Space complexities.
- CO3. Design the algorithms for solving real world problems.
- CO4. Solve sorting and searching problems using Divide and Conquer method.
- CO5. Use dynamic programming and backtracking in finding shortest paths.

II B. Tech. – II Semester**(16BT51202) OBJECT ORIENTED ANALYSIS AND DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Software Engineering and Object Oriented Programming through C++.

COURSE DESCRIPTION: Introduction to UML, Basic structural modeling; Advanced structural modeling, Class and object diagrams; Basic behavioral modeling; Advanced behavioral modeling; Architectural modeling.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on principles of object oriented analysis and design through UML Diagrams.
- CO2. Analyze user requirements and identify suitable structural and behavioral modeling components.
- CO3. Design and develop UML models for real time software applications.
- CO4. Solve real world problems by applying structural and behavioral modeling techniques.
- CO5. Use unified modeling language in preparing blue prints for software solutions.
- CO6. Design and develop UML models to solve societal problems.

II B. Tech. – II Semester**(16BT41203) SOFTWARE ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Fundamental concepts of software engineering.
 - Process models.
 - Software development life cycle.
- CO2. Analyze software requirements and process models required to develop a software system.
- CO3. Design and develop a quality software product using design engineering principles.
- CO4. Develop software product as per user and societal requirements.
- CO5. Follow standards for software development and quality management.
- CO6. Demonstrate skills in applying risk and quality management principles for effective management of software projects.

II B. Tech. II Semester**(16BT40531) DATABASE MANAGEMENT SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Database Management Systems

COURSE DESCRIPTION:

Hands on experience on - DDL, DML commands; Query processing using operators; Joins, Views, Single Row functions, Group Functions and SET functions; PL/SQL concepts - Basic Programs, Triggers, Functions, Cursors and Stored Procedures.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on creation and alteration of tables, insertion and Querying of data.
- CO2. Analyze and evaluate the databases using SQL DML/ DDL commands.
- CO3. Design database schemas for the sales database, customer database and product database.
- CO4. Develop solutions for database problems using stored procedures, stored functions, cursors and triggers.
- CO5. Implement DDL and DML commands in SQL and PL/SQL, ORACLE to manage data in databases.
- CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.
- CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports on databases.

II B. Tech. – II Semester
(16BT50533) **OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Object Oriented Analysis & Design

COURSE DESCRIPTION:

Hands on Practice to Design and Implement - Automated Teller Machine, Library Information System, Online Ticket Reservation System, Point of Sales, Airport Simulation, Course Registration System, Home Appliance Control System and Hospital Management System using Object-Oriented Language.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on principles of object oriented analysis and design through UML diagrams.
- CO2. Analyze user requirements and identify suitable structural and behavioral modeling components.
- CO3. Design and develop UML models for real time applications.
- CO4. Solve real world problems by applying structural and behavioral modeling techniques.
- CO5. Use UML to design the software system.
- CO6. Apply contextual knowledge of UML models to assess societal issues.
- CO7. Involve as individual to solve case studies.
- CO8. Develop a model for complex computational activities by preparing and presenting reports through effective communication.

II B. Tech. – II Semester
(16BT4HS31) **SOFT SKILLS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION: This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire knowledge in
 - Goal Setting
 - Creative Thinking
 - Leadership Skills and
 - Team Work
- CO2. Analyze the situations and develop skills for
 - Body Language
 - Personality Development and
 - Stress Management
- CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal forums.

III B. Tech. – I Semester
(16BT5HS01) **MANAGEMENT SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial context.
- CO2. Identify and analyse management problems in the business organizations reaching substantiated conclusions using principles of management.

- CO3. Design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
- CO4. Competently employ broad based analytical tools for decision making, system design, analysis and performance.
- CO5. Provide solution to organizations for sustainable development.
- CO6. Apply knowledge of engineering and management principles to manage the projects in multidisciplinary environments.

III B. Tech. – I Semester
(16BT50501) **COMPUTER NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Computer Organization and Operating Systems

COURSE DESCRIPTION:

Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sub-layer; The Network Layer; The Transport Layer; The Application Layer.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Functionalities of Various OSI and TCP/IP layers
 - 3G Mobile phone networks, 802.11
 - TCP,UDP and SMTP
- CO2. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.
- CO3. Design and compute subnet masks and addresses for networking requirements.
- CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.
- CO5. Apply Network Standards - 802.3 and 802.11 for developing computer Networks.
- CO6. Assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.

III B. Tech. - I Semester
(16BT51501) **COMPILER DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Theory of Computation

COURSE DESCRIPTION:

Lexical analysis; Parsers; Run Time Environments; Syntax Directed Translation; Type checking; Code Optimization; Code Generation and Compiler tools.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on the phases involved in design of compilers.
- CO2. Analyze code optimization Techniques.
- CO3. Design experiments for implementing parsing techniques.
- CO4. Synthesize rules in compiler to demonstrate semantic attribution during Parsing.
- CO5. Use compiler construction tools such as LEX and YACC for designing a Parser.
- CO6. Apply Ethical principles for usage of stack and other storage memory.

III B. Tech. – I Semester
(16BT50442) **MICROPROCESSORS AND INTERFACING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Digital Logic Design and Computer Organization.

COURSE DESCRIPTION: INTEL 8086 & 8051- Architectures; Instruction set; Programmable Interfacing Concepts; ADC, DAC, 8255, 8257,8259 ,8279,8251, Advanced peripheral Interfacing; Applications.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO 1: Demonstrate knowledge in
- a) Internal Hardware details of Intel 8086, 8051 & programming devices like 8255, 8257, 8259, 8279 and 8251.
 - b) Interfacing various peripherals to build standalone systems.

- CO2. Analyze various peripherals and interfacing techniques.
 CO3. Design application based Microcomputer system using 8086 and 8051.
 CO4. Solve problems by providing microcomputer-based real time solutions.
 CO5. Apply programming tools, appropriate techniques and resources to complex engineering activities for microprocessor and microcontroller based systems with understanding of limitations.
 CO6: Solving societal problems by applying concepts of microprocessors and microcontrollers.

III B. Tech. - I Semester
 (16BT51502) **SYSTEMS SOFTWARE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Operating Systems.

COURSE DESCRIPTION:

Kernel and Shell; The shell interpretive cycle ; Shell scripts; System calls for the File System - Open, Read, Write, File and record locking ; Process states and transitions; Process Creation; TCP/IP Basics; Resolving IP Addresses, Maintaining Security.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

- CO1. Demonstrate knowledge on commands for text processing and Files.
 CO2. Analyze and Interpret process and System management techniques used in System Software
 CO3. Use inbuilt UNIX system APIs to control system and its process.
 CO4. Apply algorithms to manipulate the process context in system Software.
 CO5. Perform effective troubleshooting using system error defines available with the operating system.

III B. Tech. – I Semester
 (16BT30503) **PYTHON PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Object Oriented Programming through C++.

COURSE DESCRIPTION:

Data types and Expressions; Control Statements; Strings; Text Files; Lists; Dictionaries; Functions; Objects and their use; Exception Handling; Design with Classes; Graphical User Interface.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in:
- ☐ Data Types, Variables, Expressions
 - ☐ Control statements, Strings and Text files.
 - ☐ Lists, Dictionaries and Functions.
 - ☐ Objects and Design with classes
 - ☐ Exception Handling and GUI
- CO2. Analyze complex computational problems.
 CO3. Design solutions for real life computational problems
 CO4. Solve complex problems using python scripting constructs.
 CO5. Implement python scripts using Integrated Development Environment.
 CO6. Apply Python programming knowledge to solve problems related to societal applications like Medical and Weather Forecasting.

III B. Tech. – I Semester
 (16BT71203) **INFORMATION RETRIEVAL SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Data Structures and Database Management Systems.

COURSE DESCRIPTION: Architecture of Information Retrieval Systems; Functional Capabilities; Data Structures; Mathematical Algorithms; Indexing; Similarity and Clustering; Human Perception and Presentation; Text Search Techniques and Evaluation Measures.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- ☐ Information Retrieval System Architecture

- ☐ Functional capabilities
 - ☐ Indexing and data presentation methods.
 - ☐ Evaluation measures of Information Retrieval Systems.
- CO2. Analyze indexing methods and clustering algorithms to group similar data items for efficient search.
- CO3. Design and develop data structures used to store and retrieve data items.
- CO4. Demonstrate problem solving skills in the usage of mathematical algorithms for information retrieval.
- CO5. Use text search algorithms and collaborative filtering techniques for information retrieval and visualization methods for information presentation.

III B. Tech. - I Semester

(16BT51503) INTELLIGENT COMPUTING SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

Courses on Discrete Mathematical Structures and Design and Analysis of Algorithms

COURSE DESCRIPTION: AI Problems; Problem Characteristics Search Algorithms; Inference in Propositional Logic; Forward and Backward Chaining Algorithms; Truth Maintenance Systems; Basic Probability Notations; Forms of Learning; Evolutionary Computing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate Knowledge on
- ☐ Artificial Intelligent Techniques
 - ☐ Searching algorithms
 - ☐ Inference in Propositional and First Order Logic
 - ☐ Evolutionary Computing
- CO2. Analyze and solve problems involving search algorithms.
- CO3. Design and develop knowledge based solutions for AI based systems.
- CO4. Apply knowledge representation, reasoning, and machine learning techniques to solve real world problems.
- CO5. Use appropriate evolutionary algorithms in intelligent computing systems.
- CO6. Demonstrate the use of intelligent systems' principles in societal context to solve diverse problems.

III B. Tech. – I Semester

(16BT40501) COMPUTER GRAPHICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods and Programming in C.

COURSE DESCRIPTION:

Introduction to Computer Graphics; Output Primitives; 2-D Geometric Transformations and Viewing; 3-D Geometric Transformations and Viewing; 3-D Object Representation; Visible Surface Detection Methods and Rendering Methods.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
- ☐ Graphical interactive devices
 - ☐ Viewing transformations
 - ☐ 2-D & 3-D object representations and
 - ☐ Surface detection methods
- CO2. Analyze Transformations and Clipping algorithms for 2-D and 3-D objects.
- CO3. Design algorithms to generate points, lines, and polygons for 2-D and 3-D objects.
- CO4. Develop innovative methods and techniques for 2-D and 3-D modeling.
- CO5. Apply appropriate techniques and tools for surface detection and rendering methods.
- CO6. Use contextual knowledge to solve problems related to societal issues.

III B. Tech. – I Semester
(16BT50531) COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Computer Networks

COURSE DESCRIPTION:

Hands on Practice on Data Link Layer Framing Methods; Routing Algorithms; Congestion Control Algorithms; Connection Management in Transport Layer;

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate Knowledge on:

- ☐ Framing methods for data link layer,
- ☐ Shortest path using Dijkstra's routing algorithms

CO2. Identify suitable algorithm to find shortest path in a given network

CO3. Design and compute subnet masks and addresses for networking Requirements.

CO4. Solve problems related to Flow control, Error control, congestion control and Network Routing.

CO5. Apply Latest software tools and technologies for designing simple to complex applications in computer networks.

CO6. Assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Network Games, Internet of Things.

CO7. Work effectively as an individual to implement mini-project.

CO8. Demonstrate communication skills both oral and written for preparing and generating reports.

III B. Tech. - I Semester
(16BT50451) MICROPROCESSORS AND INTERFACING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: Course on Microprocessors and interfacing.

COURSE DESCRIPTION:

Assembly language Programming for Intel 8086 & 8051; Programming of Interfacing standard peripherals - DAC, Stepper Motor, ADC, Logic Controller, Keyboard, Seven Segment Display.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1 Demonstrate knowledge on microcomputer & microcontroller based systems.

CO2. Analyze various programming alternatives, interfacing methods & usage of various on-chip resources like Displays, logic controllers ADC, DAC, Keyboard interfacing and Stepper Motor to build stand alone systems.

CO3. Design and develop microcomputer and microcontroller based system to suit market requirements.

CO4. Solve engineering problems by proposing potential solutions using microprocessors and microcontrollers.

CO5. Apply appropriate techniques, resources, and tools for modeling microcomputer and microcontroller based systems with understanding of limitations.

CO6. Work effectively as individual and as a team member in the area of microprocessors.

CO7. Communicate in oral and written form in the area of microprocessors.

III B. Tech. - I Semester
(16BT51531) SYSTEMS SOFTWARE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Programming in C and Operating Systems

COURSE DESCRIPTION: Hands on Implementation of copy of a file using standard I/O and system calls; emulate the UNIX commands; Access Permissions; Loops in Directory hierarchy; Displaying time of day for every 60 seconds; Print all error messages; Running two programs in pipeline.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. Demonstrate and interpret the working of commands available in UNIX.

CO2. Recognize different types of file supported by UNIX operating system.

CO3. Design and implement system-level applications for open-source operating systems.

CO4. Select and make use of the OS kernel functions and their APIs, standard programming Languages and utility tools.

CO5. Use different APIs for System Software design.

III B. Tech. - II Semester
(16BT3HS02) MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE- REQUISITE: —

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Acquire Knowledge in
 - a) Tools and concepts of Micro Economics.
 - b) Basic Principles and concepts of Accountancy.
 - c) Provides life skills for effective utilization of scarce resources.
 - d) Financial Accounting.
 - e) Significance of Economics and Accountancy
- CO2. Develop skills in managerial decision making of an organization.
- CO3. Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.
- CO4. Develop effective communication in Business and Accounting transactions.
- CO5. Ascertain the profitability and soundness of an organization.
- CO6. Practice Financial Accounting

III B. Tech. – II Semester
(16BT61501) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Database Management Systems.

COURSE DESCRIPTION: Data Mining Fundamentals; Data Preprocessing; Operational Database Systems and Data Warehouses; Mining Frequent Patterns; Classification and Prediction; Clustering; New Trends and Research Frontiers.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Concepts of data warehousing and data mining.
- CO2. Analyze using data mining techniques to find useful and potential Knowledge.
- CO3. Design of Data Warehouse for OLAP applications and deployment.
- CO4. Evaluate the usage of association mining techniques on complex data objects.
- CO5. Select appropriate techniques to measure the interesting patterns from heterogeneous databases.
- CO6. Apply appropriate evolutionary data mining algorithms to find solutions of Real time Applications.

III B. Tech. – II Semester
(16BT51203) WEB TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Java Programming.

COURSE DESCRIPTION: Hyper Text Markup Language (HTML); Features of HTML5; Cascading Style Sheets (CSS); JavaScript; JQuery; Bootstrap; Hypertext Preprocessor (PHP); MySQL.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on web page design elements, dynamic content and database interaction.
- CO2. Analyze user requirements to develop web applications.
- CO3. Design client-server applications using web technologies.
- CO4. Demonstrate problem solving skills to develop enterprise web applications.
- CO5. Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.
- CO6. Apply Web Technologies to develop interactive, dynamic and scalable web applications for societal needs.

III B. Tech. – II Semester
(16BT50341) **OPTIMIZATION TECHNIQUES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Multi-variable calculus and differential equations

COURSE DESCRIPTION:

Introduction to optimization; classical optimization techniques; classification of optimization problems; linear programming; transportation and assignment problem; non-linear programming; un-constrained non-linear programming; constrained non-linear programming; dynamic programming.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on Optimization techniques for Linear, Non linear and Dynamic programming problems.
- CO2. Analyze and quantify a system architecture or product design problem for selecting appropriate objective function, design variables, parameters and constraints.
- CO3. Develop mathematical models for real time optimization problems.
- CO4. Conduct investigations on complex problems and make recommendations based on solutions, analysis and limitations of models.
- CO5. Use optimization techniques for solving complex problems of real time applications.
- CO6. Optimize the resources in organizations for sustainable development.

III B. Tech. - II Semester
(16BT60404) **IMAGE PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION:

Fundamentals of image processing; Image transforms; Image enhancement techniques in spatial and frequency domains; Restoration techniques; Image segmentation techniques; Image compression techniques.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

- CO1. Demonstrate knowledge in
 - ☐☐☐Image Fundamentals
 - ☐☐☐Image Enhancement & Restoration Techniques
 - ☐☐☐Image Segmentation & Compression Techniques
 - ☐☐☐Color image processing
- CO2. Analyze different images using various processing techniques.
- CO3. Design and Develop various image processing algorithms to process the images in various Real Time Applications.
- CO4. Solve problems related to images for feasible and optimal solutions in the core area of Image Processing.
- CO5. Apply appropriate techniques to complex engineering activities in the field of image processing.
- CO6. Understand the impact of the image processing for societal needs.

III B. Tech. – II Semester
(16BT61201) **CLOUD COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Computer Networks and Operating Systems.

COURSE DESCRIPTION: Virtualization, Virtualization Technologies; Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security, Cloud Disaster Recovery; Working with Clouds; and Case Studies.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and virtualization.
- CO2. Analyze the issues in cloud computing Data, Network and Host security.
- CO3. Apply API development skills in web applications for Cloud deployment.
- CO4. Use research based knowledge to build cloud applications.
- CO5. Use advanced programming languages to access cloud services.
- CO6. Build cloud environment suitable for societal requirements.

III B. Tech. - II Semester
(16BT71204) MOBILE COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Networks.

COURSE DESCRIPTION: Introduction to Mobile Computing, GSM; Medium Access Control, Wireless LAN; Mobile Network and Transport Layers; Data Dissemination; Mobile Ad-Hoc Networks (MANETs), Wireless Application Protocol (WAP).

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- GSM, GPRS, 3G, 4G, Wireless LAN, MANETs.
 - Protocols in Data Link, Network, Transport and Application layer.
- CO2. Analyze the issues related to database design and data retrieval in mobile applications.
- CO3. Apply routing algorithms for finding shortest path in MANETs.
- CO4. Use protocols of Wireless Technologies for security implementation in mobile computing.
- CO5. Follow standards in the usage of mobile communications.

III B. Tech. - II Semester
(16BT70505) HUMAN COMPUTER INTERACTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION:

Graphical User Interface; Design Process; Screen Designing; Windows; Components; Software Tools; Interaction Devices.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on principles, characteristics, tools and devices of Human Computer Interaction.
- CO2. Analyze the user requirements, technological and physical characteristics of users for better interface design.
- CO3. Design appropriate user interface for desktop and web applications.
- CO4. Conduct investigations on User requirements to provide an effective user interface.
- CO5. Utilize user interface mockup tools and input, output and pointing devices for designing user interfaces.
- CO6. Apply Contextual knowledge to develop interfaces for differently abled people.

III B. Tech. - II Semester
(16BT61502) NETWORK SECURITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Networks

COURSE DESCRIPTION:

Foundations of Network Security; Security Technologies; Symmetric and Asymmetric key encryption algorithms; System Security with Firewalls; Intrusion Detection.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on types of attacks, firewalls, Symmetric encryption, Cryptography, message authentication and confidentiality
- CO2. Analyze the principles of symmetric and public key cryptographic algorithms
- CO3. Design appropriate algorithms suiting the security needs of the network.
- CO4. Apply security schemes in firewall design to protect the organization's internet/ network systems.
- CO5. Use modern engineering techniques to identify Intrusion Detection, types of malicious software and apply suitable counter measures.
- CO6. Apply ethical means to integrate network operations, administration and information assurance in a network.

III B. Tech. - II Semester
(16BT61503) SOFTWARE PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Software Engineering.

COURSE DESCRIPTION:

Conventional Software Management; Evolution of Software Economics; Improving Software Economics; Lifecycle Phases; Artifacts of the Process; Workflow of the Process; Checkpoints of the Process; Software Economics; Iterative Process Planning; Project Organization and Responsibilities; Project Control and Project Instrumentation; Agile Overview.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on software effort estimation techniques, Agile life cycle, project control and instrumentation.
- CO2. Analyze the major and minor milestones, artifacts, metrics from management and technical perspectives.
- CO3. Design and develop software products using conventional and modern principles of software project management.
- CO4. Effectively implement project management through appropriate planning of Work flows and Work Breakdown Structures of the process.
- CO5. Select appropriate techniques to evaluate progress of software project in terms of milestones and check points.
- CO6. Apply appropriate ethical principles to be followed in management of software economics.

III B. Tech. - II Semester
(16BT61504) WINDOWS PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Operating Systems.

COURSE DESCRIPTION:

Windows File Processing; Advanced File and Exception Handling; Memory Management; Process Management; Inter-process Communication; Network programming with Windows Sockets.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Acquire knowledge on Windows File processing and Exception Handling.
- CO2. Analyze and Interpret process management techniques used in System Software.
- CO3. Design and Develop memory mapping techniques for sequential files and Dynamic Link Libraries
- CO4. Use contextual knowledge for implementing Inter-Process Communication and Network Programming With Sockets.
- CO5. Apply Win32 programming techniques for Heap memory management and Parallel pattern searching.
- CO6. Exhibit professional ethics and responsibilities by understanding Windows Programming standards compared to open standards.

III B. Tech. - II Semester
(16BT61531) DATA WAREHOUSING AND DATA MINING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Data warehousing and Data Mining

COURSE DESCRIPTION: Hands on practical experience on Warehouse design; OLAP operation; Data pre-processing techniques; Association rule mining; classification of data; Naive Bayes classifier; Decision tree; Clustering technique using WEKA-Open source machine learning tool.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on the creation and usage of data warehouses.
- CO2. Analyze and interpret the results using data mining techniques.
- CO3. Design and develop transformations such as filter, join and rank on data warehouses.
- CO4. Use classification and clustering techniques to find interesting patterns in large databases.
- CO5. Choose and deploy modern tools to handle large, missing and noisy data in datasets.
- CO6. Use appropriate data mining algorithms to find solutions for real time societal applications.
- CO7. Function effectively as an individual to perform operations on different databases using Informatica.
- CO8. Communicate effectively using report generation tools on business data.

III B. Tech. – II Semester
(16BT51233) **WEB TECHNOLOGIES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Web Technologies.

COURSE DESCRIPTION: Hands-on experience on HTML5; CSS; JavaScript; JQuery; Bootstrap; PHP and MySQL.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on web page design elements, dynamic content and database Interaction.
- CO2. Analyze user requirements to develop web applications.
- CO3. Design client-server applications using web technologies.
- CO4. Demonstrate problem solving skills to develop enterprise web applications.
- CO5. Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.
- CO6. Apply web technologies to develop interactive, dynamic and scalable web applications for societal needs.
- CO7. Work effectively as an individual and as a member in team for mini-project implementation.
- CO8. Demonstrate communication skills, both oral and written for preparing and presenting reports.

III B. Tech.– II Semester
(16BT61532) **SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	2	

PRE-REQUISITES: All the courses of the program up to III B. Tech. – I Semester.

COURSE DESCRIPTION:

Identification of the topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES:

Completion of the seminar work enables a successful student to demonstrate:

- CO1. Knowledge on the seminar topic.
- CO2. Analytical ability exercised during the seminar work.
- CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.
- CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.
- CO5. Ability to function effectively as an individual as experienced during the seminar work.
- CO6. Ability to present views cogently and precisely on the seminar topic.
- CO7. Ability to engage in life-long learning as experience during the seminar work.

III B.Tech. – II Semester
(16BT6HS01) **BANKING AND INSURANCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate Knowledge in
 - a) Tools and concepts of Banking and Insurance.
 - b) Basic Principles and concepts of Insurance and Banking.
 - c) e-fund transfers, e-payments and e-business models.
- CO2. Develop skills in providing solutions for
 - a) Online banking and e – payments.
 - b) Risk Management through insurance benefits the society at large.
 - c) Money management by leveraging on technology, banking and insurance services.
- CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to more employment opportunities.
- CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

III B. Tech. – II Semester
(16BT6HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Technical English or English at Diploma level

COURSE DESCRIPTION: Nature and Scope of Communication; Corporate Communication; Writing Business Documents; Careers and Resumes; Interviews.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Corporate Communication
 - b) Main Stages of Writing Messages
 - c) Career Building
- CO2. Analyze the possibilities and limitations of language in
 - a) Communication Networks
 - b) Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in
 - a) Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

III B.Tech. – II Semester
(16BT6HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Scope, Objectives and Elements of Cost Accounting; Cost Sheet and Tender Quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: Concept of Risk and Return on Investment.

Course outcomes: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 - a) Elements of Costing.
 - b) Basic concepts of Financial Management.
 - c) Risk and Return
 - d) Significance of Cost Accountancy
 - e) Behavioral Finance
- CO2. Develop skills in
 - a) Material, Labor, Overheads control.
 - b) Excellence and ability to minimize the cost of the organization
- CO3. Develop effective Communication in Cost control and Financial Management.
- CO4. Provide solutions for effective investment decisions.

III B.Tech. – II Semester
(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: -

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

Course outcomes: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 - a) Schemes and institutions encouraging entrepreneurship
 - b) Basic Principles and concepts of Accountancy
 - c) Significance of entrepreneurship
- CO2. Develop skills in providing solutions for
 - a) Personal excellence through financial and professional freedom
 - b) Women entrepreneurship serving as contrivance in societal development
- CO3. Develop Critical thinking and evaluation ability.
- CO4. Widens knowledge and build up attitude towards trouble shooting.
- CO5. Demonstrate business acumen.

III B.Tech. – II Semester
(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communications; Basic grmmar; Advanced grammar; Basic writing; Business French (La Francais Commercial).

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Process of communication
 - b) Modes of listening
 - c) Paralinguistic features
 - d) Skimming and Scanning
 - e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - a) Barriers to Communication
 - b) Barriers to Effective Listening
 - c) Barriers to Speaking
 - d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand French culture and civilization.
- CO6. Communicate effectively with the native French in day to day situation

III B.Tech. – II Semester
(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Process of communication
 - b) Modes of listening
 - c) Paralinguistic features
 - d) Skimming and Scanning
 - e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - a) Barriers to Communication
 - b) Barriers to Effective Listening
 - c) Barriers to Speaking
 - d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand German culture and civilization.
- CO6. Communicate effectively with the native German in day to day situation.

III B.Tech. – II Semester
(16BT6HS07) INDIAN CONSTITUTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, Understanding for better professional practice and good citizenry.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge in
 - a) parliamentary proceedings, laws, legislature, administration and its philosophy
 - b) federal system and judiciary of India

- c) social problems and public services like central civil services and state civil services
 - d) Indian and international political aspects and dynamics
- CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen.

III B.Tech. – II Semester
(16BT6HS08) **INDIAN ECONOMY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquire the knowledge in
 - a) Micro and Macro Economics.
 - b) Traditional and Modern methods of Capital Budgeting.
 - c) Five year plans and NITI Aayog.
- CO2. Analyze
 - a) Capital Budgeting.
 - b) Value Analysis and Value Engineering.
 - c) Economic analysis
 - d) Law of supply and demand
- CO3. Understand the nuances of project management and finance.

III B.Tech. - II Semester
(16BT6HS09) **INDIAN HERITAGE AND CULTURE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquaint knowledge in
 - a) human aspirations and values in Vedic culture.
 - b) cultural aspects of Buddhism and Jainism
 - c) unification of our country under Mourya's and Gupta's administrations
 - d) socio Religious aspects of Indian culture
 - e) reform movements and harmonious relations.
- CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts.

III B.Tech. – II Semester
(16BT6HS10) **INDIAN HISTORY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge on evolution and history of India as a nation.
- CO2. Analyze social and political situations of past and current periods.
- CO3. Practice in career or at other social institutions morally and ethically.

III B.Tech. – II Semester
(16BT6HS11) **PERSONALITY DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Soft Skills Lab

COURSE DESCRIPTION: Self-esteem & Self-improvement; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Self-Management
 - b) Planning Career
- CO2. Analyze the situations based on
 - a) Attitudes
 - b) Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

III B.Tech. – II Semester
(16BT6HS12) **PHILOSOPHY OF EDUCATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
 - a) Philosophy of engineering education.
 - b) Philosophical methods.
 - c) Knowledge acquiring methods.
 - d) Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational Outcomes.
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

III B.Tech. – II Semester
(16BT6HS13) **PUBLIC ADMINISTRATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
 - a) Public Policy.
 - b) Good Governance.
 - c) E-governance.
 - d) Development Administration.
- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance models to find and provide opportunities in e-governance.
- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing
 - a) Bureaucracy.
 - b) Role of civil society.

III B.Tech. – II Semester**(16BT60112) BUILDING MAINTENANCE AND REPAIR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.

CO2. Analyze failures, repair and rehabilitation techniques.

CO3. Solve complex building maintenance problems through proper investigations and interpretation.

CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.

CO5. Provide solutions for building maintenance and repair problems considering health and safety.

CO6. Consider environmental sustainability in building maintenance and repair.

CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.

CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

III B.Tech. – II Semester**(16BT60113) CONTRACT LAWS AND REGULATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.

CO2. Analyze contracts and tenders.

CO3. Address the legal issues in contracts and tenders.

CO4. Follow laws and regulations in the preparation of contracts and tenders.

CO5. Prepare contract and tender documents as per the standards.

CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

III B.Tech. - II Semester**(16BT60114) DISASTER MITIGATION AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.

CO2. Analyze disasters and their vulnerability.

CO3. Design strategies for effective disaster mitigation.

CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.

CO5. Use appropriate methods in disaster mitigation and management.

CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.

CO7. Solve disaster related issues considering environment.

CO8. Consider economical issues in disaster management.

III B.Tech - II Semester**(16BT60115) ENVIRONMENTAL POLLUTION AND CONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.

CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.

- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.
- CO6. Encourage sustainable development through implementation of pollution control measures.
- CO7. Maintain IS Codes for environmental quality control.

III B.Tech - II Semester

(16BT60116) PLANNING FOR SUSTAINABLE DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.
- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

III B.Tech. – II Semester

(16BT60117) PROFESSIONAL ETHICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.
- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

III B.Tech. - II Semester

(16BT60118) RURAL TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Rural technology; Non conventional energy; Technologies for rural development; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of biofertilisers and usage of agromachinery in agriculture.

III B.Tech - II Semester
(16BT60308) **GLOBAL STRATEGY AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on Strategic management, Research & Development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

III B.Tech - II Semester
(16BT60309) **INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

III B.Tech – II Semester
(16BT60310) **MANAGING INNOVATION AND ENTREPRENEURSHIP**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1: Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2: Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3: Develop a comprehensive and well planned business structure for a new venture.

- CO4: Conduct investigation on complex problems, towards the development of Project.
 CO5: Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
 CO6: Apply ethics in constructive innovation framework.
 CO7: Exhibit professionalism by employing modern project management and financial tools.

III B. Tech – II Semester
 (16BT60311) **MATERIALS SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semi conductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on concepts of fundamental science and Engineering principles relevant to materials.
 CO2. Analyze the structures of various types of Ferrous, Non ferrous alloys influencing various engineering applications.
 CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.
 CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
 CO5. Consider health and safety issues while providing materials to real time applications.
 CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

III B.Tech - II Semester
 (16BT70412) **GREEN TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
 CO2. Analyze various green technologies for engineering practice.
 CO3. Provide green solutions to engineering problems.
 CO4. Apply various green techniques in the engineering practice.
 CO5. Consider health and safety issues while providing green solutions to the society.
 CO6. Understand issues related to environment sustainability.
 CO7. Apply ethical standards for environmental sustainability in the engineering practice.

III B.Tech. - II Semester
 (16BT70413) **INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 a) Nanoscale technology.
 b) Difference between micro and nanotechnology
 c) Classification of Nanostructure and Nanomaterial
 d) Fabrication of various nanomaterials and nanostructures.
 CO2. Analyze numerical and analytical problems in
 a) Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
 CO3. Design and fabricate devices based on nanostructures like

- a) Nano solar cell
- b) Nano cantilever
- c) Nano bio-sensor

CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.

CO5. Select appropriate technique for fabrication of nanostructures and nanocomposites.

CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

III B.Tech. – II Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. Demonstrate knowledge in

- a) Systems Process and System Design
- b) Systems Analysis and Modeling
- c) System Development Life Cycle
- d) Design Management and Maintenance Tools.

CO2. Analyze System Process and estimate the given models by using case tools.

CO3. Design and Develop a model to the organizational systems.

CO4. Solve complex problems related to engineering systems and produce accurate results.

CO5. Apply object oriented techniques for modeling dynamic systems.

CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

III B.Tech. – II Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators.

CO2. Analyze the properties of materials and identify its suitability for MEMS devices.

CO3. Design MEMS devices that meet desired specifications and requirements.

CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.

CO5. Use modern techniques in micro manufacturing process.

CO6. Develop efficient and cost effective MEMS based products for society.

III B.Tech. – II Semester

(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge in Cyber security, Cyber crimes and its related laws in Indian and Global Act.

CO2. Analyze the legal perspectives and laws related to cyber crimes in Indian context.

- CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber crimes.
- CO4. Solve Cyber security issues using privacy policies.
- CO5. Use antivirus tools to minimize the impact of cyber threats.
- CO6. Follow security standards for the implementation of Cyber Security and laws

III B.Tech. – II Semester (16BT61505) **BIOINFORMATICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: -

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2. Analyze biological sequences for Homology Modeling.
- CO3. Apply clustering methods for Phylogenetic trees.
- CO4. Solve bio sequencing problems using dynamic programming.
- CO5. Select and apply appropriate techniques and tools to structure Prediction

IV B. Tech. - I Semester (16BT71501) **SYSTEM MODELING AND SIMULATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Programming in C and Probability Distributions and Statistical Methods.

COURSE DESCRIPTION:

Discrete event simulation; R Studio Operations; Useful statistical models; Queueing systems; Properties of random numbers, Test for random numbers; Data collection, Types of simulations with respect to output analysis.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on functional modeling of system design.
- CO2. Analyze the performance of Queueing systems in real world applications.
- CO3. Design dynamic system operations using simulation results using R.
- CO4. Apply mathematical foundations and computer science theory in the modeling and design of experiments for real time systems.
- CO5. Select suitable tools and simulation software for simulating computer based systems.
- CO6. Relate appropriate professional principles of engineering practice for designing simulation models.

IV B. Tech. I Semester (16BT70402) **EMBEDDED SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Digital Logic Design and Microprocessors and Interfacing

COURSE DESCRIPTION:

Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Apply knowledge in
- MSP430 Architecture, Pin out, Instruction set
 - High level programming
 - Usage of On-chip resources like ADC, DAC, Timers
 - Internet of Things related issues
- CO2. Analyze various design issues regarding
- Usage of on chip resources
 - Low power modes
 - Communication support

- CO3. Design embedded systems using MSP430 series microcontrollers to suit market requirements.
- CO4. Solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.
- CO5. Apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.
- CO6. Reason out and practice professional engineering to deliver efficient and cost effective embedded based products to society.

IV B. Tech. - I Semester
(16BT71502) **SYSTEMS ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Software Engineering.

COURSE DESCRIPTION: Foundations of System Engineering; Complex Systems structure; System Engineering Management and Development.

COURSE OUTCOMES:

On the Successful Completion of this Course, students will be able to:

- CO1. Demonstrate Knowledge on:
- System Engineering foundation
 - Structure of Complex Systems
 - System Engineering management and Development
- CO2. Analyze the requirements for the development of structures of a system.
- CO3. Design system engineering management plan for complex integrated systems and evaluate them in operational environment.
- CO4. Use appropriate system engineering methods in iterative system development process
- CO5. Use appropriate methods to support the phases of Production, operation and maintenance in system development.
- CO6. Apply ethical principles of System engineering for addressing the issues in modeling, simulation and trade-off analysis for complex systems development.

IV B. Tech. - I Semester
(16BT71503) **DATA ANALYTICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Data Warehousing and Data Mining

COURSE DESCRIPTION: Introduction to Data Analytics; Analytic Processes and Tools; Cluster Analysis; Big Data; Hadoop;

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on concepts of Data Analytics Characteristics, Hadoop Framework ecosystem components and Cluster Analysis.
- CO2. Identify appropriate solutions through analysis for problems of Big data and Hadoop.
- CO3. Design and model an effective sustainable Database system for better performance using Data Analytic techniques.
- CO4. Appropriately use database models for storing, accessing and analyzing large data sets.
- CO5. Apply Hadoop Framework for data processing.
- CO6. Recognize the need for using Hadoop environment for solving complex engineering problems.

IV B. Tech. - I Semester
(16BT71504) **PERFORMANCE EVALUATION OF COMPUTER SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Probability Distributions and Statistical Methods.

COURSE DESCRIPTION: Performance Evaluation Systems; Workload characterization; Hardware and software monitors; Summarization of data, Linear regression models; Experimental Design.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on Performance Metrics, workload selection and Monitors.
- CO2. Analyze and interpret the data using summarization techniques.

- CO3. Design and develop Factorial Experimental models for evaluating the performance of a computer based systems.
- CO4. Use statistical methods for interpretation of data in simulation based systems.
- CO5. Select appropriate techniques for prediction of variability and index of dispersion.
- CO6. Apply contextual knowledge to assess experimental errors in Factorial designs.

IV B. Tech. - I Semester

(16BT71505) NETWORK PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Networks

COURSE DESCRIPTION:

OSI model, Unix standards; Normal startup, terminate and signal handling server process termination; lost datagram, summary of UDP example, Lack of flow control with UDP; Function and IPV6 support, uname function, IPv4 Client- IPv6 Server ;FIFO's, streams and messages, RPC.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on concepts of sockets, inter process communication and remote login.
- CO2. Identify appropriate TCP Echo server functions and Socket options used in Network based systems.
- CO3. Analyze networking protocols such as TCP and UDP for connection establishment between client and server.
- CO4. Design appropriate solutions for network applications based on UNIX.
- CO5. Apply modern tools to create cooperating processes in network based Systems.
- CO6. Relate suitable ethical principles to design and develop applications related to Network Traffic Monitoring.

IV B. Tech. - I Semester

(16BT71506) SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Software Engineering.

COURSE DESCRIPTION: Architecture Business Cycle; Documenting Architecture; Layered Systems; Heterogeneous Architectures; Architectural Structures For Shared Information Systems; Formalizing Architectural Design Space; Selection and Usage Patterns;

COURSE OUTCOMES

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in software architecture, styles, patterns and frameworks.
- CO2. Analyze and select appropriate architectural patterns for software design
- CO3. Design appropriate software architectures for software Project implementation.
- CO4. Apply Skills for designing Architectural solutions using Formal Models and Specification.
- CO5. Select appropriate techniques for designing and evaluating a system's architecture.

IV B. Tech. - I Semester

(16BT71507) BUSINESS ANALYTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Database Management Systems

COURSE DESCRIPTION:

Analytics on Spreadsheets; Visualizing and Exploring Data; Descriptive Statistical Measures; Predictive Modeling and Analysis; Regression Analysis; Linear Optimization; Applications of Linear Optimization; Decision Analysis.

COURSE OUTCOMES:

On Successful Completion of this course, students will be able to:

- CO1. Demonstrate knowledge on techniques involved in business analytics.
- CO2. Analyze the techniques involved in classifying massive and opportunistic data.
- CO3. Design solutions by evaluating business problems and determine suitable analytical methods.
- CO4. Plan, organize and evaluate methods to prepare raw data for different analytical techniques.
- CO5. Collect, manage, and interpret data to identify issues in the workplace and develop measures for solving them.
- CO6. Apply ethical principles and commit to business decisions by using data analytic techniques.

IV B. Tech. – I Semester
(16BT71202) **MOBILE APPLICATION DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Java Programming and Web Technologies.

COURSE DESCRIPTION: Mobile platforms; Mobile User Interface and tools; Introduction to Android; Activities; Views; Menus; Database Storage; SMS; e-mail; Displaying Maps; Building a Location Tracker Web Services Using HTTP; Sockets Programming; Communication between a Service and an Activity; Introduction to iOS.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Mobile platforms and Mobile User Interface
 - Android Activities and Intents
 - Messaging, Networking, Location based Services, Android Services
 - Basics of iOS
- CO2. Analyze the context of complex problems and identify user interface design requirements.
- CO3. Design and develop solutions for real world problems with android mobile applications.
- CO4. Demonstrate problem solving skills to create applications for mobile devices.
- CO5. Apply Android studio and iOS tools to develop mobile applications.
- CO6. Create mobile applications as per societal needs.

IV B. Tech. - I Semester
(16BT60502) **SOFT COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION:

Concepts on Soft Computing Techniques; Artificial Neural Networks; Supervised Learning; Unsupervised Learning; Fuzzy logic; Genetic Algorithms.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
- Artificial Neural Networks
 - Supervised Learning Networks
 - Unsupervised Learning Networks
 - Fuzzy sets, relations and measures
 - Genetic Operators
- CO2. Analyze neural network architectures, Fuzzy systems and Genetic algorithms.
- CO3. Design soft computing solutions for real life computational problems.
- CO4. Use soft computing techniques to solve complex computational problems.
- CO5. Create algorithms using soft computing techniques.
- CO6. Apply contextual knowledge to solve problems related to societal issues like Business Intelligence, Forecasting.

IV B. Tech. – I Semester
(16BT60501) **SOFTWARE TESTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Software Engineering.

COURSE DESCRIPTION:

Software Testing Basics: Goals, Defects, Terminology, Methodology, STLC in SDLC, Verification & Validation; Software Testing Techniques: White box testing, Black Box Testing, Regression testing; Test Management: Test Planning, Design & Specifications; Test Automation: Tool selection & Guidelines.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
- Software Testing Life Cycle.
 - Testing Techniques.

- Test Management & Metrics.
 - Regression Testing
 - Test Automation
- CO2. Analyze testing circumstances and their resultants in software development.
- CO3. Design and develop the appropriate test cases in accordance to the software development model.
- CO4. Use problem solving skills to control and monitor the testing process
- CO5. Apply testing tools for testing the software quality.
- CO6. Apply contextual knowledge to perform testing on software related to societal applications

IV B. Tech. – I Semester

(16BT71210) HIGH PERFORMANCE COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Organization.

COURSE DESCRIPTION: Cache-based Microprocessor Architecture; Memory Hierarchies; Multithreaded Processors; Common Sense Optimizations; The Role of Compilers; Data Access Optimization; Shared-memory Computers; Parallel Scalability; Introduction to OpenMP; Parallel Jacobi Algorithm; Introduction to MPI; MPI Performance Tools; MPI Parallelization of Jacobi Solver.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on:
- Modern Processors and code Optimization.
 - Parallel computing paradigms.
- CO2. Analyze computation problems and identify the suitable parallel processing approaches to achieve optimum computation.
- CO3. Design Parallel processing algorithms for achieving high performance computing.
- CO4. Solve shared memory problems using Parallel Programming.
- CO5. Use OpenMP and MPI tools in Parallel Programming.

IV B. Tech. - I Semester

(16BT71508) INTERNET OF THINGS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Networks

COURSE DESCRIPTION:

Internet of Things Components; Communication models; Prototyping; Hardware; Design models; Analytics for IoT.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Protocols, functional blocks and communication models of Internet of things.
- CO2. Identify appropriate sensors and communication modes used in IoT based systems.
- CO3. Design appropriate solutions for IoT applications using Raspberry Pi and Arduino kits.
- CO4. Appropriately synthesize the models and applications for usage in Home automation and cities.
- CO5. Apply evolutionary techniques to perform analytics on the data integrated from IoT based systems.
- CO6. Use advances in IoT technology to design and develop applications.

IV B. Tech. -I Semester

(16BT71509) SECURE SOFTWARE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Software Engineering

COURSE DESCRIPTION:

Security in software; Requirements engineering for secure software; Secure software architecture & design, secure coding & testing; and Governance & managing.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on security issues in:
- Requirements Engineering
 - Architecture and Design

- Coding and Testing
 - System Assembling
- CO2. Analyze complex software projects to describe security risks and its mitigation techniques.
- CO3. Design secure software system with minimal risks and attacks.
- CO4. Use statistical methods to collect metrics for assessing and improving the security of a product, process, and project objectives.
- CO5. Create software solutions for secure access and protection of data.
- CO6. Apply ethical principles and methods for secure software system design.

IV B. Tech. – I Semester
(16BT60503) WIRELESS NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Networks

COURSE DESCRIPTION:

Generations of Wireless Networks; Voice and Data Processing; Wireless Network Topology; GSM; TDMA; CDMA; Wireless LANs; Wireless WANS; Wireless PAN;

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
- Wireless Medium Access methods.
 - Network Topology
 - Wireless LAN, HIPERLAN
 - GSM, CDMA, GPRS
- CO2. Analyze the network topologies in Wireless Networks
- CO3. Design solutions for network communications at physical and transport layers
- CO4. Solve complex problems related to network communications and wireless networks
- CO5. Apply GSM, CDMA, GPRS and Bluetooth to create Home Access Networks and wireless Personal Area Network.
- CO6. Apply contextual knowledge to solve problems using societal applications like health care devices, Internet of Things.

IV B. Tech. I Semester
(16BT70432) EMBEDDED SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Embedded systems.

COURSE DESCRIPTION:

IDE for Embedded System Design using MSP430; Interfacing Switch & LED; Timers-WDT, Configuring, Programming; ADC-usage; Power down modes; DAC; PWM Generator; Networking – SPI, Wi-Fi.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in designing complex energy efficient embedded systems.
- CO2. Analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC, Comparator, SPI.
- CO3. Design embedded systems to suit market requirements.
- CO4. Solve engineering problems by proposing potential solutions using industry choice advanced Microcontrollers.
- CO5. Apply appropriate techniques, resources, and CCSV6 based IDE for modeling embedded systems with understanding of limitations.
- CO6. Provide embedded system solutions for societal needs.
- CO7. Work individually and in a group to develop embedded systems.
- CO8. Communicate effectively in oral and written form in the field of embedded systems.

IV B. Tech. - I Semester
(16BT71531) **SYSTEM MODELING AND SIMULATION LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Programming in C Lab and System Modeling and Simulation

COURSE DESCRIPTION:

Hands on Experience on Generation of random numbers; Input Modeling; Queuing System; Simulation models.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- CO1. Demonstrate Knowledge to solve complex engineering problems using Modeling and simulation.
- CO2. Analyze the problems to develop models for applications to meet requirements of the system.
- CO3. Design and develop solutions through modeling for computer based systems.
- CO4. Apply simulation methods to interpret data and provide valid conclusions for problems in systems engineering
- CO5. Use modern engineering techniques in modeling systems to provide effective solutions for real world problems.
- CO6. Apply appropriate ethics and follow principles to model systems incrementally.

IV B. Tech. – I Semester
(16BT71532) **COMPREHENSIVE ASSESSMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES:

Comprehensive Assessment enables a successful student to demonstrate:

- CO1. Knowledge on the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Ability to engage in life-long learning in the courses of the program.

IV B. Tech. – II Semester
(16BT81531) **PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES:

Completion of the project work enables a successful student to demonstrate:

- CO1. Knowledge on the project topic.
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex engineering problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.

- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the engineering practice as applied in the project work.
- CO9. Ability to function effectively as an individual as experienced during the project work.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO12. Ability to engage in life-long learning as experience during the project work.

Program: B.Tech. MECHANICAL ENGINEERING

I B. Tech. - I Semester (16BT1HS01) TECHNICAL ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Intermediate English.

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Demonstrate knowledge in

- Process of communication.
- Modes of listening.
- Paralinguistic features.
- Skimming and Scanning.
- Elements of style in writing.

CO2: Analyze the possibilities and limitations of language for understanding

- Barriers to Communication.
- Barriers to Effective Listening.
- Barriers to Speaking.
- Formal and metaphorical language.

CO3: Design and develop functional skills for professional practice.

CO4: Apply writing skills in preparing and presenting documents.

CO5: Function effectively as an individual and as a member in diverse teams.

CO6: Communicate effectively with the engineering community and society in formal and informal situations.

I B. Tech. - I Semester (16BT1BS01) ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.

CO2: Develop analytical skills in:

- Determination of hardness of water.
- Determination of viscosity, flame and fire points, cloud and pour points.

CO3: Develop designing skills in:

- Synthesis of engineering plastics.
- Chemical methods for the synthesis of Nano materials.

CO4: Develop skills for providing solutions through:

- Mitigation of hardness of water.
- Newer Nanomaterials and engineering plastics for specific applications

CO5: Acquire awareness to practice engineering in compliance to modern techniques such as:

- Nalgonda technique for defluoridation of water.
- Electroplating technique for control of corrosion.

CO6: Acquire awareness to societal issues on:

- Quality of water.
- Bio-diesel.
- Chemical materials utility and their impact.

I B. Tech. - I Semester

(16BT1BS03) MATRICES AND NUMERICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO1: Acquire basic knowledge in

- Finding the rank of matrices and analyzing them.
- Solving algebraic and transcendental equations by various numerical methods.
- Fitting of various types of curves to the experimental data.
- Estimating the missing data through interpolation methods.
- Identification of errors in the experimental data
- Finding the values of derivatives and integrals through various numerical methods.
- Solving differential equations numerically when analytical methods fail.

CO2: Develop skills in analyzing the

- methods of interpolating a given data
- properties of interpolating polynomials and derive conclusions
- properties of curves of best fit to the given data
- algebraic and transcendental equations through their solutions
- properties of functions through numerical differentiation and integration
- properties of numerical solutions of differential equations

CO3: Develop skills in designing mathematical models for

- Fitting geometrical curves to the given data
- Solving differential equations
- Constructing polynomials to the given data and drawing inferences.

CO4: Develop numerical skills in solving the problems involving

- Systems of linear equations
- Fitting of polynomials and different types of equations to the experimental data
- Derivatives and integrals
- Ordinary differential equations

CO5: Use relevant numerical techniques for

- Diagonalising the matrices of quadratic forms
- Interpolation of data and fitting interpolation polynomials
- Fitting of different types of curves to experimental data
- obtaining derivatives of required order for given experimental data
- Expressing the functions as sum of partial fractions

I B. Tech. - I Semester

(16BT1BS04) MULTI-VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO1: Acquire knowledge in

- Higher order Differential equations
- Maximum and minimum values for the functions of several variables
- Double and triple integrals
- Differentiation and integration of vector functions.
- Line and surface volume

- transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2:** Develop skills in analyzing the
- Methods for differential equation for obtaining appropriate solutions,
 - Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - The variations in the properties of functions near their stationary values
 - Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3:** Develop skills in designing mathematical models for
- R-C and L-R-C oscillatory electrical circuits
 - Heat transfer and Newton's law of cooling
 - Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces
- CO4:** Develop analytical skills in solving the problems involving
- Newton's law of cooling
 - non homogeneous linear differential equations
 - maximum and minimum values for the functions
 - lengths of curves, areas of surfaces and volumes of solids in engineering
 - transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5:** Use relevant mathematical techniques for evaluating
- various types of particular integrals in differential equations
 - stationary values for multi variable functions
 - multiple integrals in change of variables
 - integrations of vector functions.

I B. Tech. - I Semester **(16BT10501) PROGRAMMING IN C**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1: Demonstrate knowledge in:

- Elements of C Language
- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2: Analyze complex engineering problems to develop suitable solutions

CO3: Design algorithms for specified engineering problems

CO4: Use appropriate 'C' language constructs for solving engineering problems

CO5: Write programs using 'C' language to implement algorithms

I B. Tech. - I Semester **(16BT1HS31) ENGLISH LANGUAGE LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

CO1: Demonstrate knowledge in

- Phonetics
- Information Transfer

CO2: Analyze the situations in professional context by using

- Vocabulary
- Grammar

CO3: Design and develop functional skills for professional practice.

CO4: Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.

CO5: Function effectively as an individual and as a member in diverse teams through

- Extempore talk and
- Role Play

CO6: Communicate effectively in public speaking in formal and informal situations.

CO7: Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I B. Tech. - I Semester

(16BT1BS31) ENGINEERING CHEMISTRY LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.

CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.

CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.

CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.

CO5: Provide solutions for environmental issues through determination of quality of water.

I B. Tech. - I Semester

(16BT10331) COMPUTER AIDED ENGINEERING DRAWING

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	1	6	3

PRE-REQUISITES: --

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.

- CO2:** Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3:** Produce different views and projection in drawing.
- CO4:** Use modern CAD software for design and drafting of drawings.
- CO5:** Create multi-view drawings suitable for presentation to Engineering community.
- CO6:** Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B. Tech. - I Semester

(16BT10531) PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on "Programming in C"

COURSE DESCRIPTION: Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Demonstrate practical knowledge of using C language constructs:

- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2: Analyze problems to develop suitable algorithmic solutions.

CO3: Design Solutions for specified engineering problems.

CO4: Use appropriate 'C' language constructs for solving engineering problems.

CO5: Implement and execute programs using 'C' language

CO6: Document programs and communicate effectively while conducting Professional transactions.

I B. Tech. - II Semester

(16BT1BS02) ENGINEERING PHYSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION: Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors and superconductors, acoustic of buildings, crystallography and nanomaterials.

CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.

CO3: Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.

CO4: Develop problem solving skills in engineering context.

CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser.

I B. Tech. - II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z – transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

CO1: Acquire basic knowledge in

- Fourier series and Fourier transforms
- Fourier integrals
- Laplace transforms and their applications
- z- transforms and their applications
- Solving partial differential equations

CO2: Develop skills in analyzing the

- Properties of Fourier series for a given function
- Partial differential equations through different evaluation methods
- Difference equations through z – transforms
- Engineering systems and processes involving wave forms and heat transfer

CO3: Develop skills in designing mathematical models for

- Problems involving heat transfer and wave forms
- Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z- transforms and difference equations

CO4: Develop analytical skills in solving the problems involving

- Fourier series and Fourier transforms
- Laplace transforms
- Z-transforms and difference equations
- Heat transfer and wave motion

CO5: Use relevant transformation techniques for

- Obtaining Fourier transforms for different types of functions
- Laplace transforms
- Z- transforms
- Partial differential equations

I B. Tech. - II Semester

(16BT20102) ENGINEERING MECHANICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PRE-REQUISITES: Intermediate Mathematics and Physics.

COURSE DESCRIPTIONS: statics of particles and rigid bodies; support reactions; analysis of perfect frames; friction; centroid, centre of gravity and moment of inertia; kinematics and kinetics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Apply the knowledge of engineering mechanics fundamentals to the solutions of basic engineering problems.

CO2: Analyze

- Multi-body systems under equilibrium and dynamic conditions.
- Systems involving dry friction and computing the efficiency of the system of forces in frames under suitable assumptions.
- Sectional properties of surfaces and solids.

- CO3:** Design sustainable solutions to complex engineering problems using first principles of engineering mechanics.
- CO4:** Exercise awareness to assess the safety of system related to engineering mechanics.
- CO5:** Communicate effectively engineering and allied information through free body diagram.
- CO6:** Sustain interest in engineering mechanics to upgrade knowledge and skills through self learning concepts in mechanics.

I B. Tech. - II Semester

(16BT20241) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate Mathematics and Physics.

COURSE DESCRIPTION: Basics of electrical DC and AC circuits; principle of operation and applications of DC machines, transformers, and induction motors; Transducers and measuring instruments; rectifier devices; bipolar transistors and its characteristics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Demonstrate knowledge on
- Electrical and electronic circuits.
 - Construction and operation of electrical machines, electrical and electronic instruments.
- CO2:** Analyze various electrical & electronic circuits and different transducers.
- CO3:** Evaluate the electrical and electronic circuit parameters and performance of electrical machines.
- CO4:** Select and apply various machines and transducers.

I B. Tech. - II Semester

(16BT20301) ENGINEERING MATERIALS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate Physics, Engineering Chemistry.

COURSE DESCRIPTION: Classification, properties and applications of materials; atomic and crystal structure of metals; formation of alloys; structure and properties of ferrous and non-ferrous metals; properties and applications of ceramics and composite materials; testing of materials.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Gain basic knowledge on engineering materials such as,
- Classification.
 - Structure, properties and applications.
 - Various testing procedures.
- CO2:** Analyze
- Material microstructure.
 - Characterization and properties of various materials.
- CO3:** Design a crystallographic model of a material at microscopic level.
- CO4:** Use modern material testing instruments such as ultrasonic flaw detector, Radiography.
- CO5:** Identify the impact of materials on the environmental issues.

I B. Tech. - II Semester
(16BT1BS32) ENGINEERING PHYSICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1:** Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.
- CO2:** Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.
- CO3:** Develop skills in designing electronic circuits using semiconductor components.
- CO4:** Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.
- CO5:** Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B. Tech. - II Semester
(16BT20251) ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Physics.

COURSE DESCRIPTION: Verification of Kirchhoff's laws; study performance of AC/DC motors; various tests on DC shunt motors; brake test on 3-phase induction motors; V-I characteristics of diode, Half wave rectifier with/without capacitive filter; bipolar junction transistor amplifier.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Employ knowledge acquired to determine appropriate type of electrical machine or circuit to be used in a given situation.
- CO2:** Analyzing the performance of electrical machines, rectifiers and amplifiers.
- CO3:** Develop skills in selecting and developing suitable rectifiers and amplifiers for a specific use.
- CO4:** Function effectively as individual and as a member in a team.
- CO5:** Communicate effectively in both oral and written forms.

I B. Tech. - II Semester
(16BT20331) ENGINEERING WORKSHOP PRACTICE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: None

COURSE DESCRIPTION: Knowledge on various workshop hand and power tools; utilization in different manufacturing trades such as carpentry, fitting, house wiring, sheet metal forming, foundry; overview of metal cutting processes, plumbing and welding through live demonstrations.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Acquire knowledge on utilization of hand and power tools for engineering applications.
CO2: Employ analytical skills for the production of a component for real time applications.
CO3: Design and model different prototypes in the carpentry, fitting and sheet metal operations.
CO4: Comprehend the usage of modern power tools.
CO5: Abide by workshop safety regulations and adopt environmentally safe practices.
CO6: Engage in self study for solving engineering related problems.

I B. Tech. - II Semester**(16BT20332) MATERIALS SCIENCE LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate Physics, Engineering Chemistry

COURSE DESCRIPTION: Characterization of microstructures of steels, cast irons and non-ferrous metals; heat treatment procedures; data acquisition and recording; grain size analysis; phase segmentation; non-destructive tests; metal powder preparation.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Acquire knowledge in preparing metallographic specimen and various non-destructive testing methods.
CO2: Analyze the material for
- Material Microstructure.
 - Phase distribution.
 - Grain size.
- CO3:** Model appropriate material suitable for engineering applications.
CO4: Use the advanced software testing tool 'Material Plus' for detailed characterization of metal.
CO5: Choose acceptable engineering material for societal and industrial needs.

II B. Tech. – I Semester**(16BT3BS01) PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE -REQUISITE: Course on Intermediate/Senior Secondary Mathematics

COURSE DESCRIPTION: Random variables; mathematical expectations; probability distributions; correlation and regressions; statistical quality control; sampling distributions; tests for small and large samples and their significances.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1:** Acquire basic knowledge in
- Probability distributions, correlation and regressions
 - Statistical quality control and testing of hypotheses
 - Simple linear regression
 - Tests of significance for small and large samples
- CO2:** Develop skills for analyzing the data with
- Mathematical expectations for realistic results
 - Probability distributions for practical situations.
 - Control charts of statistical quality control
 - Correlation and regression concepts
 - Suitable tests of significance for practical situations.
- CO3:** Develop skills in designing
- Probability distributions

- Limitations of statistical quality control
 - Control charts,
 - X, R, np, and c charts
- CO4: Develop analytical skills for solving problems involving
- Probability distributions, means, variances and standard deviations
 - Statistical techniques employed for quality
 - Sampling techniques for decision making
 - Tests of significance for small and large samples
- CO5: Use relevant probability and statistical techniques for
- Mathematical expectations of desired results
 - Fitting probability distributions for experimental data.
 - Quality control and testing of hypothesis.

II B.Tech. - I Semester **(16BT30301) ENGINEERING METALLURGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Engineering Materials.

COURSE DESCRIPTION: Extraction of metals from the ores; Different melting techniques; Phase diagrams; Heat treatment procedures and their influence on Mechanical properties; Surface hardening methods; Modern material characterization techniques; Production of metal powders.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1: Demonstrate the knowledge of engineering metallurgy in extraction of materials by various melting techniques.
- CO2: Analyze the structures of various metals influencing various engineering applications.
- CO3: Design a suitable heat treatment method to endow required mechanical behavior as per industrial requirements.
- CO4: Interpret the data on microstructure of materials using phase diagram and modify the microstructure and properties using different heat treatments.
- CO5: Select modern material characterization techniques for analyzing the properties of various materials.
- CO6: Identify hazardous substances in metallurgical production and source of environment pollution and propose measures to protect the environment.

II B. Tech. – I Semester **(16BT30302) KINEMATICS OF MACHINERY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics and Computer Aided Engineering Drawing.

COURSE DESCRIPTION: Basic concepts and description of various plane mechanisms; Calculation of Displacement; Velocity and acceleration of simple plane mechanisms; Straight line mechanisms; Steering mechanisms; Hook's joint; Preparation of cam profiles; Concepts of Gears and Gear trains.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1: Demonstrate various mechanisms and choose one best suited for a given situation.
- CO2: Analyze a given mechanism and find motion characteristics.
- CO3: Design suitable gear train mechanism for specific requirement.
- CO4: Investigate problems associated with machine components such as gears, gear trains.
- CO5: Apply appropriate techniques to design cam profiles.
- CO6: Integrate the kinematic mechanisms to the societal needs within realistic constraints.

II B.Tech. – I Semester

(16BT30303) MANUFACTURING TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Engineering Materials.

COURSE DESCRIPTION: Manufacturing Processes; Foundry and Special Casting Processes; Joining Processes; Gas Welding; Electric Arc Welding; Resistance Welding; Metal Forming Processes; Sheet Metal Operations and Plastic Processing.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1: Demonstrate the knowledge required for Manufacturing Process suitable for fabricating a product.
- CO2: Analyze the components of moulds and select materials and allowances of patterns used in casting.
- CO3: Design Core, Core Print and Gating System in Metal Casting Processes.
- CO4: Conduct investigations on manufacturing process for a particular application.
- CO5: Use methodology to manufacture components with less human effort.

II B.Tech. – I Semester

(16BT30304) STRENGTH OF MATERIALS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Engineering Mechanics.

COURSE DESCRIPTION: Analysis of stresses and strains of mechanical and structural components; action of shear; bending and torsional stresses; deflection of beams due to axial and transverse loadings; thin and thick walled pressure vessels.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1: Demonstrate the basic behavior of materials when subject to external influences.
- CO2: Analyze the internal and external behavior of members during loading.
- CO3: Develop the solution for complex loading conditions by simplifying under suitable assumptions.
- CO4: Investigate the behavioral changes of materials and provide valid conclusion.
- CO5: Relate the contextual knowledge to access safety issues.
- CO6: Communicate the mechanical properties under loading through graphical representation.

II B. Tech. – I Semester

(16BT30305) THERMODYNAMICS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Engineering Physics and Engineering Chemistry.

COURSE DESCRIPTION: Thermodynamic system; Energy interactions; Heat and work Transfer in flow and non- flow systems; Laws of thermodynamics; Reversible and irreversible processes; Entropy; Equation of state; Pure substance and Gas power cycles.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1: Demonstrate the knowledge of thermodynamic systems, properties, laws of thermodynamics, entropy, pure substance and gas power cycles.
- CO2: Identify, formulate and analyze various thermodynamic systems and provide analytical and numerical solutions.
- CO3: Design and develop the solutions for the thermodynamic systems to achieve the required physical process parameters.
- CO4: Conduct investigations and address the complex problems on availability, entropy and gas power cycles.
- CO5: Use thermodynamic laws (exergy analysis) in estimating the performance of heat engines.

II B.Tech. - I Semester

(16BT30331) COMPUTER AIDED MACHINE DRAWING LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE-REQUISITES: Course on Computer Aided Engineering Drawing.

COURSE DESCRIPTION: Principles of machine drawing; Sectional views; Tolerances; Thread profiles; Bolted joints; Locking arrangements for nuts; Foundation bolts; Keys; Assembling and Disassembling; Part drawing; .

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. Read and infer a given CAD drawing.

CO2. Analyze features on a drawing part.

CO3. Develop suitable drawing views to represent part drawings of different machine parts in CAD software.

CO4. Investigate the requirements of complex components and interpret the implications of drawings of machine components.

CO5. Apply appropriate techniques, resources to complex engineering activities for modeling machine components with understanding of limitations.

CO6. Function effectively as an individual and as a member of team to combine various part components into a single assembly.

CO7. Communicate about the assemble and part drawings through the computer aided drawings.

II B. Tech. - I Semester

(16BT30332) MANUFACTURING TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE-REQUISITES: Course on Manufacturing Technology.

COURSE DESCRIPTION: Use of hand tools; Power tools for various manufacturing methods; Provides skill on sand testing; Pattern making; Mould preparation; Metal casting; Mechanical press working; Welding; Sheet metal works; Plastic moulding.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. Demonstrate the practical usage and utilization of hand and power tools for engineering applications.

CO2. Analyze the part to be fabricated and manufacture using a combination of the manufacturing techniques.

CO3. Design and develop different components in the casting, welding, press work and plastic moulding.

CO4. Conduct investigation and provide best sequence of operations to manufacture a complex component.

CO5. Use modern tools and methods to solve engineering problems.

CO6. Follow safe practices during work practice in laboratory.

CO7. Function effectively as an individual and as a member of team to perform various process in Manufacturing of products.

CO8. Communicate the information of the components through drawings.

II B.Tech. – I Semester

(16BT30132) STRENGTH OF MATERIALS LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE-REQUISITES: Course on Strength of Materials.

COURSE DESCRIPTION: Tension test; Compression test; Bending test; Shear test; Torsion test; Hardness test; Maxwell reciprocal theorem.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the knowledge on conducting experiments for testing strength of materials such as steel, timber, metals, beams and springs.
- CO2. Analyze test results on steel, timber, metals, beams and springs.
- CO3. Recommend suitable materials for construction after interpreting test results.
- CO4. Use appropriate method of testing construction materials.
- CO5. Consider safety in construction material testing with societal perspective.
- CO6. Follow ethics in reporting exact testing results.
- CO7. Function effectively as an individual and as a team member in construction material testing.
- CO8. Communicate effectively on construction material testing in written, oral and graphical forms.

II B.Tech. - II semester

(16BT3HS01) ENVIRONMENTAL STUDIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Engineering Chemistry

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. Develop strategies for environmental pollution control and natural resource management.
- CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. Understand the impact of social issues and population on environment.
- CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. Follow environmental protection laws for sustainable development.
- CO9. Communicate effectively on environmental issues in the form reports.

II B. Tech. – II Semester

(16BT40301) DESIGN OF MACHINE ELEMENTS-I

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Materials and Strength of Materials

COURSE DESCRIPTION: General considerations of design, design process; Manufacturing considerations, BIS codes of materials; Preferred numbers; Simple stresses, Combined stresses; theories of failure; Fatigue; Stress concentration; Goodman's line, Soderberg's line; design of welded joints; threaded joints; shafts; keys; sleeve or muff, and Flange couplings, Flexible couplings; spigot and socket cotter joint, Knuckle joint.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on design of machine elements under different loading criteria.
- CO2. Identify the design problems and analyze the stresses and strains induced in a machine element.
- CO3. Design and develop the components for engineering problems.

- CO4. Conduct investigations on complex problems in design of machine elements and provide suitable solutions.
- CO5. Apply numerical techniques to determine the stress and strains induced in the components under mechanical loading.
- CO6. Use the codes and standards of BIS, ASME and ISO in design procedures.

II B. Tech. - II Semester **(16BT40302) DYNAMICS OF MACHINERY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Kinematics of Machinery.

COURSE DESCRIPTION: Clutches, brakes and dynamometers; Gyroscopic couple, Turning moment diagrams, flywheel design; Analysis and balancing of shaking forces in machines; Governors; Vibrations, single degree, Multi degrees of freedom vibrations, spring mass systems; transmissibility of forces, Dunkerley's method, Rayleigh's method; Whirling of shafts; isolation of systems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on dynamical analysis of machine elements for design process.
- CO2. Analyze dynamic systems through systematic approach by identifying suitable sub systems.
- CO3. Design dynamic systems involving imbalance, flywheel and gyroscopic effects.
- CO4. Conduct investigations on the unbalanced forces in a multi-cylinder reciprocating engine.
- CO5. Apply the various methods to reduce the vibration effects in the operation of mechanical components.

II B. Tech. – II Semester **(16BT40303) FLUID MECHANICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Engineering Mechanics.

COURSE DESCRIPTION: Properties of Fluids; Pressure Measurements; Types of flow; One-dimensional steady flow energy & momentum Equations; Flow measurements; Impact of jets on stationary & moving plate; Hydraulic turbines and its performance; Pumps; Components and phenomena of hydroelectric power stations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the basic knowledge of hydraulics in finding fluid properties, performance parameters of hydraulic turbines and pumps.
- CO2. Identify, formulate and analyze hydraulic machines to study the characteristics of various flow of fluids.
- CO3. Develop feasible design solutions to the construction of efficient hydraulic turbines and pumps.
- CO4. Conduct investigations and address the complex problems in fluid Mechanics.
- CO5. Apply mathematical models for hydraulic systems to study their characteristics.
- CO6. Design various Hydraulic systems as per requirements of society based on standard engineering norms and practices.

II B. Tech. – II Semester **(16BT40304) MACHINE TOOLS AND MODERN MACHINING PROCESSES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Manufacturing Technology.

COURSE DESCRIPTION: Theory of Metal Cutting; Geometry of Cutting Tools; Merchant's Force Diagram; Lathe Machine-Principle of Operation; Tools; Multi spindle lathes; shaping; slotting and planning machines; drilling; boring; jig boring; milling machine Specifications; grinding; lapping; honing.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the concepts of machining methods using various machine tools.
- CO2. Identify various cutting tools used for different operations and analyze its behavior.
- CO3. Design the cutting tools for appropriate machining operation.
- CO4. Conduct investigation on complex problems during metal cutting operation.
- CO5. Apply Modern Machining processes to produce intricate shapes.
- CO6. Use the ORS and ASA system of standards in single point cutting tools for engineering practice.

II B. Tech. – II Semester

(16BT40305) THERMAL ENGINEERING-I

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Thermodynamics.

COURSE DESCRIPTION: Comparison of air-standard and actual cycles; Components and working of 2-stroke and 4-stroke engines; Combustion phenomena in spark ignition and compression ignition engines; Performance parameters of an internal combustion engine; Estimating heat losses in an engine; Components and working of reciprocating and rotary compressors.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the basic knowledge of an engine and air compressor in developing the analytical models.
- CO2. Analyze the combustion and performance parameters of SI engines and CI engines and analyze the performance of air compressors.
- CO3. Provide solutions in the design of IC engine.
- CO4. Conduct investigation on IC engines for performance improvement and emission reduction.
- CO5. Apply new combustion techniques to analyze the combustion in IC Engines.

II B. Tech. - II Semester

(16BT40331) FLUID MECHANICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Fluid Mechanics.

COURSE DESCRIPTION: The study and calibration of gauges, Orifice meter, Venturi meter. Determination of Darcy's coefficient; Performance test on Hydraulic Machines like Centrifugal Pump, Reciprocating pump, Francis Turbine, Kaplan Turbine, and Pelton wheel turbine; Study of Bernoulli's theorem verification, Head losses in pipes and impact of jet on vanes.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on various flow measuring instruments.
- CO2. Analyze the losses and discharge in pipes.
- CO3. Design systems for evaluate the performance of hydraulic machineries
- CO4. Conduct experiments, analyze the data and interpret results.
- CO5. Provide solutions to various hydraulic systems by using computational tools.
- CO6. Work with others to accomplish the common goals.
- CO7. Communicate effectively and express the results with clarity.

II B. Tech. - II Semester

(16BT40332) MACHINE TOOLS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Machine Tools and Modern Machining Processes.

COURSE DESCRIPTION: Demonstration on lathe; drilling; milling; slotting machine; shaper; grinding machine; milling machine; provides skill on making products using machines tools.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate practical knowledge on utilization of machine tools for engineering and domestic applications
- CO2. Analyze and perform step turning, taper turning, thread cutting, drilling and tapping operations on lathe, operations on shaper, planer and milling machines.
- CO3. Design and model different components using machine tools .
- CO4. Conduct experiments, investigate the products quality and interpret the results.
- CO5. Select and apply relevant cutting tools for machining operations.
- CO6. Relate knowledge based on standard engineering norms and practices to make products to cater the needs of the society.
- CO7. Formulate the team to attain multidisciplinary settings.
- CO8. Communicate effectively and present technical information in oral and written form

II B. Tech. - II Semester **(16BT4HS31) SOFT SKILLS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION: This course covers Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire knowledge in
 - Goal Setting
 - Creative Thinking
 - Leadership Skills and
 - Team Work
- CO2. Analyse the situations and develop skills for
 - Body Language
 - Personality Development and
 - Stress Management
- CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal forums.

III B. Tech. - I semester **(16BT50301) DESIGN OF MACHINE ELEMENTS -I**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Design of Machine Elements-I.

COURSE DESCRIPTION: Study, analysis and design of machine components such as Journal bearings - anti friction bearings; spur gears, helical gears; Design of helical and leaf springs; internal combustion engine parts such as piston, crank and connecting rod; Design of belt drives; Safety and reliability consideration in machine design; detailed design to define the shape, size and material.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in design of machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
- CO2. Analyze the forces acting and stresses in the machine components for designed mechanical properties.
- CO3. Design the bearing, gears, mechanical springs and IC engine parts.
- CO4. Investigate the reasons for failure of machine elements and provide solutions/improvisation to improve trial designs.
- CO5. Use empirical relationships for solving complex problems in the design of IC engine parts.
- CO6. Apply the contextual knowledge to provide safe designs as per the standards and needs for real time applications.

III B. Tech. – I Semester

(16BT50302) INDUSTRIAL ENGINEERING AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Concepts and functions of management and organization; selection and analysis of plant location and plant layout; method study and work measurement; inventory, stores and purchase management functions; techniques of statistical process control; Engineering ethics; industrial safety.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge of Industrial Engineering and Management concepts to the Solution of complex engineering problems in an industrial scenario.
- CO2. Analyze Industrial problems, identify probable causes and suggest suitable solutions to increase the productivity by reducing the wastages using Principles of Management, and Industrial engineering concepts.
- CO3. Design and develop integrated systems that include people, materials, information and equipment that meet the specified needs with appropriate considerations.
- CO4. Investigate and employ systematic approach to simplify a complex problem in to a Manageable Sub problem for quicker solution.
- CO5. Apply appropriate techniques such as method study, control charts, skills, resources, and modern engineering tools like TQM necessary for engineering practices with an understanding of the limitations.
- CO6. Consider safety issues in the providing engineering solutions in industrial scenario.

III B. Tech. – I Semester

(16BT50303) METROLOGY AND MEASUREMENTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Physics, Computer Aided Machine Drawing Lab and Machine Tools and Modern Machining Processes.

COURSE DESCRIPTION: Limits, Fits and Tolerances; Limit Gauges and Gauge Design; Comparators; Linear Measurement; Measurement of Angles and Tapers; Flatness Measurement, Surface Roughness Measurement; Measurement of Displacement; Measurement of Speed, Stress & Strain Measurements; Measurement of Temperature; Measurement of Pressure.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on various instrument/measurement methods for a given application.
- CO2. Identify, formulate and analyze complex problems related to metrology and measurements.
- CO3. Design and Develop the solutions for real time problems related to measurements and its applications.
- CO4. Conduct investigation on advanced measuring techniques for the Industrial applications.
- CO5. Use modern tools and methods to solve engineering problems.

III B. Tech. – I Semester

(16BT50304) REFRIGERATION AND AIR – CONDITIONING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Thermodynamics and Fluid Mechanics.

COURSE DESCRIPTION: Refrigeration cycles; Application of thermodynamics; heat transfer to the refrigeration cycles; Analysis and design of various refrigeration systems; Study of components of

refrigeration system; refrigerants selection; Psychrometry; Heat gain and Heat loss calculations. Air conditioning equipment; load calculations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on the concepts and applications of RAC systems.
- CO2. Identify the RAC problems and analyze refrigeration requirements to arrive at an outline configuration of the refrigeration system.
- CO3. Design RAC systems for physical systems and predict their performance.
- CO4. Conduct investigation on complex problems of RAC systems.
- CO5. Apply Psychrometric charts and refrigeration charts in evaluate the performance of RAC systems.
- CO6. Consider health and safety issues in the design of RAC systems for societal needs.

III B. Tech. – I Semester

(16BT50305) THERMAL ENGINEERING-II

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Thermal Engineering-I.

COURSE DESCRIPTION: Concept of Rankine Cycle in Steam Power Plant; Working of Steam Boilers; Functions of Various Boiler Mountings and Accessories; Performance of Boiler parameters and Boiler Draught; Characteristics of flow through steam nozzles; Working of Steam Condensers and their performance; Steam turbines and their analysis; Introduction to gas turbines and jet propulsion.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on components of thermal power plant and gas turbines.
- CO2. Analyze the components of thermal power plants using thermodynamic cycles and velocity diagrams.
- CO3. Provide suitable solutions by analyzing the various components of thermal power generation system.
- CO4. Conduct an elementary energy audit and develop heat balance sheet for boilers.
- CO5. Use Steam Tables and Mollier Chart in solving complex problems of Thermal Engineering.

III B. Tech. – I Semester

(16BT50306) HUMAN RESOURCE MANAGEMENT

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of HRM; Environmental Scanning; Human Resource Planning; Job analysis; Job design; Job evaluation; Recruitment; Selection; Placement; Orientation; Training and Development; Performance appraisal; Merit rating; Compensation; Industrial relations; Trade unions; Industrial disputes; Ethical issues; Employee safety.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on the principles, processes and practices of human resource management.
- CO2. Analyze the key issues related to administering the human elements such as motivation, recruitment, training and development, compensation, appraisal, and career development.
- CO3. Provide solutions to plan and manage human resource functions effectively within organization.
- CO4. Apply HRM concepts and techniques in strategic planning to improve organizational effectiveness.
- CO5. Evaluate HRM related social, cultural and safe responsibilities and issues in a global context.
- CO6. Exercise discernment in following ethical code of conduct in human resource planning.

III B.Tech. - I Semester

(16BT50307) INSTRUMENTATION AND CONTROL SYSTEMS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Basic Electrical and Electronics Engineering.

COURSE DESCRIPTION: Fundamentals of instrumentation; Static and Dynamic characteristics; Working principle of instruments used for measurement of level and flow; Basic elements of control systems; Electrical analogue of mechanical, thermal, hydraulic and pneumatic systems; Process control; PID controllers; Data acquisition systems; Programmable Logic Controllers; SCADA system.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge of fundamentals of instrumentation, measurement and control systems.
- CO2. Select the instruments based on the physical considerations for a particular application.
- CO3. Build mathematical models of simple physical systems using transfer functions and design logical control systems.
- CO4. Investigate the suitable calibration methodology and error analysis related to measuring instruments for real time applications.
- CO5. Apply control engineering techniques to the automatic control systems found in modern mechanical systems.

III B. Tech. – I Semester

(16BT50308) MECHATRONICS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Basic Electrical and Electronics Engineering and Programming in C.

COURSE DESCRIPTION: Mechatronics system; Sensors; Transducers; Actuating systems; DC Motors; Micro controller; Signal Conditioning; Programmable Logic Controllers; Programmable Motion Controllers; Design Approach; Case Studies.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on integrative nature of Mechatronics and different components of mechatronics systems.
- CO2. Select the appropriate sensors and actuators required for a system by identifying and analyzing real life engineering problems thoroughly.
- CO3. Design signal conditioning circuits for mechatronics systems and establish the controlling methods required for that system to meet the specified needs.
- CO4. Select, and apply appropriate programmable motion controller techniques and adaptive controllers to complex mechatronics systems with an understanding of the limitations.
- CO5. Exhibit the knowledge on design approach, keeping in view of environmental contexts, to reflect the sustainable development.
- CO6. Perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

III B. Tech. – I Semester

(16BT40502) DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on
- Data models and Database Languages
 - Database design
 - Normal forms
 - Storage and Indexing
- CO2. Analyze databases using normal forms to provide solutions for real time applications.
- CO3. Design solutions for database problems using database design, views design and framing queries.
- CO4. Use database techniques for designing databases, managing databases and its security.
- CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.
- CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

III B. Tech. – I Semester

(16BT50331) DYNAMICS AND VIBRATIONS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Dynamics of Machinery.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the working principle of measuring devices used for dynamic testing.
- CO2. Analyze the primary and secondary out-of-balance forces in reciprocating machinery.
- CO3. Design the experiments to assess the performance of static and dynamic balancing rotating machinery systems.
- CO4. Investigate the effect of forces and moments acting on particles and bodies.
- CO5. Work in teams in measurement of various parameters of vibration systems.
- CO6. Report experimental results, calculations, and inferences systematically.

III B. Tech. - I Semester

(16BT50332) INTERNAL COMBUSTION ENGINES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Thermal Engineering-I.

COURSE DESCRIPTION: Calculating the performance parameters of 2-stroke and 4- stroke I.C. Engines; Heat balancing of an engine; Practicing the valve and port timing diagrams; Determining frictional power for single and multi-cylinder engines; Compressor performance. Assembly and disassembly of an automobile models; Determining the Fuel properties;

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the theoretical knowledge of Thermal Engineering in finding the Performance of I.C. Engines.
- CO2. Analyze the Performance and Exhaust Emissions of an I.C. Engine by conducting various Tests.
- CO3. Design and Conduct experiments as well as analyze and interpret the experimental data.
- CO4. Conduct investigations on the IC engines for performance improvement and emission reductions.
- CO5. Work in teams to achieve common Objectives.
- CO6. Report experimental results, calculations, and inferences systematically.

III B. Tech. – I Semester

(16BT50333) METROLOGY AND INSTRUMENTATION LAB

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PRE-REQUISITES: Courses on Computer Aided Machine Drawing Lab and Machine Tools and Modern Machining Processes.

COURSE DESCRIPTION: High precision Metrology; Standardization; Calibration of instruments such as Vernier calipers, Micrometer, Vernier height gauge; Measure dimensions of shafts, bearings; Alignment tests on lathes and milling machines; Straightness and flatness measurements; Identifying uncertainties in dimensional metrology; Measurement of gear and threaded profiles; Measurement of level, speed, viscosity, density, humidity, temperature, pressure and discharge coefficient; Data acquisition and analysis using LabVIEW; Data logging and analysis.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on measure variables like temperature, pressure, torque, humidity etc. using transducers and gauging instruments for a given system.
- CO2. Analyse and select suitable measurement tool and/or measurement system in a practical situation.
- CO3. Apply analytical skills to design instrumentation to measure different physical parameters.
- CO4. Investigate the sources of measurement errors and eliminate them by use of reference materials to ensure good quality, accurate and traceable measurement results.
- CO5. Apply dimensional analysis techniques and use reference values for unit conversions, accurately perform associated mathematics and present final values.
- CO6. Function effectively as an individual, and as a member of a team to express the results of measurement and calculations and correctly reflect the effects of measurement uncertainty.
- CO7. Document the traceability of measurement standards and specify a dimension validation process.

III B. Tech. – II Semester

(16BT3HS02)MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire Knowledge in
 - Tools and concepts of Micro Economics
 - Basic Principles and concepts of Accountancy
 - Financial Accounting
 - Significance of Economics and Accountancy
- CO2. Demonstrate analytical skills in managerial decision making of an organization by applying economic theories
- CO3. Develop effective communication in Business and Accounting transactions
- CO4. Ascertain the profitability and soundness of an organization
- CO5. Practice Financial Accounting

III B. Tech. – II Semester (16BT60301) CAD/CAM

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Computer Aided Machine Drawing Lab and Manufacturing Technology.

COURSE DESCRIPTION: Fundamental and conventional CAD processes; Raster scan graphics co-ordinate system; Transformations; Geometric construction models; Curve representation methods; Computer Control in NC; GT; CAPP.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the basic concepts of CAD/CAM to generate a suitable geometric model of an object.
- CO2. Analyze the features on an object and develop process planning chart/ part program.
- CO3. Model the components and develop part programs for real time applications.
- CO4. Evaluate the sequential steps required for computer aided design and manufacturing of components.
- CO5. Apply software tools for numerical control of fabrication processes.
- CO6. Utilize the safe practices in developing codes for designing and manufacturing components with realistic constraints.

III B.Tech. – II Semester (16BT60302) HEAT TRANSFER

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Multi-Variable Calculus and Differential Equations, Thermodynamics and Fluid Mechanics.

COURSE DESCRIPTION: Modes of heat transfer; One-dimensional steady and transient conduction; Analysis of extended surfaces; Convection heat transfer; free and forced convection; boiling and condensation; Heat exchangers; radiation; Concept of black body; irradiative heat exchange between surfaces.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on the concepts of conduction, convection and radiation heat transfer processes.
- CO2. Identify, analyze and formulate heat transfer process for the thermal design of systems.
- CO3. Design thermal systems for real time applications.
- CO4. Conduct investigations on complex heat transfer problems and provide solutions.
- CO5. Use analytical and numerical solution techniques in solving heat transfer problems, including heat generation and extended surfaces

III B. Tech. – II Semester (16BT60303) NON- CONVENTIONAL ENERGY SOURCES

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Overview and importance of non-conventional energy sources; Solar Energy collection, solar energy storage and applications; Wind energy conversion; Biomass energy conversion; Geothermal energy Conversion; Ocean energy conversion: Ocean thermal energy conversion, Wave energy and tidal energy conversion.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge of Non-Conventional energy resources.
- CO2. Identify, analyze and formulate requirements for various non-conventional energy conversion systems.

- CO3. Propose probable designs for various non-conventional energy conversion systems to solve real time applications.
- CO4. Conduct investigations in selection of non-conventional energy conversion systems for a particular geographic region.
- CO5. Consider health and safety issues in designing non-conventional energy conversion systems to solve industrial and social problems.
- CO6. Optimize the utilization of the natural resources using non-conventional energy conversion systems to reduce the environmental pollution.

III B. Tech. - II Semester

(16BT50402) MICROPROCESSORS AND MICROCONTROLLERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Basic Electrical and Electronics Engineering.

COURSE DESCRIPTION: Architecture, Instruction set and programming of 8086; Programmable interfacing devices - architecture and programming; Interfacing Memory and I/O devices with 8086; 8051 Microcontroller - Architecture, programming, interrupts and applications.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Internal hardware details of Intel 8086, 8051 and programmable devices like 8255, 8251, 8259, 8257.
 - Interfacing various peripherals to build stand alone systems.
- CO2. Critically analyze the requirements to meet the specifications of microprocessors and microcontrollers based systems.
- CO3. Design and develop suitable interfaces for real time applications.
- CO4. Exhibit programming skills, choose suitable hardware and program the devices to solve Engineering problems.
- CO5. Apply appropriate techniques, resources to complex engineering activities for modeling microcomputer and microcontroller based systems with understanding of limitations.
- CO6. Apply concepts of microprocessors and microcontrollers for solving societal problems.

III B. Tech. – II Semester

(16BT41202) JAVA PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Programming in C.

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate knowledge on:
 - Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
 - Packages, interfaces, multithreading, exception handling, event handling.
- CO2. Analyze complex engineering problems using object oriented concepts.
- CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.
- CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.
- CO5. Use advanced programming languages to develop web applications.
- CO6. Build Java Applications suitable for societal requirements.

III B. Tech. – II Semester (16BT51201) COMPUTER GRAPHICS AND MULTIMEDIA

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Matrices and Numerical Methods.

COURSE DESCRIPTION: Introduction to Computer Graphics, Output Primitives; 2D Geometric Transformations and Viewing; 3D object representation and Visible Surface Detection Methods; Introduction to Multimedia, Audio and Video; Multimedia Data Compression.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. Demonstrate knowledge on:

- Graphical interactive devices
- Viewing transformations
- 3-D object representations
- Surface detection methods
- Image, audio, video representations and standards.

CO2. Analyze multimedia compression issues using image, audio and video compression techniques.

CO3. Design algorithms to generate points, lines, polygons for 2-D, 3-D objects.

CO4. Apply Transformations and Clipping algorithms for 2-D and 3-D objects, various lossy/ lossless coding techniques on text and images for compression and decompression.

CO5. Build multimedia applications for societal requirements.

III B. Tech. – II Semester (16BT60304) GAS TURBINES AND JET PROPULSION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Thermal Engineering - II

COURSE DESCRIPTION: Jet propulsion gas turbine; Engine types; Performance; Turbojet and turbofan engines; Design of Compressor; Combustor and Turbines; Jet and Rocket propulsions.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. Demonstrate the knowledge on gas turbines, Jet and Rocket propulsion systems.

CO2. Identify, Analyze and formulate the performance of components in the engine.

CO3. Design the propulsion systems with an influence on engine output considering the required parameters for a particular gas turbine engine.

CO4. Investigate and carry out a cyclic analysis of a gas turbine engine, including ramjet and turbofan.

CO5. Utilize appropriate analytical methods in integrating the engine into an aircraft system for better performance analysis.

III B. Tech. – II Semester (16BT60305) HYDRAULICS AND PNEUMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Fluid Mechanics and Basic Electrical and Electronics Engineering

COURSE DESCRIPTION: Basic fluid power system; Hydraulic components and its use; Hydraulic circuits and its application; Fundamentals of pneumatics; Pneumatic components and its use; Pneumatic circuits; Application; Design of hydraulic and pneumatic systems for various applications; Electro Pneumatics; Logic gates.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. Demonstrate the basic mechanism of fluid power systems and automation.

CO2. Identify and analyze engineering problems in automated environment.

- CO3. Design the pneumatic and hydraulic circuits for domestic and industrial problems.
- CO4. Investigate the issues related to the design and manufacture of pneumatic and hydraulic systems.
- CO5. Use modern tools available in automation to enhance the productivity.
- CO6. Deploy the best way of implementing the automation to have eco-friendly environment and sustainable development.

III B. Tech. – II Semester (16BT60306) MECHANICAL VIBRATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Dynamics of Machinery.

COURSE DESCRIPTION: Basics of vibration; Analysis of two or more degrees of freedom; Multi-body mechanical systems; Undamped free vibrations; Damped free vibration; Forced vibrations; Basic concepts on engineering measurements; Spectrum analysis; signal processing; vibration control.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on Vibration and its practical applications.
- CO2. Analyze the mathematical models of the system and provide a qualitative assessment of the vibrations present in the system.
- CO3. Design the possible sources of unwanted vibration and suggest means of rectification.
- CO4. Investigate the complex system by analyzing the sub-systems and using their models for quicker solutions.
- CO5. Use the different tools involved in Vibration Control to enhance productivity.
- CO6. Relate the issue of safety in dynamic systems involving moving parts and propose solutions for society.

III B. Tech. - II Semester (16BT60307) SUPPLY CHAIN MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Industrial Engineering and Management.

COURSE DESCRIPTION: Fundamentals of supply chain management; Supply Chain Decisions; Achieving Strategic fit; Drivers of Supply Chain; Inventory management in a supply chain; Supply chain integration; Distribution Resources Planning; Bullwhip Effect; Role of information technology in SCM; Designing and planning transportation networks through infrastructure and strategies; International and Contemporary issues in SCM; Demand and Supply planning; Mass customization; Global issues and Outsourcing problems; Supply Chain Operations Reference Model; Third party logistics; Retailer-Supplier Partnership; Metrics and Emerging trends in SCM.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate the knowledge on the supply chain management concepts including supplier relationships, and optimization approaches.
- CO2. Analyze and identify the key drivers and enablers of SCM for a given firm.
- CO3. Propose appropriate and customized strategies and policies for managing supply chain of the firm and implement the same.
- CO4. Investigate the issues in managing supply chains and give appropriate solutions that cater the needs of a particular organization.
- CO5. Use internet technologies to enhance productivity of the firm through better SCM practices.

III B. Tech. – II Semester (16BT6HS01) **BANKING AND INSURANCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Functions of Insurance; Insurance players in India.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate Knowledge in
- Tools and concepts of Banking and Insurance
 - Basic Principles and concepts of Insurance and Banking
 - E-fund transfers, e-payments and e-business models
- CO2. Develop skills in providing solutions for
- Online banking and e – payments...
 - Risk Management through insurance benefits the society at large.
 - Money management by leveraging on technology, banking and insurance services.
- CO3. Designing software and IT solutions based on banking and business models.
- CO4. Provide life-long learning for effective utilization of Banking and Insurance facilities.

III B. Tech. – II Semester (16BT6HS02) **BUSINESS COMMUNICATION AND CAREER SKILLS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Nature and scope of communication; corporate communication; writing business documents; careers and resumes; interviews.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
- Corporate Communication
 - Main Stages of Writing Messages
 - Career Building
- CO2. Analyze the possibilities and limitations of language in
- Communication Networks
 - Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in
- Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

III B. Tech. – II Semester (16BT6HS03) **COST ACCOUNTING AND FINANCIAL MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Scope, Objectives and Elements of cost Accounting; Cost Sheet and Tender quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: concept of Risk and Return on Investment.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire Knowledge in
- Elements of Costing.
 - Basic concepts of Financial Management.
 - Risk and Return
 - Cost Accountancy
 - Capital Budgeting
- CO2. Develop skills in
- Material, Labor, Overheads control.
 - Cost Control
- CO3. Develop effective Communication in Cost Accountancy and Financial Management.
- CO4. Design solutions for effective investment decisions.

III B. Tech. – II Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire Knowledge in
- Basic Principles and concepts of entrepreneurship.
 - Significance of entrepreneurship.
 - Schemes and institutions encouraging entrepreneurship.
- CO2. Develop skills in providing solutions for
- To start dynamic entrepreneurial ventures and manage them.
 - Women entrepreneurship serving as contrivance in societal development
- CO3. Develop Critical thinking and evaluation ability.
- CO4. Inculcates business acumen and attitude towards trouble shooting
- CO5. Design solutions for new start-ups

III B. Tech. – II Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Oral communications; Basic grammar; advanced grammar; basic writing; Business French (La Francais Commercial)

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Demonstrate knowledge in
- a) Process of communication
 - b) Modes of listening
 - c) Paralinguistic features
 - d) Skimming and Scanning
 - e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
- a) Barriers to Communication
 - b) Barriers to Effective Listening
 - c) Barriers to Speaking
 - d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.

- CO4.** Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5.** Understand French culture and civilization.
- CO6.** Communicate effectively with the native French in day to day situation.

III B. Tech. – II Semester

(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1.** Demonstrate knowledge in
- Process of communication
 - Modes of listening
 - Paralinguistic features
 - Skimming and Scanning
 - Elements of style in writing
- CO2.** Analyze the possibilities and limitations of language, understanding
- Barriers to Communication
 - Barriers to Effective Listening
 - Barriers to Speaking
 - Formal and metaphorical language
- CO3.** Design and develop language skills for professional practice.
- CO4.** Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5.** Understand German culture and civilization.
- CO6.** Communicate effectively with the native German in day to day situation.

III B. Tech. – II Semester

(16BT6HS07) INDIAN CONSTITUTION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, understanding for better professional practice and good citizenry

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1.** Gain knowledge in
- parliamentary proceedings, laws, legislature, administration and its philosophy
 - federal system and judiciary of India
 - social problems and public services like central civil services and state civil services
 - Indian and international political aspects and dynamics
- CO2.** Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen

III B. Tech. – II Semester (16BT6HS08) INDIAN ECONOMY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value Analysis; Value Engineering; Economic Planning.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire the knowledge in
- Micro and Macro Economics.
 - Traditional and Modern methods of Capital Budgeting.
 - Five year plans and NITI Aayog.
- CO2. Analyze
- Capital Budgeting.
 - Value Analysis and Value Engineering.
 - Economic analysis
 - Law of supply and demand
- CO3. Understand the nuances of project management and finance

III B. Tech. – II Semester (16BT6HS09) INDIAN HERITAGE AND CULTURE

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Acquaint knowledge in
- human aspirations and values in Vedic culture.
 - cultural aspects of Buddhism and Jainism
 - unification of our country under Mourya's and Gupta's administrations
 - socio Religious aspects of Indian culture
 - reform movements and harmonious relations.
- CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts

III B. Tech. – II Semester (16BT6HS10) INDIAN HISTORY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Gain knowledge on evolution and history of India as a nation
- CO2. Analyze social and political situations of past and current periods
- CO3. Practice in career or at other social institutions morally and ethically

III B. Tech. – II Semester (16BT6HS11) PERSONALITY DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Demonstrate knowledge in
 - Self-Management
 - Planning Career
- CO2. Analyze the situations based on
 - Attitudes
 - Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

III B. Tech. – II Semester (16BT6HS12) PHILOSOPHY OF EDUCATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire knowledge in
 - Philosophy of Engineering education.
 - Philosophical Methods.
 - Knowledge acquiring methods.
 - Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational outcomes.
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

III B. Tech. – II Semester (16BT6HS13) PUBLIC ADMINISTRATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire knowledge in
 - Public Policy.
 - Good Governance.
 - E-governance.
 - Development Administration.
- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance modelsto find and provide opportunities in e-governance.

- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing Bureaucracy. Role of civil society.

III B. Tech. – II Semester

(16BT60112) BUILDING MAINTENANCE AND REPAIR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. Analyze failures, repair and rehabilitation techniques.
- CO3. Solve complex building maintenance problems through proper investigations and interpretation.
- CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. Provide solutions for building maintenance and repair problems considering health and safety.
- CO6. Consider environmental sustainability in building maintenance and repair.
- CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

III B.Tech. – II Semester

(16BT60113) CONTRACT LAWS AND REGULATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. Analyze contracts and tenders.
- CO3. Address the legal issues in contracts and tenders.
- CO4. Follow laws and regulations in the preparation of contracts and tenders.
- CO5. Prepare contract and tender documents as per the standards.
- CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

III B.Tech. - II Semester

(16BT60114) DISASTER MITIGATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of course, students will be able to:

- CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. Analyze disasters and their vulnerability.
- CO3. Design strategies for effective disaster mitigation.

- CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. Use appropriate methods in disaster mitigation and management.
- CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. Solve disaster related issues considering environment.
- CO8. Consider economical issues in disaster management.

III B.Tech. - II Semester

(16BT60115) ENVIRONMENTAL POLLUTION AND CONTROL

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.

III B.Tech. - II Semester

(16BT60116) PLANNING FOR SUSTAINABLE DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:—

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.
- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

III B.Tech. – II Semester

(16BT60117) PROFESSIONAL ETHICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.

- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.
- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

III B.Tech. - II Semester **(16BT60118) RURAL TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Rural technology; Non conventional energy; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of biofertilisers and usage of agromachinery in agriculture.

III B.Tech. - II Semester **(16BT60308) GLOBAL STRATEGY AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on Strategic management, Research & development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

III B.Tech. - II Semester

(16BT60309) INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

III B. Tech. – II Semester

(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3. Develop a comprehensive and well planned business structure for a new venture.
- CO4. Conduct investigation on complex problems, towards the development of Project.
- CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6. Apply ethics in constructive innovation framework.
- CO7. Exhibit professionalism by employing modern project management and financial tools.

III B. Tech. – II Semester (16BT60311) MATERIALS SCIENCE

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semi conductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on concepts of fundamental science and engineering principles relevant to materials.
- CO2. Analyze the structures of various types of Ferrous, Non ferrous alloys influencing various engineering applications.
- CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.
- CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
- CO5. Consider health and safety issues while providing materials to real time applications.
- CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

III B. Tech. - II Semester (16BT70412) GREEN TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
- CO2. Analyze various green technologies for engineering practice.
- CO3. Provide green solutions to engineering problems.
- CO4. Apply various green techniques in the engineering practice.
- CO5. Consider health and safety issues while providing green solutions to the society.
- CO6. Understand issues related to environment sustainability.
- CO7. Apply ethical standards for environmental sustainability in the engineering practice.

III B. Tech. - II Semester

(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Nanoscale technology.
 - Difference between micro and nanotechnology
 - Classification of Nanostructure and Nanomaterial
 - Fabrication of various nanomaterials and nano-structures.

- CO2. Analyze numerical and analytical problems in
 - Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
- CO3. Design and fabricate devices based on nanostructures like
 - Nano solar cell
 - Nano cantilever
 - Nano bio-sensor
- CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.
- CO5. Select appropriate technique for fabrication of nanostructures and nanocomposites.
- CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

III B. Tech. – II Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in
 - Systems Process and System Design
 - Systems Analysis and Modeling
 - System Development Life Cycle
 - Design Management and Maintenance Tools.
- CO2. Analyze System Process and estimate the given models by using case tools.
- CO3. Design and Develop a model to the organizational systems.
- CO4. Solve complex problems related to engineering systems and produce accurate results.
- CO5. Apply object oriented techniques for modeling dynamic systems.
- CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

III B.Tech. – II Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators
- CO2. Analyze the properties of materials and identify its suitability for MEMS devices.
- CO3. Design MEMS devices that meet desired specifications and requirements.
- CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
- CO5. Use modern techniques in micro manufacturing process.
- CO6. Develop efficient and cost effective MEMS based products for society.

III B. Tech. – II Semester (16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge in Cyber security, Cyber crimes and its related laws in Indian and Global Act.
- CO2. Analyze the legal perspectives and laws related to cyber crimes in Indian context.
- CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber crimes.
- CO4. Solve Cyber security issues using privacy policies.
- CO5. Use antivirus tools to minimize the impact of cyber threats.
- CO6. Follow security standards for the implementation of Cyber Security and laws.

III B.Tech. – II Semester (16BT61505) BIOINFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: —

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics

COURSE OUTCOMES: On successful completion of this course, student will be able to:

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2. Analyze biological sequences for Homology Modeling.
- CO3. Apply clustering methods for Phylogenetic trees.
- CO4. Solve bio sequencing problems using dynamic programming.
- CO5. Select and apply appropriate techniques and tools to structure Prediction

III B. Tech. - II Semester (16BT60331) CAD AND SIMULATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Computer Aided Machine Drawing Lab.

COURSE DESCRIPTION: Fundamental Concepts of CAD and Simulation; 2D and 3D Part Modeling; Analysis of Simple Structural, Thermal and CFD problems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate basic knowledge to use software package CREO to generate 3D models of parts and assemblies, and choose appropriate module of ANSYS to perform stress, thermal and CFD analysis.
- CO2. Analyze any part or machine component in a standardized manner suitable for industrial scenarios.
- CO3. Design components and analyze for various required parameters.
- CO4. Conduct investigation on complex subsystem and employ bottom-up approach to build the model of the entire system and generate drawings or models.
- CO5. Apply appropriate hardware and software for CAD and Simulation thereby enhancing productivity in design.

- CO6. Contribute to the society and engineering profession based on standard engineering norms and practices in design.
- CO7. Function effectively as an individual and as a member of team to combine various part components into a single assembly.
- CO8. Communicate effectively about any mechanical components or system.

III B. Tech. – II Semester (16BT60332) HEAT TRANSFER LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Heat Transfer.

COURSE DESCRIPTION: Experimental studies on mechanisms of heat transfer; Film wise and drop wise condensation; Steady and unsteady flow; Effectiveness of heat exchanger; thermal conductivity; emissivity; Stefan - Boltzmann constant.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge of heat transfer phenomenon in objects of different geometries.
- CO2. Identify, formulate and analyze various heat transfer problems.
- CO3. Design various thermal systems and conduct experiments to increase/decrease heat transfer rates.
- CO4. Investigate the results obtained in the various experiments and provide suitable conclusions.
- CO5. Apply dimensional analysis to evaluate the performance of heat transfer equipment.
- CO6. Work and contribute to team to accomplish common goals.
- CO7. Communicate effectively about laboratory work reports and presentations.

III B. Tech – II Semester (16BT60333) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PRE-REQUISITES: —

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES: Completion of the seminar work enables a successful student to demonstrate:

- CO1. Knowledge on the seminar topic.
- CO2. Analytical ability exercised during the seminar work.
- CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.
- CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.
- CO5. Ability to function effectively as an individual as experienced during the seminar work.
- CO6. Ability to present views cogently and precisely on the seminar topic.
- CO7. Ability to engage in life-long learning as experience during the seminar work.

IV B. Tech – I Semester (16BT70301) AUTOMOBILE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Thermal Engineering-I.

COURSE DESCRIPTION: Basic components and classification of automobiles; Fuel Supply System; Cooling System; Ignition System; Emissions from automobiles; Pollution control Techniques; Transmission System; Steering System; Suspension and Braking System.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on working of various components of an automobile.

- CO2. Identify and analyze the various systems and sub systems suitable for an automobile.
- CO3. Present the probable solution in the design of fuel systems, cooling and ignition systems, transmission systems, steering systems, suspension and braking systems of an automobile.
- CO4. Investigate the complex issues in automobile engineering and provide valid conclusions.
- CO5. Use the techniques to estimate pollution from the emissions of automobiles.
- CO6. Use the national and international standards to assess the emissions from automobiles considering health and safety.

IV B. Tech. – I Semester

(16BT70302) **FINITE ELEMENT METHOD**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Design of Machine Elements-II and Heat Transfer.

COURSE DESCRIPTION: Discretization; Formulation of finite element expression; Finite Element approach to solve 1-D problems; beams; trusses; CST problems; Heat transfer problems and Dynamic analysis problems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate principles and approaches for solving FEM problems in different fields.
- CO2. Formulate and analyze element stiffness matrices and shape functions to find stresses in trusses and beams.
- CO3. Develop solutions for CST element and axi-symmetric element.
- CO4. Conduct investigation on heat transfer problems using FEM.
- CO5. Apply finite element technique to solve vibration analysis problems.
- CO6. Apply practical constraints to find solutions for structural and thermal problems.

IV B. Tech. – I Semester

(16BT70303) **OPERATIONS RESEARCH**

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Industrial Engineering and Management

COURSE DESCRIPTION: Quantitative methods and techniques for effective decision making; model formulation and applications pertinent to business decision problems; mathematical tools for solving deterministic problems, linear programming formulation and optimization; transportation models; queuing models and simulation; Replacement models; Game theory.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on preparation of mathematical model for optimization in a given application.
- CO2. Analyze a practical situation and apply appropriate methodology to solve the problem.
- CO3. Design a system with optimum parameters to maximize the efficiency and minimize the wastage in selected situations.
- CO4. Investigate alternate solutions for complex decision making problems.
- CO5. Apply simulation tool to model the industrial systems.
- CO6. Consider societal issues in solving industrial decision making problems for optimum benefits.

IV B. Tech. – I Semester
(16BT70304) CRYOGENICS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Refrigeration & Air-conditioning

COURSE DESCRIPTION: Necessity of low temperature, Multi stage refrigeration, Cascade system, Properties of cryogenic fluids, Liquefaction of air, hydrogen and helium, Applications of low temperature, Low temperature insulation, Storage systems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the principles of cryogenics in various low temperature refrigeration applications.
- CO2. Analyze the various refrigeration cycles in solving cryogenic problems.
- CO3. Present the probable solution in the design of insulation to the various systems in handling the cryogenic fluids.
- CO4. Conduct investigations cryogenic fluids suitable for low temperature applications in real time situations.
- CO5. Apply the suitable storage and handling systems for various cryogenic fluids.

IV B. Tech. – I Semester
(16BT70305) GEOMETRIC MODELLING

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on CAD/CAM.

COURSE DESCRIPTION: Basic concepts of coordinate systems; Bezier curves and surfaces, geometric continuity, curvature, subdivision, curve and surface fitting; Output primitives; 2-D and 3-D geometrical transformations and viewing; Surface detection methods and Computer Animation.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on the Concepts of coordinate systems and Design Parameters involved in computer aided drawings.
- CO2. Analyze higher degree curves using algorithms in geometric modeling.
- CO3. Propose solutions which indulge with multiple 2-D and 3-D geometrical transformations to represent and solve real engineering problems.
- CO4. Conduct investigations on intricate and non linear design projects involving geometric modeling.
- CO5. Apply the visual surface detection methods such as solid works, Unigraphics, Ansys, Hyper mesh for new product design.
- CO6. Consider societal issues while providing designs to real time applications.

IV B. Tech. – I Semester
(16BT70306) QUALITY MANAGEMENT AND RELIABILITY ENGINEERING

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Industrial Engineering and Management.

COURSE DESCRIPTION: Introduction to Quality, Quality Costs, Quality Circles, QC Tools, Statistical Quality Control, Control Charts, Acceptance Sampling Evaluation, Reliability, Types of Failures, Reliability Improvement.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on the concepts of standardization and bodies of standardization for improvement of quality.
- CO2. Analyze sampling plans for continuous quality in production.
- CO3. Develop failure hazard models to improve reliability.
- CO4. Conduct investigations to identify active and standby redundancies for reliability optimization.
- CO5. Use control charts and quality tools for inspection of quality.
- CO6. Improve products and processes in accordance with the requirements for building and sustaining performance excellence.
- CO7. Use the quality control codes and standards in the quality control processes.

IV B.Tech. - I Semester
(16BT70307) TOOL DESIGN

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Machine Tools and Modern Machining Processes.

COURSE DESCRIPTION: Basic cutting parameters; Determination of cutting forces; Stresses and Strains; Importance of heat treatment in tool design; design of dies; design of single and multi-point cutting tools.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate knowledge on the impact of cutting tool angles for various operations.
- CO2. Analyse the cutting tool requirement and specify the material and geometry required for a given tool in a given machining situation.
- CO3. Design single/multipoint cutting tools and jigs/fixtures for selected applications.
- CO4. Interpret tolerances applicable to dies, jigs, fixtures and moulds.
- CO5. Select the tool and other requirements for machining an object with complex geometry.

IV B. Tech. - I Semester
(16BT70308) COMPUTATIONAL FLUID DYNAMICS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Heat Transfer.

COURSE DESCRIPTION: Introduction to Computational Fluid Dynamics(CFD); Various Numerical methods; Solution methods for governing equations; Finite difference method and its application to heat transfer problems; Errors and stability analysis; Study flow analysis; Simple CFD techniques.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge of CFD techniques, basic aspects of discretization and grid generation in solving partial differential equations.
- CO2. Analyze CFD problems and offer probable solutions using Finite Differential approach.
- CO3. Develop mathematical models and flow simulations for CFD problems.
- CO4. Conduct investigations on complex CFD problems using different techniques.
- CO5. Apply modern flow simulation codes for solving governing equations of computational fluid dynamics.
- CO6. Use CFD techniques for critical decision making in various applications in the society to eliminate the need for expensive and complex prototypes.

IV B. Tech. – I Semester
(16BT70309) INDUSTRIAL ROBOTICS

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods and Dynamics of Machinery.

COURSE DESCRIPTION: Introduction of Robots classifications; Components; Robot drive mechanisms; Mechanical transmission methods aided in functioning of robots; Forward kinematics; inverse kinematics; Manipulator dynamics; Trajectory planning and avoidance of obstacles; Robot programming; Robot Application in Industry; Future Application and Challenges and Case Studies.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on concepts of robot, Kinematics and dynamics, Trajectory planning and programming of robot.
- CO2. Identify, analyze and interpret various methods and review the contemporary problems of robotics.

- CO3. Optimize various robotic configuration parameters to analyze the reverse and forward kinematics.
- CO4. Investigate the performance parameters on the complex robotic designs.
- CO5. Apply appropriate functional techniques, resources, and programming tools to robotic engineering activities.
- CO6. Consider safety issues in designing robots for societal applications.

IV B. Tech. – I Semester **(16BT70310) PRODUCT DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Design of Machine Elements-I, CAD/CAM, Manufacturing Technology and Industrial Engineering and Management.

COURSE DESCRIPTION: Introduction to Design process; Identifying customer needs; Product development and design processes and methods; Product specifications; Concept development; Theory of Inventive Problem solving (TRIZ); Conception selection; Conception testing; Introduction to Embodiment design; Product architecture; Industrial design; Design for prototyping; and manufacturing; Ethical issues considered during Engineering Design Process.

COURSE OUTCOMES: On successful completion of this course, students will be able to

- CO1. Demonstrate the knowledge on general design principles, material selection, theories of failure, factor of safety and manufacturing considerations.
- CO2. Analyze and interpret the given product by modeling and simulation techniques by using the design specifications.
- CO3. Design the complex engineering models and solution for the product.
- CO4. Investigate and improve the process by using the tools like Failure mode effect analysis and Taguchi Methods.
- CO5. Consider societal and safety issues in the designing of the products.
- CO6. Follow the Ethical principles during engineering design process.

IV B. Tech. - I Semester **(16BT70311) PRODUCTION AND OPERATIONS MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Industrial Engineering and Management.

COURSE DESCRIPTION: Overview of production and operations management concepts and issues from both strategic and operational perspective; relationships between operations and environment; analysis of strategic issues relating to competitiveness in production and operations management, and application of tools to improve productivity in production and operations; concepts/principles related to management of operations – forecasting demand; production, material and capacity requirements planning; scheduling; inventory planning and control; lean and supply chain management systems.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge of Aggregate Planning, Scheduling, Forecasting, and Supply Chain Management to various operations of industry.
- CO2. Analyze the operations of an industry and incorporate principles and concepts of operations management to assess and improve operational performance.
- CO3. Design a process by optimizing the use of resources that meet the specified needs with appropriate consideration for industrial operations.
- CO4. Apply the techniques of forecasting, aggregate planning, Just-In-Time, Enterprise Resource Planning, Kaizen to establish methods for maximizing productivity.
- CO5. Use the concepts of operations management and specialized knowledge in Operations Management to solve business processes steering to meet societal needs.
- CO6. Manage the industrial projects from forecasting of demand, identification of Material requirements, scheduling on machines and dispatching it to customer

IV B. Tech. – I Semester

(16BT70312) POWER PLANT ENGINEERING

(Program Elective-4)

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on Thermal Engineering-II and Heat transfer.

COURSE DESCRIPTION: Energy sources; Types of Power Plants; Thermal power plant; Study of various systems of thermal power plant; Combustion and Firing Methods; Diesel Power plant; Gas Turbine Power Plants; Hydroelectric power plants and Nuclear power plants; Power generation and recovery systems; Various conventional and nonconventional sources of energy with power plant economics.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on various power plants and its sub systems.
- CO2. Identify, analyze and formulate the various systems and components in power plants.
- CO3. Propose probable designs of power plants for a particular geographic region.
- CO4. Conduct investigation on the components of power plants using thermodynamic analysis to predict the performance of the power plants.
- CO5. Consider health and safety issues in selecting a suitable type of power plant in a given location.
- CO6. Provide preliminary estimates of the capital cost and operating costs of a power plant.

IV B. Tech – I Semester

(16BT70313) PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Course on Industrial Engineering and Management.

COURSE DESCRIPTION: Project Characteristics; Project Selection; Economics; Feasibility Assessment and Evaluation; Project integration; Project scope management; Project time and cost management; Organizational and Work Breakdown; Scheduling; Budgeting; Project Control; Project Auditing; Financing for projects; Project investment evaluation.

EXPECTED OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the process of project management and practice it in the execution of projects.
- CO2. Analyze the key performance metrics, audit report and project closure activities to obtain formal project acceptance.
- CO3. Develop the resources required for a project to produce effective work plan and resource schedule.
- CO4. Apply project management tools and techniques for project communications, risk analysis, and quality control.
- CO5. Steer the projects for maximizing societal benefit.
- CO6. Provide accurate project cost estimates and to plan various activities accordingly.

IV B. Tech. – I Semester

(16BT70314) RAPID PROTOTYPE TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks
30	70	100

L	T	P	C
3	1	-	3

PRE-REQUISITES: Courses on CAD/CAM and Manufacturing Technology.

COURSE DESCRIPTION: History of RP systems; Stereo; Data files and machine details; Type of machines; Solid Ground Curing; Principle of operation, Machine details; Applications; Thermal jet printer; 3-D printer; GenisysXs printer HP system 5; Indirect Rapid tooling, Silicone rubber tooling; Aluminum filled epoxy tooling; Tooling; Quick cast process; Copper polyamide; Rapid Tool; DMILS; Software For RP; STL files; Overview of Solid view; Collaboration tools; Rapid manufacturing process optimization; Vacuum; Casting, Surface digitizing; data transfer to solid models.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge to identify the tools needed to produce a prototype of the product using RPT techniques.
- CO2. Analyze the various simulations /proto typings and select an RPT system.
- CO3. Develop the steps to acquire the desired products in any RPT system using the knowledge of process parameters of the machine.
- CO4. Investigate the viability of various rapid tooling for specific applications.
- CO5. Apply tools to develop manufacturing data which will be essential to produce products conforming to industrial standards.

IV B. Tech. - I Semester (16BT70315) TRIBOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Fluid Mechanics and Design of Machine Elements-II.

COURSE DESCRIPTION: Surface friction; characteristic, sources, wear of various metals; lubricants, types, lubrication necessity; film lubrication theory; loads on bearing; surface modification; surface coatings; fusion processes; material for bearings.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the knowledge on effect of friction, wear phenomenon and lubrication in any system of mechanism.
- CO2. Analyze complex problems in tribological system of mechanical engineering.
- CO3. Design the journal bearing and provide suitable lubrication to minimize the stresses.
- CO4. Conduct investigations on complex problems tribology and provide valid Solutions
- CO5. Deploy the contextual knowledge on friction/lubrication mechanisms to the professional Engineering practices.
- CO6. Implement the design pattern to have eco-friendly environment and sustainable development.

IV B. Tech. - I Semester (16BT70331) COMPUTER AIDED MANUFACTURING AND AUTOMATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: --

COURSE DESCRIPTION: CNC Programming; Pressure control valve; flow control valve; Directional control valve; Logic controls; Timers; PLC; Ladder diagram; Robotics.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the practical usage of automation and robotics.
- CO2. Analyse the hydraulic, pneumatic circuits for the appropriateness to real time applications.
- CO3. Design and model different components using automation and develop codes for part programming in CNC
- CO4. Conduct investigations to suit the automation and robotics for practical applications.
- CO5. Using computer numerical control techniques in computer aided manufacturing of components.
- CO6. Formulate the team to attain multidisciplinary settings in achieving automation.
- CO7. Communicate effectively on sequence of manufacturing operations for the given component or machine.

IV B. Tech. - I Semester
(16BT70332) INDUSTRIAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Operations Research.

COURSE DESCRIPTION: Work study; Method Study; Preparation of Process Charts; Work Measurement; Time Study; Productivity; Sampling; Quality control for attributes; Ergonomics; Supply Chain Management, Simulation of Inventory.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- CO1. Demonstrate the concepts and use of IE techniques in providing solutions to complex productivity related Problems.
- CO2. Analyze the process parameters required for conducting the experiments related to industrial engineering problems.
- CO3. Prepare (Design) and conduct the exercises on Process chart, Method study and Work Measurement for effective utilization of Man- power resources.
- CO4. Investigate the results obtained in the various experiments and draw suitable conclusions.
- CO5. Apply IE techniques to achieve Effective work place environment.
- CO6. Work and contribute to team to accomplish common goals.
- CO7. Communicate effectively about laboratory work reports and presentation.

IV B. Tech – I Semester
(16BT70333) COMPREHENSIVE ASSESSMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to demonstrate:

- CO1. Knowledge in the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Ability to engage in life-long learning in the courses of the program.

IV B. Tech – II Semester
(16BT80331) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

- CO1. Knowledge on the project topic.
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex engineering problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the engineering practice as applied in the project work.
- CO9. Ability to function effectively as an individual as experienced during the project work.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO12. Ability to engage in life-long learning as experience during the project work.

Program: B.Tech. CIVIL ENGINEERING

I B. Tech. - I Semester (16BT1HS01) Technical English

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1.** Demonstrate knowledge in
 - a. Process of communication
 - b. Modes of listening
 - c. Paralinguistic features
 - d. Skimming and Scanning
 - e. Elements of style in writing
- CO2.** Analyze the possibilities and limitations of language for understanding
 - a. Barriers to Communication
 - b. Barriers to Effective Listening
 - c. Barriers to Speaking
 - d. Formal and metaphorical language
- CO3.** Design and develop functional skills for professional practice.
- CO4.** Apply writing skills in preparing and presenting documents
- CO5.** Function effectively as an individual and as a member in diverse teams.
- CO6.** Communicate effectively with the engineering community and society in formal and informal situations.

I B. Tech - I Semester (16BT1BS01): ENGINEERING CHEMISTRY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1:** Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
- CO2:** Develop analytical skills in:
 - a. Determination of hardness of water.
 - b. Determination of viscosity, flame and fire points, cloud and pour points.
- CO3:** Develop designing skills in:
 - a. Synthesis of engineering plastics.
 - b. Chemical methods for the synthesis of Nano materials.
- CO4:** Develop skills for providing solutions through:
 - a. Mitigation of hardness of water.
 - b. Newer Nanomaterials and engineering plastics for specific applications
- CO5:** Acquire awareness to practice engineering in compliance to modern techniques such as:
 - a. Nalgonda technique for defluoridation of water
 - b. Electroplating technique for control of corrosion.
- CO6:** Acquire awareness to societal issues on:
 - a. Quality of water.
 - b. Bio-diesel
 - c. Chemical materials utility and their impact.

I B. Tech. - I Semester
(16BT1BS03) MATRICES AND NUMERICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire basic **knowledge** in
- Finding the rank of matrices and analyzing them.
 - Solving algebraic and transcendental equations by various numerical methods.
 - Fitting of various types of curves to the experimental data.
 - Estimating the missing data through interpolation methods.
 - Identification of errors in the experimental data
 - Finding the values of derivatives and integrals through various numerical methods.
 - Solving differential equations numerically when analytical methods fail.
- CO2: Develop skills in **analyzing** the
- methods of interpolating a given data
 - properties of interpolating polynomials and derive conclusions
 - properties of curves of best fit to the given data
 - algebraic and transcendental equations through their solutions
 - properties of functions through numerical differentiation and integration
 - properties of numerical solutions of differential equations
- CO3: Develop skills in **designing** mathematical models for
- Fitting geometrical curves to the given data
 - Solving differential equations
 - Constructing polynomials to the given data and drawing inferences.
- CO4: Develop numerical skills in **solving the problems** involving
- Systems of linear equations
 - Fitting of polynomials and different types of equations to the experimental data
 - Derivatives and integrals
 - Ordinary differential equations
- CO5: Use relevant numerical **techniques** for
- Diagonalising the matrices of quadratic forms
 - Interpolation of data and fitting interpolation polynomials
 - Fitting of different types of curves to experimental data
 - obtaining derivatives of required order for given experimental data
 - Expressing the functions as sum of partial fractions

I B. Tech. - I Semester
(16BT1BS04) MULTI-VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

- CO1: Acquire knowledge in
- Higher order Differential equations
 - Maximum and minimum values for the functions of several variables
 - Double and triple integrals
 - Differentiation and integration of vector functions.
 - Line and surface volume
 - transforming integrals from three dimensional surfaces and volumes on to plane surfaces
- CO2: Develop skills in analyzing the
- methods for differential equation for obtaining appropriate solutions,
 - Properties of oscillatory electrical circuits and heat transfer in engineering systems
 - The variations in the properties of functions near their stationary values
 - Flow patterns of fluids, electrical and magnetic flux and related aspects
- CO3: Develop skills in designing mathematical models for
- R-C and L-R-C oscillatory electrical circuits
 - Heat transfer and Newton's law of cooling

- (c) Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces
- CO4: Develop analytical skills in solving the problems involving
- (a) Newton's law of cooling
 - (b) non homogeneous linear differential equations
 - (c) maximum and minimum values for the functions
 - (d) lengths of curves, areas of surfaces and volumes of solids in engineering
 - (e) transformation of integrals from three dimensional surfaces and volumes on to plane surfaces
- CO5: Use relevant mathematical techniques for evaluating
- (a) various types of particular integrals in differential equations
 - (b) stationary values for multi variable functions
 - (c) multiple integrals in change of variables
 - (d) integrations of vector functions.

I B. Tech. - I Semester

(16BT10501) PROGRAMMING IN C

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1: Demonstrate knowledge in:
- o Elements of C Language
 - o Selection and Repetition statements.
 - o Arrays, Strings and Functional statements.
 - o Derived data types, Files and Pointers
- CO2: Analyze complex engineering problems to develop suitable solutions
- CO3: Design algorithms for specified engineering problems
- CO4: Use appropriate 'C' language constructs for solving engineering problems
- CO5: Write programs using 'C' language to implement algorithms

I B. Tech. - I Semester

(16BT1HS31) ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: English at Intermediate or Equivalent Level

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to

- CO1. Demonstrate knowledge in
- a. Phonetics
 - b. Information Transfer
- CO2. Analyze the situations in professional context by using
- a. Vocabulary
 - b. Grammar
- CO3. Design and develop functional skills for professional practice.
- CO4. Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.
- CO5. Function effectively as an individual and as a member in diverse teams through
- a. Extempore talk and
 - b. Role Play
- CO6. Communicate effectively in public speaking in formal and informal situations.
- CO7. Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

I-B. Tech- I Semester
(16BT1BS31): **ENGINEERING CHEMISTRY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of pH on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, pH meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.
- CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
- CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.
- CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, pH of a solution, determination of viscosity of lubricants and estimation of iron in cement.
- CO5: Provide solutions for environmental issues through determination of quality of water.

I B. Tech. - I Semester
(16BT10331) **COMPUTER AIDED ENGINEERING DRAWING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	6	3

PRE-REQUISITES: None

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

I B. Tech. - I Semester
(16BT10531) **PROGRAMMING IN C LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:-

A course on Programming in C

COURSE DESCRIPTION:

Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- CO1. Demonstrate practical knowledge of using C language constructs:
 - . Selection and Repetition statements.
 - . Arrays, Strings and Functional statements.
 - . Derived data types, Files and Pointers
- CO2. Analyze problems to develop suitable algorithmic solutions
- CO3. Design Solutions for specified engineering problems

- CO4.** Use appropriate 'C' language constructs for solving engineering problems
CO5. Implement and execute programs using 'C' language
CO6. Document programs and communicate effectively while conducting Professional transactions.

I B. Tech. - II Semester
(16BT1BS02) ENGINEERING PHYSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: Intermediate / Senior Secondary Physics

COURSE DESCRIPTION: Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

- CO1.** Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.
CO2. Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
CO3. Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
CO4. Develop problem solving skills in engineering context.
CO5. Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser.

I B. Tech. - II Semester
(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

- CO1:** Acquire basic knowledge in
 (a) Fourier series and Fourier transforms
 (b) Fourier integrals
 (c) Laplace transforms and their applications
 (d) z- transforms and their applications
 (e) solving partial differential equations
CO2: Develop skills in analyzing the
 (a) Properties of Fourier series for a given function
 (b) Partial differential equations through different evaluation methods
 (c) Difference equations through z – transforms
 (d) Engineering systems and processes involving wave forms and heat transfer
CO3: Develop skills in designing mathematical models for
 (a) Problems involving heat transfer and wave forms
 (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations
CO4: Develop analytical skills in solving the problems involving
 (a) Fourier series and Fourier transforms
 (b) Laplace transforms
 (c) Z-transforms and difference equations
 (d) Heat transfer and wave motion
CO5: Use relevant transformation techniques for
 (a) Obtaining Fourier transforms for different types of functions
 (b) Laplace transforms
 (c) Z- transforms
 (d) Partial differential equations

I B. Tech. - II Semester
(16BT20101) **BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITE: Engineering Chemistry

COURSE DESCRIPTION: Stones; Bricks; Tiles; Timber; Lime; Cement; Miscellaneous materials in construction; Masonry and Foundations; Building Components; Finishings; Shoring; Scaffolding and Formwork.

COURSE OUTCOMES:

On successful completion of this course the students will be able to

- CO1.** Identify building materials, building components and construction techniques.
- CO2.** Characterize building materials and construction techniques.
- CO3.** Recommend proper building materials and construction techniques.
- CO4.** Develop new construction materials and construction techniques.
- CO5.** Use modern tools and techniques in construction practice.
- CO6.** Ensure health and safety in construction practice.
- CO7.** Encourage sustainable and environmental friendly building materials and construction techniques.
- CO8.** Maintain ethical standards for quality in construction.
- CO9.** Promote cost effective building materials and construction techniques.
- CO10.** Engage in continuous learning of latest construction materials and techniques.

I B. Tech. - II Semester
(16BT20102) **ENGINEERING MECHANICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PRE-REQUISITES: Intermediate Mathematics and Physics.

COURSE DESCRIPTIONS: statics of particles and rigid bodies; support reactions; analysis of perfect frames; friction; centroid, centre of gravity and moment of inertia; kinematics and kinetics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Apply the knowledge of engineering mechanics fundamentals to the solutions of basic engineering problems.
- CO2:** Analyze
 - Multi-body systems under equilibrium and dynamic conditions.
 - Systems involving dry friction and computing the efficiency of the system of forces in frames under suitable assumptions.
 - Sectional properties of surfaces and solids.
- CO3:** Design sustainable solutions to complex engineering problems using first principles of engineering mechanics.
- CO4:** Exercise awareness to assess the safety of system related to engineering mechanics.
- CO5:** Communicate effectively engineering and allied information through free body diagram.
- CO6:** Sustain interest in engineering mechanics to upgrade knowledge and skills through self learning concepts in mechanics.

I B. Tech. - II Semester
(16BT20241) **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Physics and Mathematics

COURSE DESCRIPTION: Basics of electrical DC and AC circuits; principle of operation and applications of DC machines, transformers, and induction motors; Transducers and measuring instruments; rectifier devices; bipolar transistors and its characteristics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Demonstrate knowledge on
 - ☐ Electrical and electronic circuits.
 - ☐ Construction and operation of electrical machines, electrical and electronic instruments.
- CO2:** Analyze various electrical & electronic circuits and different transducers.
- CO3:** Evaluate the electrical and electronic circuit parameters and performance of electrical machines.
- CO4:** Select and apply various machines and transducers.

I B. Tech. - II Semester
(16BT1BS32) ENGINEERING PHYSICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3: Develop skills in designing electronic circuits using semiconductor components.

CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.

CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

I B. Tech. - II Semester
(16BT20131) BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: Building Materials and Construction Technology

COURSE DESCRIPTION: Exercises on Masonry; Bar bending; Painting; House wiring; Shuttering and scaffolding; Plumbing and sanitation; Building materials; Construction equipment.

COURSE OUTCOMES:

After completion of this course, a successful student will be able to:

CO1. Identify building materials, building components and construction techniques.

CO2. Characterize building materials and construction techniques.

CO3. Recommend proper building materials and construction techniques.

CO4. Develop new construction materials and construction techniques.

CO5. Use modern tools and techniques in construction practice.

CO6. Ensure health and safety in construction practice.

CO7. Encourage sustainable and environmental friendly building materials and construction techniques.

CO8. Maintain ethical standards for quality in construction.

CO9. Function effectively as an individual, and as a member or leader in teams.

CO10. Comprehend and write effective reports on building materials and construction techniques.

CO11. Promote cost effective building materials and construction techniques.

CO12. Engage in continuous learning of latest construction materials and techniques.

I B. Tech. - II Semester
(16BT20252) MATLAB Practice for Civil Engineers

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	3	2

PRE-REQUISITE: Mathematics at Intermediate Level and Principles of Computer Programming.

COURSE DESCRIPTION: Exercises on MATLAB Basics; Arrays; Functions and Files; Programming Techniques; Plotting; Linear Algebraic Equations; Polynomials; Simulink.

COURSE OUTCOMES:

After successful completion of the course, student will be able to

CO1. Apply knowledge of MATLAB basics.

CO2. Carryout numerical computations and analysis.

CO3. Design solutions for engineering problems using MATLAB.

CO4. Develop solutions for complex civil engineering problems using MATLAB Programming and Simulation.

CO5. Use MATLAB Tool boxes for civil engineering applications.

I B. Tech. - II Semester
(16BT20331) ENGINEERING WORKSHOP PRACTICE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: None

COURSE DESCRIPTION: Knowledge on various workshop hand and power tools; utilization in different manufacturing trades such as carpentry, fitting, house wiring, sheet metal forming, foundry; overview of metal cutting processes, plumbing and welding through live demonstrations.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO1:** Acquire knowledge on utilization of hand and power tools for engineering applications.
- CO2:** Employ analytical skills for the production of a component for real time applications.
- CO3:** Design and model different prototypes in the carpentry, fitting and sheet metal operations.
- CO4:** Comprehend the usage of modern power tools.
- CO5:** Abide by workshop safety regulations and adopt environmentally safe practices.
- CO6:** Engage in self study for solving engineering related problems.

II B.Tech. – I Semester
(16BT3BS01) PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: Intermediate/senior secondary mathematics

COURSE DESCRIPTION: Random variables; mathematical expectations; probability distributions; correlation and regressions; statistical quality control; sampling distributions; tests for small and large samples and their significances.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire basic knowledge in
 - a) probability distributions, correlation and regressions
 - b) statistical quality control and testing of hypotheses
 - c) Simple linear regression
 - d) Tests of significance for small and large samples
- CO2. Develop skills for analyzing the data with
 - a) mathematical expectations for realistic results
 - b) probability distributions for practical situations.
 - c) control charts of statistical quality control
 - d) correlation and regression concepts
 - e) suitable tests of significance for practical situations.
- CO3. Develop skills in designing
 - a) probability distributions
 - b) limitations of statistical quality control
 - c) control charts,
 - d) X, R, np, and c charts
- CO4. Develop analytical skills for solving problems involving
 - a) Probability distributions, means, variances and standard deviations
 - b) statistical techniques employed for quality
 - c) sampling techniques for decision making
 - d) Tests of significances for small and large samples
- CO5. Use relevant probability and statistical techniques for
 - a) Mathematical expectations of desired results
 - b) Fitting probability distributions for experimental data.
 - c) Quality control and testing of hypothesis.

II B.Tech. – I Semester
(16BT3HS02) MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Basic concepts of Accounting

(Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 - a) Tools and concepts of Micro Economics.
 - b) Basic Principles and concepts of Accountancy.
 - c) Provides life skills for effective utilization of scarce resources.
 - d) Financial Accounting.
 - e) Significance of Economics and Accountancy
- CO2. Develop skills in managerial decision making of an organization.
- CO3. Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.
- CO4. Develop effective communication in Business and Accounting transactions.
- CO5. Ascertain the profitability and soundness of an organization.
- CO6. Practice Financial Accounting

II B.Tech. – I Semester

(16BT30101) CONSTRUCTION PLANNING AND PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Construction planning and organization; Resource management - Manpower, Materials, Machinery; Project management; Elements and development of network; PERT and CPM.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on construction planning and project management.
- CO2. Identify critical activities and critical paths in a construction project and analyze networks.
- CO3. Develop the network for analyzing critical path by using programme evaluation techniques.
- CO4. Solve complex construction planning and management problems through proper interpretation of data.
- CO5. Use appropriate tools and techniques for better construction planning and management.
- CO6. Plan and manage construction ensuring safety.
- CO7. Use environmentally sustainable approach in construction planning and management.
- CO8. Maintain ethics in construction planning and management following rules and regulations.
- CO9. Plan, monitor and control the finance in civil engineering construction.

II B.Tech. – I Semester

(16BT30102) FLUID MECHANICS AND HYDRAULIC MACHINERY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics, Multi-Variable Calculus and Differential Equations.

COURSE DESCRIPTION: Properties of fluids and pressure measurement; Hydrostatic forces; Fluid kinematics; Fluid dynamics; Closed conduit flow; Measurement of flow; Laminar and Turbulent flow; Hydraulic similitude and Model testing; Boundary layer theory; Open channel flow; Impact of jets; Hydraulic turbines; Centrifugal pumps.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on basic properties of fluids, classification of flows and hydraulic machinery.
- CO2. Analyze fluids, flows and forces in hydraulics.
- CO3. Design piping systems, open channels and hydraulic machinery.
- CO4. Address the problems and faults in the prototype preparation using the model analysis and provide suitable solutions.
- CO5. Use of flow and pressure measurement devices in channels and hydraulic machinery.
- CO6. Consider safety issues in the analysis and design of channels, pipes and hydraulic machinery.

II B.Tech. – I Semester

(16BT30103) MECHANICS OF SOLIDS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Engineering Mechanics

COURSE DESCRIPTION: Simple stresses and strains; Strain energy; Shear force and bending moment; Stresses in beams; Combined direct and bending stresses; Torsion; Springs; Thin cylinders; Thick cylinders.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquire the knowledge on simple stresses and strains, shear force, bending moment, stresses in beams, torsion, springs, thin cylinders and thick cylinders.

- CO2. Analyze bars, beams, shafts, springs and cylinders for stresses, strains, strain energy, shear force and bending moment distributions.
- CO3. Design beams, shafts, springs and cylinders for various loading conditions.
- CO4. Solve complex engineering problems associated with beams, shafts, springs and cylinders through proper investigation and interpretation of stresses, strains, shear force and bending moment.
- CO5. Use appropriate methods in analyzing bars, beams, shafts and cylinders.
- CO6. Consider safety and stability issues in analyzing bars, beams, shafts, springs and cylinders.

II B.Tech. – I Semester
(16BT30104) **SURVEYING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics.

COURSE DESCRIPTION: Chain surveying; Compass surveying; Plane tabling; Levelling and contouring; Theodolite surveying; Tachometric surveying; Computation of areas and volumes; Curves; Electronic distance measurement.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on chain, compass, plane table, auto level, theodolite, theodolite, theodolite and EDM surveying; areas and volumes; curves.
- CO2. Analyze surveying techniques, tools and survey data.
- CO3. Design different types of curves and prepare contour maps.
- CO4. Solve complex engineering survey problems through proper survey and interpretation.
- CO5. Use appropriate modern tools in surveying.
- CO6. Follow ethics in surveying practice.

II B.Tech. – I Semester
(16BT30131) **FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery

COURSE DESCRIPTION: Calibration of flow meters; Verification of Bernoulli's equation; Performance of turbines and pumps; Losses through pipes.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate practical knowledge on flow measuring devices, losses in pipes and hydraulic machinery.
- CO2. Analyze fluids, flows and forces in hydraulics.
- CO3. Interpret the experimental results and suggest suitable solutions.
- CO4. Use of flow and pressure measurement devices in channels and hydraulic machinery.
- CO5. Consider safety issues in performing experiments.
- CO6. Function effectively as an individual and as a team member in solving fluid mechanics and hydraulic machinery problems.
- CO7. Communicate effectively on the experimental results in written, oral and graphical forms.

II B.Tech. – I Semester
(16BT30132) **STRENGTH OF MATERIALS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Mechanics of Solids/Strength of Materials.

COURSE DESCRIPTION: Tension test; Compression test; Bending test; Shear test; Torsion test; Hardness test; Maxwell reciprocal theorem.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the knowledge on conducting experiments for testing strength of materials such as steel, timber, metals, beams and springs.
- CO2. Analyze test results on steel, timber, metals, beams and springs.
- CO3. Recommend suitable materials for construction after interpreting test results.
- CO4. Use appropriate method of testing construction materials.
- CO5. Consider safety in construction material testing with societal perspective.
- CO6. Follow ethics in reporting exact testing results.
- CO7. Function effectively as an individual and as a team member in construction material testing.
- CO8. Communicate effectively on construction material testing in written, oral and graphical forms.

II B.Tech. – I Semester
(16BT30133) **SURVEYING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics.

COURSE DESCRIPTION: Exercises on chain surveying; Compass surveying; Plane table surveying; Auto Levelling; Theodolite surveying; Total station surveying; Area by planimeter.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on chain, compass, plane table, auto level, theodolite, and total station surveying setting out works, area measurement by planimeter.
- CO2. Analyze surveying techniques, tools and survey data.
- CO3. Design simple curves; and develop survey plots and contour maps.
- CO4. Solve complex engineering survey problems through proper survey and interpretation.
- CO5. Use appropriate modern tools in surveying.
- CO6. Follow ethics in surveying practice.
- CO7. Function effectively as an individual and as a team member in surveying.
- CO8. Communicate effectively on surveying in written, oral and graphical forms.

II B.Tech - II semester
(16BT3HS01) **ENVIRONMENTAL STUDIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	-	3

PRE-REQUISITES: Course on Engineering Chemistry

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- CO3. Develop strategies for environmental pollution control and natural resource management.
- CO4. Solve environmental problems through proper analysis and interpretation of environmental data.
- CO5. Choose appropriate techniques in environmental pollution control and natural resource management.
- CO6. Understand the impact of social issues and population on environment.
- CO7. Provide solutions to individuals, industries and government for environmental sustainable development.
- CO8. Follow environmental protection laws for sustainable development.
- CO9. Communicate effectively on environmental issues in the form reports.

II B. Tech. – II Semester
(16BT40101) **CONCRETE TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Cement and admixtures; Aggregates; Fresh and hardened concrete; Tests on concrete; Elasticity, Creep and Shrinkage; NDT; Mix design- ACI and IS methods; Special concretes.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on properties of cement, admixtures, aggregates, fresh and hardened concrete; elasticity, creep and shrinkage of concrete; special concrete.
- CO2. Characterize the constituent materials of concrete in choice of mix proportion.
- CO3. Design the concrete mix using IS-10262 and ACI method.
- CO4. Conduct various tests on fresh and hardened concrete.
- CO5. Make use of modern tools in Non-Destructive testing of concrete.
- CO6. Encourage the use of sustainable and environmental friendly constituent materials in manufacture of concrete.
- CO7. Maintain ethical standards for quality in concrete.

II B.Tech. – II Semester
(16BT40102) ENGINEERING GEOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: General geology and weathering; Mineralogy and petrology; Structural geology and geophysical studies; Groundwater; Earthquake and landslides; Dams; Reservoirs; Tunnels; Bridges.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate basic knowledge on weathering, minerals, rocks, geological structures, geophysical methods, groundwater, earthquakes and landslides and site selection for civil engineering structures.
- CO2. Analyze minerals, rocks, geological structures and failure of structures due to geological considerations.
- CO3. Conduct geological investigations and give recommendations for the site suitability for construction.
- CO4. Use modern methods and apply suitable techniques in geological study for civil engineering applications.
- CO5. Demonstrate causes and effects of natural hazards and suggest remedial measures for the societal safety.
- CO6. Consider environmental sustainability in exploitation of groundwater and construction materials using suitable methods.
- CO7. Communicate effectively on geological maps and reports to the engineering community.

II B.Tech.– II Semester
(16BT40103) ENGINEERING HYDROLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery

COURSE DESCRIPTION: Hydrologic cycle; Applications and history; Weather and seasons in India; Precipitation; Evaporation; Evapotranspiration; Runoff; Groundwater hydrology; Hydrograph analysis; Design flood; Erosion; Reservoir sedimentation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the basic knowledge on surface and groundwater hydrology.
- CO2. Analyze problems associated with surface and groundwater hydrology.
- CO3. Design of floods using Muskingum's method.
- CO4. Provide solutions for complex engineering problems in hydrology through proper interpretation data.
- CO5. Use appropriate techniques for solving issues related to hydrology
- CO6. Address the safety issues in flood routing, erosion and reservoir sedimentation.
- CO7. Understand the effect of erosion and reservoir sedimentation on the environment and provide solutions to ensure environmental sustainability.

II B.Tech. – II Semester
(16BT40104) STRUCTURAL ANALYSIS – I

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Engineering Mechanics, Mechanics of Solids.

COURSE DESCRIPTION: Principal stresses and strains; Deflection of beams, Macaulay's method and double integration method; Columns and struts; Indeterminate Beams; Theories of failure; Unsymmetrical bending and shear centre.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Elucidate the knowledge on principal stresses and strains, slopes and deflections of beams using double integration, Macaulay's and moment area method; columns and struts, fixed and propped cantilever beams, continuous beams, theories of failure and unsymmetrical bending and shear centre.
- CO2. Analyze different beams, columns and struts, unequal sections and theories of failure.
- CO3. Solve complex problems linked with different beams, columns and channel sections.
- CO4. Use appropriate methods to analyze the beams and columns.
- CO5. Ensure safety in the analysis of beams and columns.
- CO6. Present the results of analysis such as stresses, bending moment, shear force, slope and deflections effectively in written and graphical forms.

II B.Tech. II Semester
(16BT40105) WATER SUPPLY ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Environmental Studies, Fluid Mechanics and Hydraulic Machinery.

COURSE DESCRIPTION: Water sources; Quality; Quantity; Demand; Collection; Conveyance and distribution; Water treatment; Distribution; Water supply arrangements in buildings.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the basic knowledge on sources, quality, quantity, demand, conveyance, treatment systems, storage and distribution of water; and water supply arrangements in buildings.
- CO2. Analyse problems associated with water supply engineering.
- CO3. Design water conveyance, treatment, storage and distribution systems.
- CO4. Solve water supply engineering problems through proper investigations and interpretation.
- CO5. Use appropriate techniques in solving water supply engineering problems.
- CO6. Provide solutions to water supply engineering problems ensuring health and safety.
- CO7. Maintain quality standards in analysis, treatment and distribution of water in water supply schemes.

II B.Tech. – II Semester
(16BT40131) CONCRETE TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Concrete Technology.

COURSE DESCRIPTION: Testing of cement and sand; Testing of fresh and hardened concrete mixes; Non-destructive tests on concrete.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on test for cement, sand and concrete.
- CO2. Characterize the constituent material of concrete in the choice of mix proportion.
- CO3. Design the concrete mix using IS-10262.
- CO4. Conduct various tests on cement, sand and concrete in fresh and hardened state.
- CO5. Make use of modern tools in non-destructive testing of concrete.
- CO6. Maintain ethical standards for quality in concrete.
- CO7. Function effectively as an individual and as a team member in concrete technology using modern tools and techniques.
- CO8. Communicate effectively on concrete technology in written, oral and graphical forms.

II B.Tech. – II Semester
(16BT40132) ENGINEERING GEOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: -

COURSE DESCRIPTION: Study of physical properties and identification of minerals and rocks; Rock forming minerals; Ore forming minerals; Igneous rocks; Sedimentary rocks; Metamorphic rocks; Geological maps; Problems on structural geology; CIPW norm calculations; Resistivity survey.

COURSE OUTCOMES: On successful completion of this course the students will be able to:

- CO1. Apply the knowledge on identification of minerals and rocks, structural geology problems and maps and geophysical studies.
- CO2. Analyze different minerals, rocks, geophysical data for engineering applications.
- CO3. Interpret the geological maps and geophysical data with emphasis on practical applications in civil engineering.
- CO4. Use modern tools for geologic investigations on the availability of minerals, rocks and groundwater.
- CO5. Consider safety in geological investigations.
- CO6. Follow standards in geological investigations.
- CO7. Function effectively as an individual, and as a member or leader in teams to solve engineering geology problems.
- CO8. Communicate effectively on geological information in written, oral and graphical forms.

II B.Tech. – II Semester
(16BT4HS31) SOFT SKILLS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION: Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
 - a) Goal Setting
 - b) Creative Thinking
 - c) Leadership Skills and
 - d) Team Work
- CO2. Analyse the situations and develop skills for
 - a) Body Language
 - b) Personality Development and
 - c) Stress Management
- CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal forums.

III B.Tech. – I Semester
(16BT50101) IRRIGATION ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery, Engineering Hydrology.

COURSE DESCRIPTION: Irrigation and soil moisture; Diversion head works; Gravity and earth dams; Canal structures; Cross drainage works.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Identify the importance of various irrigation practices and irrigation structures.
- CO2. Analyze irrigation structures.
- CO3. Design irrigation structures.
- CO4. Provide solutions to the various types of failures of hydraulics structures.
- CO5. Use appropriate techniques in solving irrigation engineering problems.
- CO6. Ensure safety and stability of irrigation structures.
- CO7. Follow IS codes in the design of irrigation structures.
- CO8. Consider environmental sustainability in the analysis and design of irrigation structures.

III B.Tech. – I Semester
(16BT50102) REINFORCED CEMENT CONCRETE STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Engineering Mechanics, Mechanics of Solids, Structural Analysis – I, Structural Analysis – II.

COURSE DESCRIPTION: Beams (Working stress and limit state methods); Shear, torsion and bond; Slabs; Columns; Shallow footings and Stair case.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge concepts, techniques and applications of design of reinforced cement concrete structural elements: beams, slabs, columns, footings, stair cases.
- CO2. Analyze different reinforced cement concrete structural elements.
- CO3. Design different reinforced cement concrete structural elements.
- CO4. Recommend suitable structural elements for reinforced cement concrete structures.
- CO5. Use appropriate method to design RCC structural elements.
- CO6. Ensure the RCC design as per safety and serviceability requirements.
- CO7. Uphold Ethics in RCC design.

III B.Tech. – I Semester
(16BT50103) SOIL MECHANICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics, Engineering Geology.

COURSE DESCRIPTION: Basic principles of soil mechanics and their application in engineering practice; Index properties; Engineering properties - Permeability and Seepage, Stress distribution and Compaction, Consolidation, Shear strength.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge on classification and engineering behavior of soils.
- CO2. Analyze properties and engineering behavior of soils.
- CO3. Address complex problems associated with soils and suggest suitable solutions.
- CO4. Use appropriate techniques to determine the soil properties.
- CO5. Consider safety through proper assessment of engineering behavior of soils.
- CO6. Demonstrate the need of soil testing for sustainable development.
- CO7. Practice soil engineering in accordance with IS Codes.
- CO8. Communicate effectively on soil engineering problems in written and graphical forms.

III B.Tech. – I Semester
(16BT50104) STRUCTURAL ANALYSIS – II

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Structural Analysis – I.

COURSE DESCRIPTION: Shear force and bending moment for moving loads; Influence lines; Slope–deflection method; Moment distribution method; Kani's method; Energy method; Redundant pin–jointed frames; Plastic analysis.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on moving loads, influence lines, slope deflection method, moment distribution method, Kani's method, energy method and plastic analysis.
- CO2. Analyze beams and frames using slope-deflection method, moment distribution method and Kani's method; beams subjected to moving loads, trusses.
- CO3. Address complex problems associated with the analysis of beams for collapse loads using plastic theory.
- CO4. Use appropriate method to analyze civil engineering structures.
- CO5. Follow the analyzing principles to ensure safety of the structures.
- CO6. Present the results of analysis such as bending moment and shear force distributions and deflections effectively in written and graphical forms.

III B.Tech. – I Semester
(16BT50105) WASTEWATER TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Water Supply Engineering.

COURSE DESCRIPTION: Wastewater collection systems and sewer design; Sewage characteristics; Preliminary and primary treatment of sewage; Secondary treatment of sewage; Tertiary treatment; Sludge management; Effluent disposal.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on sewage collection systems, characteristics, treatment, sludge management and effluent disposal.
- CO2. Analyze characteristics, treatment methods and disposal techniques of wastewater.
- CO3. Design sewer pipeline and storm water drain, wastewater treatment plant units.
- CO4. Investigate and recommend suitable solutions to complex wastewater treatment and disposal problems.
- CO5. Use appropriate techniques to treat and dispose wastewater.
- CO6. Understand the effectsof improper wastewater treatment and disposal on health and safety.
- CO7. Encourage environmental friendly sustainable approach in wastewater treatment and disposal.
- CO8. Maintain ethical standards for wastewater treatment and disposal following relevant IS Codes.
- CO9. Communicate effectively on wastewater engineering problems in written and graphical forms.

III B.Tech. – I Semester
(16BT50441) **PRINCIPLES OF IMAGE PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION:

Fundamentals of digital image processing; Image transforms; Image enhancement techniques in spatial and frequency domains; Restoration techniques & image segmentation techniques; Morphological operations; Representation and description; Pattern recognition.

COURSE OUTCOMES: On successful completion of the course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a. Image Fundamentals
 - b. Image Enhancement & Restoration Techniques
 - c. Image Segmentation Techniques
 - d. Morphological operations.
 - e. Representation and description
 - f. Pattern recognition
- CO2. Analyze different images using various processing techniques.
- CO3. Develop various image processing algorithms to process the images in various Real Time Applications.
- CO4. Solve problems related to images for feasible and optimal solutions in the core area of Image Processing.
- CO5. Apply appropriate techniques to restore degraded images in the field of image processing.
- CO6. Understand the impact of the image processing for societal needs.

III B.Tech. – I Semester
(16BT5HS01) **COSTING AND FINANCE MANAGEMENT FOR CIVIL ENGINEERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: -

COURSE DESCRIPTION: Cost Planning; Contract Costing; Budgeting; Capital Budgeting; Estimation of Cash Flows; Working Capital Management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
 - a) The basic concepts of finance
 - b) Basic principles of costing
 - c) Provides skills for effective utilization of costing concepts for quoting tenders
 - d) Framing budgets in relation to construction
- CO2. Develop skills in analyzing problems for
 - a) Quoting tenders in relation to civil engineering
 - b) Budgeting finance for construction industry
 - c) Enhancing ability in calculating working capital requirement
 - d) Improvising ability in estimating cash flows
- CO3. Develop effective communication in relation to costing and finance
- CO4. Design solutions for effective decisions in investment

III B.Tech. – I Semester
(16BT50241) **RENEWABLE ENERGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Physics and Basic Electrical and Electronics Engineering

COURSE DESCRIPTION: Various renewable energy sources; Different energy conversion techniques; Storage methods and applications.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on
 - a) various renewable energy sources.
 - b) different conversion techniques, energy storage methods and applications.
- CO2. Analyze
 - a) various solar energy collectors.
 - b) horizontal and vertical axis windmills.
 - c) ocean energy conversions
 - d) various biogas digesters.

- CO3. Design suitable accessories / controllers for desired operating conditions.
 CO4. Explore relevant renewable sources to generate electrical power and provide valid solutions.
 CO5. Assess societal and safety issues and the consequent responsibilities relevant to the renewable sources engineering practice.

III B.Tech. – I Semester
 (16BT70308) **COMPUTATIONAL FLUID DYNAMICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Multi-Variable Calculus and Differential Equations and Fluid Mechanics.

COURSE DESCRIPTION:

Introduction to Computational Fluid Dynamics (CFD); Various Numerical methods; Solution methods for governing equations; Finite difference method and its application to heat transfer problems; Errors and stability analysis; Study flow analysis; Simple CFD techniques.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge of CFD techniques, basic aspects of discretization and grid generation in solving partial differential equations.
 CO2. Analyze CFD problems and offer probable solutions using Finite Differential approach.
 CO3. Develop mathematical models and flow simulations for CFD problems.
 CO4. Conduct investigations on complex CFD problems using different techniques.
 CO5. Apply modern flow simulation codes for solving governing equations of computational fluid dynamics.
 CO6. Use CFD techniques for critical decision making in various applications in the society to eliminate the need for expensive and complex prototypes.

III B.Tech. – I Semester
 (16BT50131) **COMPUTER AIDED BUILDING PLANNING AND DRAWING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	3	2

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Exercises on Conventional signs and symbols used in building; Planning and computer aided drawing of load bearing walls; RCC framed structures; Industrial buildings.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Explain knowledge on computer aided building drawing to develop the 2D and 3D views of structures using AutoCAD.
 CO2. Analyze the given data for the developing the plans, elevations, cross-sectional view of the structures.
 CO3. Design and develop the buildings plans, elevations, sectional views using AutoCAD.
 CO4. Use appropriate drafting tools for developing the plans, elevation, sectional views using AutoCAD.
 CO5. Utilize contextual knowledge for preparing the structural elements and building plans as per the engineering practice.
 CO6. Follow building bye-laws and principles for promoting building plans, elevation, sectional views using AutoCAD.
 CO7. Function effectively as an individual and as a team member to develop plan, elevation, cross sectional view of the structural elements and buildings using AutoCAD.
 CO8. Communicate effectively on the building planning and drawing using AutoCAD in written, oral and graphical forms.
 CO9. Promote cost effective building plans by management principles using AutoCAD.

III B.Tech. – I Semester
 (16BT50132) **ENVIRONMENTAL ENGINEERING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Water Supply Engineering, Wastewater Technology.

COURSE DESCRIPTION: Experimental analysis of physical, chemical and biological parameters of water and wastewater.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on experimental analysis of water and wastewater.
 CO2. Analyse water and wastewater.

- CO3. Solve complex problems associated with water and wastewater through proper investigations and interpretation of data.
- CO4. Use appropriate techniques in the analysis of water and wastewater.
- CO5. Provide solutions to the problems of water and wastewater ensuring health and safety.
- CO6. Consider environmental sustainability in solving water and wastewater problems.
- CO7. Follow standards in water and wastewater analysis.
- CO8. Function effectively as an individual, and as a member or leader in teams to solve the water and wastewater problems.
- CO9. Communicate effectively on water and wastewater analysis in written, oral and graphical forms.

III B. Tech. – I Semester
(16BT50133) **GEOTECHNICAL ENGINEERING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Course on Soil Mechanics.

COURSE DESCRIPTION: Experiments on the determination of index properties and engineering properties of soil.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on laboratory testing of soils.
- CO2. Analyze characteristics and engineering behavior of soils.
- CO3. Conduct experiments on soils to find its suitability for any civil engineering construction.
- CO4. Select an appropriate experimental method based on soil, ease of testing and application.
- CO5. Establish soil properties with societal responsibility.
- CO6. Give solutions to the problems of soil which are environmental friendly.
- CO7. Follow IS Codes in soil testing.
- CO8. Work effectively as an individual or in a group to determine soil properties.
- CO9. Communicate effectively on soil properties in written, oral and graphical forms.

III B.Tech. – II Semester
(16BT60101) **FOUNDATION ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Soil Mechanics.

COURSE DESCRIPTION: Soil exploration- Subsurface sampling and characterization methods; Lateral earth pressure; Earth retaining structures; Stability of earth slopes; Bearing capacity of shallow foundations; Pile foundations; Caissons and well foundations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge on geotechnical site investigation, types of footings, bearing capacity and settlement of shallow and deep footings.
- CO2. Analyze soil exploration techniques, slopes; and footings for bearing capacity and settlements.
- CO3. Decide and design all types of foundations.
- CO4. Interpret the data obtained from soil investigations and suggest suitable foundation.
- CO5. Select appropriate techniques to solve foundation engineering problems.
- CO6. Consider safety measures in soil exploration, design and construction of foundations, earth slopes and retaining walls.
- CO7. Perform soil exploration and design of footings as per IS Code.
- CO8. Communicate effectively on foundation engineering problems in written and graphical forms.
- CO9. Plan cost effective soil exploration programs.

III B.Tech. – II Semester
(16BT60102) **HIGHWAY AND TRAFFIC ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Surveying, Soil Mechanics.

COURSE DESCRIPTION: Highway development and planning; Highway geometric design; Highway materials; Pavement design; Traffic engineering; Traffic measurement and analysis; Highway capacity; Traffic regulation, control and control devices.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on highway and traffic engineering.
- CO2. Analyze highway materials, pavements, traffic and parking facilities.
- CO3. Design highway geometry, pavements and traffic signals.
- CO4. Provide solutions to complex highway and traffic engineering problems through investigations.
- CO5. Use appropriate methods to assess highway materials, traffic; and design pavements.
- CO6. Follow IS and IRC Codes in the design of highway and traffic engineering systems.
- CO7. Maintain ethical standards for quality in highway and traffic engineering practice.
- CO8. Communicate effectively on highway and traffic engineering in written and graphical forms.

III B.Tech. – II Semester
(16BT60103) **STEEL STRUCTURES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics, Mechanics of Solids, Structural Analysis-I, Structural Analysis-II.

COURSE DESCRIPTION: Bolted connections; Welded connections; Beams; Tension members; Compression members; Built-up Compression members; Column foundations, Roof trusses; Tubular trusses.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Attain the basic knowledge on design of steel structures and their elements by limit state method.
- CO2. Analyze the steel structures and their elements.
- CO3. Design steel structures and their elements.
- CO4. Provide solutions to complex engineering problems associated with steel construction through proper analysis and design.
- CO5. Use appropriate techniques to analyze and design of steel structures and their elements.
- CO6. Ensure safety and stability in the design of steel structures and their elements.
- CO7. Follow IS codes in the design of steel structures and their elements.

III B.Tech. – II Semester
(16BT40502) **DATABASE MANAGEMENT SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on
 - a) Data models and Database Languages
 - b) Database design
 - c) Normal forms
 - d) Storage and Indexing
- CO2. Analyze databases using normal forms to provide solutions for real time applications.
- CO3. Design solutions for database problems using database design, views design and framing queries.
- CO4. Use database techniques for designing databases, managing databases and its security.
- CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.
- CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

III B.Tech. – II Semester
(16BT50341) **OPTIMIZATION TECHNIQUES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: A course on Multi-variable Calculus and Differential Equations

COURSE DESCRIPTION: Introduction to optimization; Classical optimization techniques; Classification of optimization problems; Linear programming; transportation and assignment problem; Non-linear programming; Un-constrained non-linear programming; Constrained non-linear programming; Dynamic programming.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate the knowledge on Optimization techniques for Linear, Nonlinear and Dynamic programming problems.
- CO2. Analyze and quantify a system architecture or product design problem for selecting appropriate objective function, design variables, parameters and constraints.
- CO3. Develop mathematical models for real time optimization problems.
- CO4. Conduct investigations on complex problems and make recommendations based on solutions, analysis and limitations of models.
- CO5. Use optimization techniques for solving complex problems of real time applications.
- CO6. Optimize the resources in organizations for sustainable development.

III B.Tech. – II Semester

(16BT60104) FIRE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Chemistry, Building Materials and Construction Technology, Environmental Studies.

COURSE DESCRIPTION: Physics and chemistry of fire; Fire prevention and protection; Industrial fire protection systems; Building fire safety; Explosion protecting systems.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the knowledge on fire characteristics, fire detection, fire protection and explosion protection.
- CO2. Analyze fire characteristics, fire detection systems, fire and explosion protection systems.
- CO3. Design building elements and develop fire and explosion protection systems.
- CO4. Solve fire engineering problems through proper investigation and interpretation.
- CO5. Use appropriate techniques to solve fire engineering problems.
- CO6. Ensure health and fire safety in solving fire engineering problems.
- CO7. Consider environmental sustainability in fire and explosion protection systems.
- CO8. Follow rules and regulations in fire engineering practice.
- CO9. Prepare layouts and diagrams in fire engineering.
- CO10. Manage effectively fire and explosion protection systems.

III B.Tech. – II Semester

(16BT60241) ENERGY AUDIT AND CONSERVATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of energy audit and conservation; Energy efficiency in buildings; Energy efficient motors, lighting, instruments and significance of energy economics.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Demonstrate knowledge on auditing practices, conservation measures and economics of energy.
- CO2. Analyze auditing practices, conservation measures and economics of energy.
- CO3. Design an appropriate energy conservation measures in commercial and industrial applications.
- CO4. Provide feasible solutions for problems associated with energy auditing and conversion through proper investigation and interpretation of data.
- CO5. Use appropriate techniques for energy auditing and conservation.
- CO6. Solve energy auditing and conservation problems with societal relevance.
- CO7. Consider environment and sustainability in energy auditing and conservation.
- CO8. Follow relevant rules and regulations in practicing energy audit and conservation.
- CO9. Communicate effectively on energy audit in written and graphical forms.
- CO10. Consider financial issues in energy audit and conservation.

III B.Tech. – II Semester

(16BT60105) ADVANCED REINFORCED CEMENT CONCRETE STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Engineering Mechanics, Mechanics of Solids, Structural Analysis – I, Structural Analysis – II, Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Foundations; Flat slabs; Water tanks; Retaining walls; Bunkers; Silos; Chimneys.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge concepts, techniques and applications of design of reinforced cement concrete structures; foundations, flat slabs, water tanks, retaining walls, bunkers, silos, chimneys.
- CO2. Analyze different reinforced cement concrete structures.
- CO3. Design different reinforced cement concrete structures.
- CO4. Recommend suitable structural elements for reinforced cement concrete structures
- CO5. Use appropriate method to design RCC structures.
- CO6. Ensure the RCC design as per safety and serviceability requirements.
- CO7. Uphold Ethics in RCC design

III B.Tech. – II Semester

(16BT60106) ADVANCED STRUCTURAL ANALYSIS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Structural Analysis – I, Structural Analysis –II.

COURSE DESCRIPTION: Arches: two and three hinged arches; Portal frames; Flexibility method; Stiffness method; Curved beams.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on the analysis of arches, portal frames, beams (flexibility and stiffness methods) and curved beams.
- CO2. Analyze arches, portal frames, beams and curved beams.
- CO3. Solve complex problems in analyzing arches, portal frames, beams and curved beams for different loading.
- CO4. Select appropriate technique for analyzing arches, portal frames, beams and curved beams.
- CO5. Ensure safety in the analysis of arches, portal frames, beams and curved beams.
- CO6. Present the results of analysis such as bending moment, shear force effectively in written and graphical forms.

III B.Tech. – II Semester

(16BT60107) ADVANCED SURVEYING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics, Surveying.

COURSE DESCRIPTION: Astronomical surveying; Construction and boundary surveys; Theory of errors; Land surveys; Triangulation and baseline measurements; GPS surveying.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on advanced surveying techniques.
- CO2. Analyze advanced surveying techniques, tools and survey data.
- CO3. Prepare survey maps.
- CO4. Solve complex engineering survey problems through proper survey and interpretation.
- CO5. Use appropriate modern tools in advanced surveying practice.
- CO6. Follow ethics in surveying practice.
- CO7. Communicate effectively on advanced surveying issues in written and graphical forms.

III B.Tech. – II Semester

(16BT60108) GEOENVIRONMENTAL ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Soil Mechanics, Environmental Engineering.

COURSE DESCRIPTION: Fundamentals of geoenvironmental engineering; Soil–water–contaminant interaction; Waste containment system; Contaminant site remediation; Advanced soil characterization.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge on fundamentals of geoenvironmental engineering, site characterization, waste containment systems and remediation.
- CO2. Characterize contaminated site and analyze waste containment systems and remediation techniques.
- CO3. Design waste containment systems and remediation techniques.
- CO4. Solve complex geoenvironmental problems through proper investigations.
- CO5. Use appropriate techniques for site characterization and remediation.

- CO6. Propose geoenvironmental solutions considering health and safety issues.
- CO7. Protect environment through sustainable remediation techniques.
- CO8. Follow ethics in geoenvironmental engineering practice.

III B.Tech. – II Semester

(16BT60109) GROUNDWATER DEVELOPMENT AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Hydrology, Engineering Geology, Irrigation Engineering.

COURSE DESCRIPTION: Groundwater occurrence and movement; Analysis of pumping test data; Saline water intrusion in an aquifer; Artificial recharge of groundwater; Groundwater exploration.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on ground water occurrence, exploration, movement, pollution, and recharge methods.
- CO2. Analyze problems associated with occurrence, pumping test data, artificial recharge and exploration of groundwater and saline water intrusion.
- CO3. Design and develop artificial groundwater recharge sites using various techniques.
- CO4. Conduct investigations on occurrence of groundwater and saline water intrusion in a basin.
- CO5. Use appropriate tools and techniques in exploration, development and management of groundwater.
- CO6. Solve groundwater issues related to saline water intrusion considering societal issues.
- CO7. Consider environmental sustainability in solving groundwater problems.

III B.Tech. – II Semester

(16BT60110) SOLID WASTE MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Environmental Studies

COURSE DESCRIPTION: Sources and types of municipal solid wastes; Onsite handling; Storage and processing; Collection and transfer; Off sites processing; Disposal.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on sources, characterization, collection, segregation, transportation, storage, off-site processing and disposal of solid waste.
- CO2. Analyze characteristics; collection, transportation, storage, processing and disposal methods of solid waste.
- CO3. Design of solid waste disposal systems.
- CO4. Investigate and interpret data to recommend suitable solutions to solid waste management.
- CO5. Use appropriate techniques for solid waste management.
- CO6. Consider health and safety in solid waste management.
- CO7. Ensure environmental sustainability in solid waste management.
- CO8. Follow environmental acts in solid waste management.
- CO9. Provide economically viable solid waste management solutions.

III B.Tech. – II Semester

(16BT60111) STRUCTURAL HEALTH MONITORING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Basic Electrical and Electronics Engineering, Concrete Technology.

COURSE DESCRIPTION: Structural health monitoring; Non destructive testing of concrete structures; Sensors for health monitoring systems; SHM Techniques and systems; Information technology for health monitoring; SHM Applications in civil engineering.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the fundamental knowledge on structural health monitoring and its applications.
- CO2. Analyze smart materials, civil engineering structures and techniques for health monitoring.
- CO3. Recommend suitable solutions for structural health monitoring.
- CO4. Implement the modern tools and techniques in structural health monitoring.
- CO5. Ensure health and safety of the structures through structural health monitoring systems.
- CO6. Understand the impacts of the structural health monitoring on environment and sustainability.
- CO7. Follow ethics in choosing and implementing structural health monitoring systems and techniques.

III B.Tech. – II Semester
(16BT6HS01) **BANKING AND INSURANCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate Knowledge in
 - a) Tools and concepts of Banking and Insurance.
 - b) Basic Principles and concepts of Insurance and Banking.
 - c) e-fund transfers, e-payments and e-business models.
- CO2. Develop skills in providing solutions for
 - a) Online banking and e – payments.
 - b) Risk Management through insurance benefits the society at large.
 - c) Money management by leveraging on technology, banking and insurance services.
- CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to more employment opportunities.
- CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

III B. Tech. – II Semester
(16BT6HS02) **BUSINESS COMMUNICATION AND CAREER SKILLS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Technical English or English at Diploma level

COURSE DESCRIPTION: Nature and Scope of Communication; Corporate Communication; Writing Business Documents; Careers and Resumes; Interviews.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Corporate Communication
 - b) Main Stages of Writing Messages
 - c) Career Building
- CO2. Analyze the possibilities and limitations of language in
 - a) Communication Networks
 - b) Crisis Management/Communication
- CO3. Design and develop the functional skills for professional practice in
 - a) Business Presentations & Speeches
- CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.
- CO5. Function effectively as an individual and as a member in diverse teams.
- CO6. Communicate effectively with the engineering community and society in formal and informal situations.

III B.Tech. – II Semester
(16BT6HS03) **COST ACCOUNTING AND FINANCIAL MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITES: -

COURSE DESCRIPTION: Scope, Objectives and Elements of Cost Accounting; Cost Sheet and Tender Quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: Concept of Risk and Return on Investment.

Course outcomes: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 - a) Elements of Costing.
 - b) Basic concepts of Financial Management.
 - c) Risk and Return
 - d) Significance of Cost Accountancy
 - e) Behavioral Finance

- CO2. Develop skills in
 a) Material, Labor, Overheads control.
 b) Excellence and ability to minimize the cost of the organization
- CO3. Develop effective Communication in Cost control and Financial Management.
- CO4. Provide solutions for effective investment decisions.

III B.Tech. – II Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: -

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

Course outcomes: On successful completion of this course, the students will be able to:

- CO1. Acquire Knowledge in
 a) Schemes and institutions encouraging entrepreneurship
 b) Basic Principles and concepts of Accountancy
 c) Significance of entrepreneurship
- CO2. Develop skills in providing solutions for
 a) Personal excellence through financial and professional freedom
 b) Women entrepreneurship serving as contrivance in societal development
- CO3. Develop Critical thinking and evaluation ability.
- CO4. Widens knowledge and build up attitude towards trouble shooting.
- CO5. Demonstrate business acumen.

III B.Tech. – II Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communications; Basic grammar; Advanced grammar; Basic writing; Business French (La Francais Commercial).

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 a) Process of communication
 b) Modes of listening
 c) Paralinguistic features
 d) Skimming and Scanning
 e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 a) Barriers to Communication
 b) Barriers to Effective Listening
 c) Barriers to Speaking
 d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand French culture and civilization.
- CO6. Communicate effectively with the native French in day to day situation

III B.Tech. – II Semester

(16BT6HS06) GERMAN LANGUAGE (Deutsch als Fremdsprache)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutsch (Business German)

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in

- a) Process of communication
- b) Modes of listening
- c) Paralinguistic features
- d) Skimming and Scanning
- e) Elements of style in writing
- CO2. Analyze the possibilities and limitations of language, understanding
 - a) Barriers to Communication
 - b) Barriers to Effective Listening
 - c) Barriers to Speaking
 - d) Formal and metaphorical language
- CO3. Design and develop language skills for professional practice.
- CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.
- CO5. Understand German culture and civilization.
- CO6. Communicate effectively with the native German in day to day situation.

III B.Tech. – II Semester
(16BT6HS07) **INDIAN CONSTITUTION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, Understanding for better professional practice and good citizenry.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge in
 - a) parliamentary proceedings, laws, legislature, administration and its philosophy
 - b) federal system and judiciary of India
 - c) social problems and public services like central civil services and state civil services
 - d) Indian and international political aspects and dynamics
- CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen.

III B.Tech. – II Semester
(16BT6HS08) **INDIAN ECONOMY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquire the knowledge in
 - a) Micro and Macro Economics.
 - b) Traditional and Modern methods of Capital Budgeting.
 - c) Five year plans and NITI Aayog.
- CO2. Analyze
 - a) Capital Budgeting.
 - b) Value Analysis and Value Engineering.
 - c) Economic analysis
 - d) Law of supply and demand
- CO3. Understand the nuances of project management and finance.

III B.Tech. - II Semester
(16BT6HS09) **INDIAN HERITAGE AND CULTURE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

- CO1. Acquaint knowledge in
- human aspirations and values in Vedic culture.
 - cultural aspects of Buddhism and Jainism
 - unification of our country under Mourya's and Gupta's administrations
 - socio Religious aspects of Indian culture
 - reform movements and harmonious relations.
- CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts.

III B.Tech. – II Semester (16BT6HS10) INDIAN HISTORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain knowledge on evolution and history of India as a nation.
- CO2. Analyze social and political situations of past and current periods.
- CO3. Practice in career or at other social institutions morally and ethically.

III B.Tech. – II Semester (16BT6HS11) PERSONALITY DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Soft Skills Lab

COURSE DESCRIPTION: Self-esteem & Self-improvement; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
- Self-Management
 - Planning Career
- CO2. Analyze the situations based on
- Attitudes
 - Thinking strategies
- CO3. Design and develop the functional skills for professional practice in
- CO4. Function effectively as an individual and as a member in diverse teams.
- CO5. Communicate effectively in public speaking in formal and informal situations.

III B.Tech. – II Semester (16BT6HS12) PHILOSOPHY OF EDUCATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
- Philosophy of engineering education.
 - Philosophical methods.
 - Knowledge acquiring methods.
 - Engineering education and responsibilities.
- CO2. Understand the impact of Outcome Based Education for effective educational Outcomes.
- CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

III B.Tech. – II Semester
(16BT6HS13) **PUBLIC ADMINISTRATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge in
 - a) Public Policy.
 - b) Good Governance.
 - c) E-governance.
 - d) Development Administration.
- CO2. Analyze the possibilities and limitations of existing policies through Good Governance perspective.
- CO3. Design and develop solutions in e-governance models to find and provide opportunities in e-governance.
- CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.
- CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing
 - a) Bureaucracy.
 - b) Role of civil society.

III B.Tech. – II Semester
(16BT60112) **BUILDING MAINTENANCE AND REPAIR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
- CO2. Analyze failures, repair and rehabilitation techniques.
- CO3. Solve complex building maintenance problems through proper investigations and interpretation.
- CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
- CO5. Provide solutions for building maintenance and repair problems considering health and safety.
- CO6. Consider environmental sustainability in building maintenance and repair.
- CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
- CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

III B.Tech. – II Semester
(16BT60113) **CONTRACT LAWS AND REGULATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- CO2. Analyze contracts and tenders.
- CO3. Address the legal issues in contracts and tenders.
- CO4. Follow laws and regulations in the preparation of contracts and tenders.
- CO5. Prepare contract and tender documents as per the standards.
- CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

III B.Tech. - II Semester
(16BT60114) **DISASTER MITIGATION AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
- CO2. Analyze disasters and their vulnerability.
- CO3. Design strategies for effective disaster mitigation.
- CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
- CO5. Use appropriate methods in disaster mitigation and management.
- CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
- CO7. Solve disaster related issues considering environment.
- CO8. Consider economical issues in disaster management.

III B.Tech - II Semester
(16BT60115) **ENVIRONMENTAL POLLUTION AND CONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
- CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
- CO3. Recommend suitable solutions to complex environmental pollution problems.
- CO4. Use appropriate remedial technique to solve environmental pollution problems.
- CO5. Understand the effects of environmental pollution on human health and vegetation.
- CO6. Encourage sustainable development through implementation of pollution control measures.
- CO7. Maintain IS Codes for environmental quality control.

III B.Tech - II Semester
(16BT60116) **PLANNING FOR SUSTAINABLE DEVELOPMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
- CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
- CO3. Develop suitable methods and systems for sustainable development.
- CO4. Use appropriate techniques in solving issues related to sustainable development.
- CO5. Provide solutions to problems associated with sustainable development considering society.
- CO6. Consider environment while planning sustainable development.
- CO7. Communicate effectively on sustainable development issues through media and education.
- CO8. Consider economical issues while planning for sustainable development.

III B.Tech. – II Semester
(16BT60117) **PROFESSIONAL ETHICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
- CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
- CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
- CO5. Use appropriate theories in resolving issues pertain to professional ethics.
- CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
- CO7. Practice engineering with professionalism, accountability and ethics.
- CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO9. Write reports without bias and give instructions to follow ethics.

III B.Tech. - II Semester
(16BT60118) **RURAL TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Rural technology; Non conventional energy; Technologies for rural development; Community development; IT in rural development.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on technologies for rural development.
- CO2. Analyze various technologies available which are appropriate for rural development.
- CO3. Carryout feasibility study on the public and private partnership for rural development.
- CO4. Develop and use latest technologies for rural development.
- CO5. Address health and safety issues while choosing technologies for rural development.
- CO6. Educate the rural populace on the positive impacts of biofertilisers and usage of agromachinery in agriculture.

III B.Tech - II Semester
(16BT60308) **GLOBAL STRATEGY AND TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on Strategic management, Research & Development strategies, Technology management and transfer, Globalization and Corporate governance.
- CO2. Identify and analyze crucial problems in strategic management to improve performance of the organizations.
- CO3. Develop the products and production process by using research and development strategies.
- CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
- CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
- CO6. Apply ethics in strategic decision making.

III B.Tech - II Semester
(16BT60309) **INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.
- CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.
- CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.
- CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.
- CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.
- CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.
- CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

III B.Tech – II Semester
(16BT60310) **MANAGING INNOVATION AND ENTREPRENEURSHIP**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1: Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
- CO2: Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
- CO3: Develop a comprehensive and well planned business structure for a new venture.
- CO4: Conduct investigation on complex problems, towards the development of Project.
- CO5: Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
- CO6: Apply ethics in constructive innovation framework.
- CO7: Exhibit professionalism by employing modern project management and financial tools.

III B. Tech – II Semester
(16BT60311) **MATERIALS SCIENCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semi conductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on concepts of fundamental science and Engineering principles relevant to materials.
- CO2. Analyze the structures of various types of Ferrous, Non ferrous alloys influencing various engineering applications.
- CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.

- CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
 CO5. Consider health and safety issues while providing materials to real time applications.
 CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

III B.Tech - II Semester
(16BT70412) GREEN TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
- CO2. Analyze various green technologies for engineering practice.
- CO3. Provide green solutions to engineering problems.
- CO4. Apply various green techniques in the engineering practice.
- CO5. Consider health and safety issues while providing green solutions to the society.
- CO6. Understand issues related to environment sustainability.
- CO7. Apply ethical standards for environmental sustainability in the engineering practice.

III B.Tech. - II Semester
(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in
 - a) Nanoscale technology.
 - b) Difference between micro and nanotechnology
 - c) Classification of Nanostructure and Nanomaterial
 - d) Fabrication of various nanomaterials and nanostructures.
- CO2. Analyze numerical and analytical problems in
 - a) Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction
- CO3. Design and fabricate devices based on nanostructures like
 - a) Nano solar cell
 - b) Nano cantilever
 - c) Nano bio-sensor
- CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.
- CO5. Select appropriate technique for fabrication of nanostructures and nanocomposites.
- CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

III B.Tech. – II Semester
(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

- CO1. Demonstrate knowledge in
 - a) Systems Process and System Design
 - b) Systems Analysis and Modeling
 - c) System Development Life Cycle
 - d) Design Management and Maintenance Tools.

- CO2. Analyze System Process and estimate the given models by using case tools.
 CO3. Design and Develop a model to the organizational systems.
 CO4. Solve complex problems related to engineering systems and produce accurate results.
 CO5. Apply object oriented techniques for modeling dynamic systems.
 CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

III B.Tech. – II Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1.Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators.
 CO2.Analyze the properties of materials and identify its suitability for MEMS devices.
 CO3.Design MEMS devices that meet desired specifications and requirements.
 CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
 CO5.Use modern techniques in micro manufacturing process.
 CO6.Develop efficient and cost effective MEMS based products for society.

III B.Tech. – II Semester

(16BT61205) CYBER SECURITY AND LAWS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge in Cyber security, Cyber crimes and its related laws in Indian and Global Act.
 CO2. Analyze the legal perspectives and laws related to cyber crimes in Indian context.
 CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber crimes.
 CO4. Solve Cyber security issues using privacy policies.
 CO5. Use antivirus tools to minimize the impact of cyber threats.
 CO6. Follow security standards for the implementation of Cyber Security and laws

III B.Tech. – II Semester

(16BT61505) BIOINFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: -

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
 CO2. Analyze biological sequences for Homology Modeling.
 CO3. Apply clustering methods for Phylogenetic trees.
 CO4. Solve bio sequencing problems using dynamic programming.
 CO5. Select and apply appropriate techniques and tools to structure Prediction

III B.Tech. – II Semester
(16BT60131) COMPUTER AIDED DESIGN AND DETAILING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Reinforced Cement Concrete Structures, Design of Steel Structures.

COURSE DESCRIPTION: Exercises on Analysis and design of Simple beams; 2-D and 3-D RCC Frames; Trusses; Solid slabs; Retaining walls; Water tanks; Plate Girder Bridges.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Explain the knowledge on computer aided design of RCC and steel structures using software tools.
- CO2. Analyze RCC and steel structures using software tools.
- CO3. Design RCC and steel structures using software tools.
- CO4. Solve complex RCC and steel structural design problems using software tools and suggest suitable solutions.
- CO5. Use appropriate techniques in modeling, analysis and design of RCC and steel structures using software tools.
- CO6. Apply contextual knowledge to assess the safety and serviceability of the structures designed.
- CO7. Follow relevant IS Codes for the design of RCC and steel structures using software tools.
- CO8. Function effectively as an Individual and as a team member in the design of RCC and steel structures using software tools.
- CO9. Communicate effectively on the design of RCC and steel structures using software tools in written, oral and graphical forms.

III B.Tech. II Semester
(16BT60132) HIGHWAY ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Highway material testing – Aggregates, Bituminous materials, Bituminous mixes; Pavement evaluation; Traffic studies.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate practical knowledge on highway material testing, pavement evaluation and traffic studies.
- CO2. Characterize highway materials, pavements and traffic.
- CO3. Design bituminous mix for pavements.
- CO4. Solve complex engineering problems associated with highway materials, pavements and traffic through suitable investigations.
- CO5. Use modern tools and techniques appropriate in highway material testing, pavement evaluation and traffic studies.
- CO6. Ensure health and safety in highway material testing, pavement evaluation and traffic studies.
- CO7. Encourage sustainable and environmental friendly highway materials, pavement evaluation methods and traffic studies.
- CO8. Maintain ethical standards for quality in highway material testing, pavement evaluation and traffic studies following relevant IS codes.
- CO9. Function effectively as an individual, and as a member or leader in teams to solve highway and traffic engineering problems.
- CO10. Communicate effectively on highway material testing, pavement evaluation and traffic studies in written, oral and graphical forms.
- CO11. Promote cost effective highway materials.

III B.Tech. – II Semester
(16BT60133) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PREREQUISITES: All the courses of the program up to III B. Tech. – I Semester.

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Knowledge on the seminar topic.
- CO2. Analytical ability exercised during the seminar work.
- CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.
- CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.

- CO5. Ability to function effectively as an individual as experienced during the seminar work.
 CO6. Ability to present views cogently and precisely on the seminar topic.
 CO7. Ability to engage in life-long learning as experience during the seminar work.

IV B.Tech. – I Semester

(16BT70101) ESTIMATION AND QUANTITY SURVEYING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Surveying, Computer Aided Building Planning and Drawing.

COURSE DESCRIPTION: Estimation of residential buildings; Estimation of different structures; Specifications and rate analysis; Contracts and Tenders; Valuation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the basic knowledge on estimation of civil engineering structures, specifications, rate analysis, contracts, tenders and valuation.
 CO2. Analyze estimates for different structures, rates, specifications, contracts, tenders and valuation.
 CO3. Provide solutions to problems associated with valuation, contracts and tenders by proper interpretation.
 CO4. Use appropriate techniques for estimation and valuation of civil engineering structures.
 CO5. Consider societal and legal issues in contracts and tenders.
 CO6. Maintain ethical standards in estimation, valuation, contracts and tenders.
 CO7. Prepare contracts, tenders and valuation reports for various civil engineering projects.
 CO8. Prepare contracts and tenders considering financial issues.

IV B. Tech. – I Semester

(16BT70102) GEOSPATIAL TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Surveying.

COURSE DESCRIPTION: Photogrammetry; Remote sensing; Geographic information system; GIS Spatial analysis; Remote sensing and GIS applications.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the basic knowledge on photogrammetry, remote sensing and geographic information system and their applications.
 CO2. Analyze the spatial data and non spatial data.
 CO3. Develop thematic maps using RS and GIS data for engineering applications.
 CO4. Conduct investigations to provide valid conclusions in geospatial applications.
 CO5. Apply suitable techniques to predict and model the damages due to natural disasters.
 CO6. Provide geospatial solutions ensuring societal safety.
 CO7. Consider the environmental sustainability issues in geospatial applications.

IV B.Tech. – I Semester

(16BT70103) RAILWAY, AIRPORT AND HARBOUR ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Railway Engineering; Construction and maintenance of railway tracks; Airport planning; Airport design; Harbour engineering.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the basic knowledge on railway, airport and harbour engineering.
 CO2. Analyze railway, airport and harbour engineering problems.
 CO3. Design elements of railways and airports.
 CO4. Solve problems associated with railway, airport and harbour engineering through proper investigations, analysis and interpretation.
 CO5. Use appropriate techniques in solving railway, airport and harbour engineering problems.
 CO6. Provide solutions to railway, airport and harbour engineering problems considering health and safety in the context of society.
 CO7. Consider the environmental issues while solving railway, airport and harbour engineering problems.
 CO8. Follow standards for planning and design of Railways, Airports and Harbours.

IV B.Tech. - I Semester
(16BT70104) **ADVANCED FOUNDATION ENGINEERING**

(Program Elective – 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Soil Mechanics, Foundation Engineering.

COURSE DESCRIPTION: Shallow foundations- Advanced bearing capacity theories, Design principles of shallow foundations; Pile foundations; Sheet pile walls; Foundations in problematic soils - Underreamed pile foundations; Marine substructures.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on advanced theories of bearing capacity and settlement of shallow and pile foundations; sheet pile walls, foundations on expansive soils and marine sub structures.
- CO2. Analyze footings for bearing capacity and settlements, sheet piles for stability and marine substructures.
- CO3. Proportion and design all types of foundations, sheet piles and break waters.
- CO4. Provide solutions to complex foundation engineering problems.
- CO5. Use appropriate techniques for the analysis and design of foundations, sheet piles and marine substructures.
- CO6. Ensure stability and safety in the design of foundations, sheet piles and marine substructures.
- CO7. Follow IS Codes to design foundations, sheet piles and break waters.
- CO8. Communicate effectively on advanced foundation engineering problems in written and graphical forms.

IV B.Tech. I Semester
(16BT70105) **ARCHITECTURE AND TOWN PLANNING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Construction Planning and Project Management

COURSE DESCRIPTION: Architectural design and site planning; Building architecture and services; Town planning and structure; Land use planning; Regional planning and standards.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on architecture and town planning.
- CO2. Identify the regional and urban related problems by analyzing the principles of architecture design and town planning practices in India.
- CO3. Design and develop a town plan by using various models of urban structure.
- CO4. Use information system approach and appropriate techniques for better land use planning.
- CO5. Ensure safety and performance standards in integration of building architecture and services.
- CO6. Use environmentally sustainable approach in architecture and town planning.
- CO7. Maintain ethics in architecture and town planning by following building rules and regulations.
- CO8. Communicate effectively in the form of layouts pertain to architecture and town planning.

IV B.Tech. I Semester
(16BT70106) **ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Environmental Studies, Water Supply Engineering, Wastewater Technology.

COURSE DESCRIPTION: Environmental impact assessment (EIA); EIA methodologies; Environmental impact on soils, ground water and surface water; Environmental impact assessment on air, vegetation and wild life; Environmental audit and acts.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain basic knowledge on EIA, EIA methodologies, environmental audits and acts and preparation of EIA reports for various projects.
- CO2. Analyze factors, elements, methodologies and reports of EIA; environmental audits and acts.
- CO3. Interpret EIA and audit reports to provide solutions for environmental problems.
- CO4. Use appropriate methods to prepare EIA and audit reports.
- CO5. Consider health and safety in EIA.
- CO6. Give suitable recommendations based on EIA study for sustainable development.
- CO7. Follow environmental acts in EIA.
- CO8. Prepare EIA and audit reports.

IV B. Tech. – I Semester
(16BT70107) GLOBAL POSITIONING SYSTEM

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Physics.

COURSE DESCRIPTION: Geodesy; Overview of Global Positioning System (GPS); GPS signal structure; GPS Errors and accuracy; GPS surveying and applications.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on geodesy, GPS signal structure, GPS errors and accuracy, GPS surveying and applications for civil engineering structures.
- CO2. Analyze problems associated with GPS and GPS surveying.
- CO3. Conduct investigations and give recommendations for boundary and locations, specific land surveying issues.
- CO4. Use modern methods and apply suitable techniques in collecting waypoints, recording tracks, navigating to a position.
- CO5. Consider societal issues in practicing GPS survey.
- CO6. Follow ethics in GPS survey practice.
- CO7. Understand and manage projects on global positioning satellite data interface and relation in multidisciplinary environments.

IV B.Tech. – I Semester
(16BT70108) STRUCTURAL DYNAMICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics, Mechanics of Solids, Structural Analysis - I, Structural Analysis - II.

COURSE DESCRIPTION: Principle of vibration analysis; Single degree of freedom, Two degree of freedom and multi-degree of freedom systems; Vibration analysis; Dynamic analysis of continuous systems.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Elucidate the knowledge on theory of vibrations.
- CO2. Analyze engineering systems for different modes of vibrations.
- CO3. Formulate the complex equation of motions for free vibrations and continuous systems.
- CO4. Solve complex engineering problems associated with vibrations by proper modeling and analysis.
- CO5. Use appropriate methods to analyze engineering systems for vibrations.
- CO6. Ensure sustainability while analyzing engineering systems for vibrations.

IV B.Tech. - I Semester
(16BT70109) TRANSPORTATION PLANNING AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Transportation planning; Transport demand analysis; Traffic assignment; Landuse transport models and theory of traffic flow; Transport economics; Public transportation–mass transit systems; Scheduling; Planning; Softwares.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on transportation planning and management.
- CO2. Analyze problems associated with transportation planning and management.
- CO3. Develop transportation plans and management systems.
- CO4. Solve complex problems in transportation planning and management through proper investigations, analysis and interpretation.
- CO5. Use appropriate tools and techniques in transportation planning and management.
- CO6. Consider societal issues in transportation planning and management.
- CO7. Provide solutions to transportation planning and management problems considering environment.
- CO8. Maintain ethics in transportation planning and management practice.
- CO9. Consider economical issues in transportation planning and management.

IV B.Tech. – I Semester**(16BT70110) WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Surveying, Engineering Hydrology, Irrigation Engineering.

COURSE DESCRIPTION: Concepts of water resources system planning and management; Linear programming; Dynamic programming; Non-linear optimization techniques; Simulation; Water resources economics; Water resources management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the basic knowledge on optimization techniques in systems, planning and management of water resources.
- CO2. Analyze optimization techniques and their application in water resources systems, planning and management.
- CO3. Develop water resources management systems.
- CO4. Solve complex problems associated with water resources systems planning and management through proper analysis and interpretation of data.
- CO5. Use and develop appropriate optimization techniques in water resources planning and management.
- CO6. Understand the impact of water resources planning and management on society.
- CO7. Provide suitable solutions to water resources planning and management problems considering environment sustainability.
- CO8. Consider economical issues for cost effective water resources planning and management.

IV B.Tech. – I Semester**(16BT70111) ADVANCED STEEL STRUCTURES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Structural Analysis-I, Structural Analysis-II, Steel Structures.

COURSE DESCRIPTION: Welded plate girders; Gantry girder; Steel water tanks; Composite construction; Grillage foundation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Gain the knowledge on advanced steel structures: welded plate girders, gantry girder, water tanks, composite construction, grillage foundation and connections.
- CO2. Analyze the advanced steel structures and their elements.
- CO3. Design advanced steel structures and their elements.
- CO4. Provide solutions to complex engineering problems associated with advanced steel construction through proper analysis and design.
- CO5. Use appropriate techniques to analyze and design of advanced steel structures and their elements.
- CO6. Ensure safety and stability in the design of advanced steel structures and their elements
- CO7. Follow IS codes in the design of advanced steel structures and their elements.

IV B.Tech. – I Semester**(16BT70112) EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Structural Dynamics, Engineering Geology.

COURSE DESCRIPTION: Earthquake engineering; Earthquake analysis; Codal design and detailing provisions; Seismic planning; Shear walls and base isolation techniques.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire the knowledge on seismology and earthquake resistant design of structures.
- CO2. Analyze structures for earthquake loading.
- CO3. Design earthquake resistant structures.
- CO4. Recommend suitable structural elements for earthquake resistant structures.
- CO5. Use an appropriate technique for earthquake resistant design of structures.
- CO6. Consider stability and safety issues in earthquake resistance design of structures.
- CO7. Ensure ethics in earthquake resistant design of structures as per IS Codes.

IV B.Tech. – I Semester
(16BT70113) HIGHWAY CONSTRUCTION AND MAINTENANCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Highway and Traffic Engineering

COURSE DESCRIPTION: Highway construction; Stabilized roads; Highway drainage, Hill roads; Highway construction equipment; Highway maintenance; Road side development.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on highway construction and maintenance.
- CO2. Analyze the problems associated with highway construction and maintenance.
- CO3. Design highway drainage.
- CO4. Solve issues related to highway construction and maintenance through proper investigations and interpretation of data.
- CO5. Use appropriate techniques and tools in highway construction and maintenance.
- CO6. Consider the societal issues in highway construction and maintenance.
- CO7. Provide solutions to the problems in highway construction and maintenance considering environment.
- CO8. Follow ethics in highway construction and maintenance.

IV B.Tech - I Semester
(16BT70114) INDUSTRIAL WASTEWATER TREATMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Wastewater Technology.

COURSE DESCRIPTION: Industrial wastewater sources and characteristics; Principles of Primary and biological treatment; Advanced wastewater treatment systems; Typical wastewater treatment systems for different industries; Waste minimization.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CEO1. Demonstrate the knowledge on characteristics of industrial wastewater, treatment systems and waste minimization.
- CEO2. Analyze characteristics, treatment systems and waste minimization techniques of industrial wastewater.
- CEO3. Design wastewater treatment

IV B.Tech. I Semester
(16BT70115) INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Construction Planning and Project Management.

COURSE DESCRIPTION: Infrastructure development; Overview of Indian infrastructure – Tenders, Contracts and specifications; Policies on infrastructure development; Construction and infrastructure; Infrastructure management.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on infrastructure development and management in global economy scenario in India.
- CO2. Analyze problems associated with infrastructure development and management.
- CO3. Formulate legal framework for regulating private partnerships by adopting government policies.
- CO4. Use appropriate tools and techniques for better infrastructure development and management.
- CO5. Ensure public health care and education in different sectors of infrastructural development projects.
- CO6. Use environmentally sustainable approach in infrastructure development and management.
- CO7. Maintain ethics in infrastructure development and management by following policies and regulations as per government norms.
- CO8. Futuristic plan, monitor and control the finance in infrastructural development projects.

IV B.Tech. - I Semester
(16BT70116) SOIL DYNAMICS AND MACHINE FOUNDATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Soil Mechanics, Foundation Engineering.

COURSE DESCRIPTION: Fundamentals of vibration; Frequency of soil systems; Wave propagation; Dynamic soil properties; Vibration analyses; Design of machine foundations; Machine foundations on piles; Vibration isolation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on soil behaviour under dynamic loading, vibration analysis, machine foundations and vibration isolation.
- CO2. Analyze dynamic soil properties, vibrations and machine foundations.
- CO3. Design machine foundations.
- CO4. Investigate the soil properties during wave propagation and suggest suitable foundations.
- CO5. Use appropriate techniques for dynamic soil characterization, design of machine foundations and vibration isolation.
- CO6. Recommend machine foundations and vibration isolation techniques considering stability and safety.
- CO7. Follow IS codes in dynamic soil characterization, design of machine foundations and suggesting vibration isolation techniques.

IV B.Tech I Semester
(16BT70117) WATERSHED MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Surveying, Engineering Hydrology.

COURSE DESCRIPTION: Concept of watershed; Need and objectives; Characteristics of watershed; Principles of erosion; Measures to control erosion; Water harvesting; Land and ecosystem management; Planning and administration.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Understand the principles and applications of watershed management.
- CO2. Assess water availability, soil erosion, ecosystems and watershed management techniques.
- CO3. Design solutions for complex harvesting sites to meet the specific needs.
- CO4. Conduct investigations and interpret data for development of watersheds.
- CO5. Use of modern tools to enhance the efficiency of harvesting systems.
- CO6. Consider societal issues in the development of watershed management.
- CO7. Ensure environmental sustainability in the development of watershed.
- CO8. Effective management of watersheds.

IV B.Tech. - I Semester
(16BT70118) AIR POLLUTION AND CONTROL

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Environmental Studies

COURSE DESCRIPTION: Fundamentals of air pollution; Effects of air pollution; Sampling and analysis; Control methods and equipment; Air and noise pollution from industrial operations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on air pollution, effects, sampling, control methods and equipment.
- CO2. Identify and analyse air pollution and control measures.
- CO3. Design various air pollution controlling systems.
- CO4. Provide solutions to complex air pollution problems through proper investigations and interpretation.
- CO5. Use appropriate techniques in the analysis, control and management of air pollution.
- CO6. Consider the ill effects of air pollution on human health, materials and vegetation in designing controlling systems.
- CO7. Understand and demonstrate the need for sustainable development.
- CO8. Follow IS codes in analysis and control of air pollution.

IV B.Tech. – I Semester
(16BT70119) BRIDGE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Reinforced Concrete Structures and Foundation Engineering.

COURSE DESCRIPTION: Bridge loading standards; Box culvert and deck slab bridge; Beam and slab bridge; Bridge bearings; Piers and abutments.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge on site selection and design of RCC Bridges.
- CO2. Analyze various components RCC bridges.
- CO3. Design various components of RCC bridges.
- CO4. Recommend suitable bridge components.
- CO5. Use appropriate techniques in the analysis and design of RCC bridges.
- CO6. Consider stability, safety and serviceability requirements in the design components of RCC bridges.
- CO7. Ensure environmental sustainability in planning and preparing RCC bridge designs.
- CO8. Ensure ethics in RCC bridge design in accordance with IS Codes.

IV B.Tech. – I Semester
(16BT70120) GROUND IMPROVEMENT TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Soil Mechanics and Foundation Engineering.

COURSE DESCRIPTION: Scope of ground improvement; Methods of ground improvement; Drainage and dewatering; In-situ densification; Stabilization; Geosynthetics and earth reinforcement.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Explain the concept and techniques of ground improvement.
- CO2. Compare different types of ground improvement techniques and select an appropriate one.
- CO3. Design ground improvement techniques.
- CO4. Solve complex soil problems through suitable ground improvement techniques.
- CO5. Use and develop appropriate ground improvement techniques.
- CO6. Understand the importance of safety in the design and execution of any ground improvement technique.
- CO7. Recommend environmental friendly ground improvement techniques.
- CO8. Follow IS Codes in practicing ground improvement techniques.

IV B.Tech. – I Semester
(16BT70121) HYDRO POWER ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery.

COURSE DESCRIPTION: Hydro power; Water power estimate; Hydro power plants; Pumped storage power plants; Hydraulic turbines; Water conveyance; Channel surges and intakes; Power house and equipment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate knowledge on the basic concepts of hydro power, hydro power plants and its components.
- CO2. Analyze hydro power estimates, hydro power plants and its components.
- CO3. Design components of hydro power plant.
- CO4. Recommend suitable solutions for hydro power issues through proper investigation and interpretation.
- CO5. Use appropriate methods in estimation of hydropower potential.
- CO6. Consider societal issues while recommending for the construction of hydro power plants.
- CO7. Ensure environmental sustainability in planning, construction and operation of hydro power plants.

IV B.Tech. – I Semester
(16BT70122) PAVEMENT ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Highway materials and mix design; Design factors for flexible pavements; Analysis and design of flexible pavements; Analysis and design of rigid pavements.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on transportation planning, pavement analysis and design.
- CO2. Analyze problems associated with transportation planning, pavement analysis and design.
- CO3. Design of pavements and bituminous concrete mix.
- CO4. Solve transportation planning, pavement analysis and design problems through proper analysis, interpretation and design.
- CO5. Use appropriate methods in transportation planning, pavement analysis and design.
- CO6. Consider safety issues in providing solutions to problems in transportation planning and pavement design.
- CO7. Provide solutions to the problems in transportation planning, pavement analysis and design, considering environment.
- CO8. Follow codes of practice in transportation planning, pavement analysis and design.

IV B.Tech. – I Semester

(16BT70123) PRESTRESSED CONCRETE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Structural Analysis, Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Materials for prestressed concrete; Prestressing systems; Analysis of prestress; Design of section for flexure and shear; Analysis of end blocks, Composite construction of prestressed and insitu concrete.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on prestressed concrete structures and composite construction.
- CO2. Analyze prestressed concrete members and composite structures.
- CO3. Design prestressed concrete structural elements and composite structures.
- CO4. Solve problems associated with prestressed concrete structures and composite construction through proper analysis and interpretation.
- CO5. Use appropriate techniques for the analysis and design of prestressed concrete structures and composite construction.
- CO6. Consider safety issues in the design of prestressed concrete structures and composite construction in the context of society.
- CO7. Follow IS Codes of practice in the design of prestressed concrete structures and composite construction.

IV B.Tech. – I Semester

(16BT70124) REHABILITATION AND RETROFITTING OF STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Concrete Technology, Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Maintenance and repair strategies; Serviceability and durability of concrete; Materials and techniques for repair; Repairs, Rehabilitation and Retrofitting of structures; Demolition techniques.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the knowledge on maintenance, repair and rehabilitation of concrete structures.
- CO2. Analyze structural damages and techniques of rehabilitation, retrofitting and demolition.
- CO3. Solve the complex problems pertaining to the repairs, rehabilitation, retrofitting and demolition of structures.
- CO4. Use appropriate techniques for repairs, rehabilitation, retrofitting and demolition of structures.
- CO5. Understanding the impacts of damages and apply contextual knowledge in repair, rehabilitation, retrofitting to ensure safety of the structures in societal context.
- CO6. Comprehend the reports effectively on the case studies of demolition of buildings.

IV B.Tech. – I Semester

(16BT70131) CIVIL ENGINEERING SOFTWARE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses in different domains of Civil Engineering.

COURSE DESCRIPTION: Software tools in modeling; analysis and design of systems in different domains of Civil Engineering - Structural Engineering; Geotechnical Engineering; Transportation Engineering; Environmental Engineering; Water Resources Engineering; Construction Engineering; Surveying.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Acquire knowledge on software tools in analysis and design of civil engineering systems.
- CO2. Analyse civil engineering systems by software tools.
- CO3. Design civil engineering systems through software tools.
- CO4. Address complex civil engineering problems for better solutions with software tools.
- CO5. Use the latest software tools for modeling, analysis and design of civil engineering systems.
- CO6. Consider safety of built environment through software tools.
- CO7. Contemplate environmental sustainability of civil engineering systems through software tools.
- CO8. Follow ethics in civil engineering practice through software tools.
- CO9. Function effectively as an individual and as a team member in modeling, analysis and design of civil engineering systems using software tools.
- CO10. Communicate effectively on civil engineering software applications in written, oral and graphical forms.

IV B. Tech. – I Semester

(16BT70132) REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: -

COURSE DESCRIPTION: Creation of geo-database; Digitization of toposheet/map; Drainage analysis; Developing digital elevation model; Preparation of thematic maps; Land use and land cover analysis; Study of feature estimation; Rainfall runoff analysis; Road network analysis; Watershed analysis; Site suitability analysis; Natural hazard zones map.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

- CO1. Demonstrate the practical knowledge on toposheets, aerial photographs, satellite imagery, remote sensing and GIS applications to civil engineering.
- CO2. Identify the spatial objects on the toposheets and imagery.
- CO3. Create the thematic maps using geospatial data with emphasis on practical applications in civil engineering.
- CO4. Conduct field study and interpret the spatial and non spatial data.
- CO5. Select appropriate methods to estimate the feature classes in RS and GIS applications.
- CO6. Provide geospatial solutions to civil engineering problems considering societal issues.
- CO7. Consider environmental sustainability in engineering and non engineering applications.
- CO8. Follow standards in mapping and interpretation of the geospatial data.
- CO9. Function effectively as an individual, and as a member or leader in teams to solve Geospatial technology issues.
- CO10. Communicate effectively on the geospatial data to the engineering community and society in written, oral and graphical forms.

IV B.Tech. – I Semester

(16BT70133) COMPREHENSIVE ASSESSMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
	100	100	-	-	-	2

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to demonstrate:

- CO1. Knowledge in the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Project management skills in the courses of the program.
- CO12. Ability to engage in life-long learning in the courses of the program.

IV B.Tech. – II Semester
(16BT80131) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

- CO1. Knowledge on the project topic.
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex engineering problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the project work.
- CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the engineering practice as applied in the project work.
- CO9. Ability to function effectively as an individual as experienced during the project work.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO12. Ability to engage in life-long learning as experience during the project work.



Course Outcomes (PG Programmes)

SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)

Sree Sainath Nagar, A.Rangampet – 517 102 (A.P.)

(AFFILIATED TO JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU)

Program: M.Tech. DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS

M. Tech. - I Semester

(16MT13801) COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

A Course on Computer Networks and Wireless Communication and Networks at UG Level

COURSE DESCRIPTION:

Advanced computer networks and its architectures; Protocols & Network security; Mobile adhoc networks.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge on
 - Architectures and functioning of advanced computer networks like Ethernet, SONET/SDH, Wi-Fi, Frame Relay, ATM networks etc.
 - Protocols like IPv6, MPLS, RSVP, VoIP associated with advanced computer networks.
 - Security features associated with advanced computer networks.
2. Analyze various design issues for conducting research related to the Internet protocol (IP), Wireless LANs and ATM network technologies prominent in high performance scenario.
3. Design and develop techniques for solutions pertaining to the advanced networking technologies.
4. Formulate solutions for engineering problems pertaining to the advanced networking technologies.
5. Initiate research in advanced computer networks.
6. Apply appropriate techniques and tools to complex engineering activities in the field of advanced computer networks.
7. Contribute positively to multidisciplinary scientific research in design and development of Protocols for adhoc network architectures.

I M. Tech. – I Semester

(16MT13802) DIGITAL COMMUNICATION TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

Course on Digital Communications at UG Level, Review of random Variables and Processes

COURSE DESCRIPTION:

Characterization of Communication Signals and Systems; Digital Modulation Techniques; Optimum Receivers for the Additive Gaussian Noise Channel; Spread Spectrum Technique; Multichannel and Multicarrier Systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Characterization of communication signals and systems.
 - Digital modulation techniques
 - Communication over AWGN channels
 - Optimum receivers
 - Spread spectrum techniques
 - Multi-carrier communication system
2. Analyze numerical and analytical problems critically for conducting research in the field of Digital Communication Systems.
3. Solve engineering problems and arrive at optimal solutions pertaining to digital communications.
4. Apply appropriate techniques to complex engineering activities in the field of signal processing and communications.

M. Tech. - I Semester**(16MT13803) DIGITAL SYSTEM DESIGN AND TESTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Switching Theory and Logic Design at UG Level.

COURSE DESCRIPTION:

Design of digital systems using ROMs, PLAs, CPLDs and FPGAs; Fault diagnosis in combinational and sequential circuits; Fault modeling in programmable logic array.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Identifying various Faults in combinational and sequential circuits
 - Test generation algorithms
 - Programmable Logic Devices (PLDs)
 - BIST
2. Analyze complex engineering problems critically for conducting research in the field of digital system design.
3. Design of complex digital systems in combinational and sequential modes.
4. Conceptualize and solve engineering problems to obtain solutions for the design of digital machines.
5. Initiate research in digital system design and testing.
6. Apply appropriate techniques to complex engineering activities in the design of digital systems.
7. Contribute positively to multidisciplinary scientific research in design and development of Fault Diagnosis well suited for wide range of applications.

M. Tech. - I Semester**(16MT13804) IMAGE & VIDEO PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Digital Communications & Digital Signal Processing at UG Level

COURSE DESCRIPTION:

Image Fundamentals and its transforms; image enhancement techniques; Image compression, Image Restoration & Image Segmentation; Video Processing basics like Representation, Sampling, Motion estimation, Filtering and Compression.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - a. Image Transforms
 - b. Image Enhancement & Restoration Techniques
 - c. Image Segmentation & Compression Techniques
 - d. Video Processing
2. Analyze complex engineering problems critically in the domain of Image Processing for conducting research.
3. Solve engineering problems for feasible and optimal solutions in the core area of Image Processing.
4. Initiate research in image and video processing.

5. Apply appropriate tools and techniques to complex engineering activities in the field of Image Processing.
6. Contribute positively to multidisciplinary scientific research in Image Processing.

M. Tech. - I Semester

(16MT13805) MODERN DIGITAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE: Courses on Digital Signal Processing at UG level.

COURSE DESCRIPTION: Design of digital filter banks; Power spectral estimation; Principles of adaptive filters; Algorithms for error minimization.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Filter banks and Wavelets
 - Efficient power Spectral Estimation Techniques.
 - Characteristics of adaptive systems
 - Searching algorithms such as gradient and steepest descent
 - Adaptive algorithms like LMS, RLS and Kalman filtering
 - Non-linear adaptive filtering
2. Analyze complex engineering problems critically in digital filter design and the domain of adaptive filtering for conducting research.
3. Design Various Digital Filter Banks for using in Communication Systems.
4. Solve engineering problems for feasible and optimal solutions in the core areas of Multirate signal processing and Adaptive signal processing.
5. Initiate research in modern digital signal processing.
6. Applying Various Techniques related to the Linear Optimum Filters and understand their design considerations
7. Contribute positively to scientific research in signal processing, applications towards society, antennas and spectral analysis.

M. Tech. I-Semester

(16MT20501) ADVANCED COMPUTER ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Computer Organization".

COURSE DESCRIPTION

Quantitative design and analysis, memory hierarchy design; parallel computer models and network properties; pipelining, superscalar techniques, multiprocessors and multi computers; Multi-Vector, SIMD and Multi-Core computers

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Acquire knowledge of:
 - Computational models and Computer Architectures.
 - Concepts of parallel computer models.
 - Scalable Architectures.
 - Pipelining, Superscalar processors, multiprocessors, SIMD and Multi core Computers.
2. Analyze architectures of parallel computers, sub systems and their interconnection structures.
3. Apply concepts and techniques of advanced computer architectures to solve engineering problems.

4. Conduct investigations, apply appropriate techniques to analyze and interpret data to gain advanced knowledge and solve new problems.

M. Tech. -I Semester

(16MT12541) SOFT COMPUTING TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

COURSE DESCRIPTION: Artificial neural network; fuzzy logic; Genetic algorithms and Soft Computing.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge on :
 - Neural networks and fuzzy logic
 - Genetic algorithms
 - Soft Computing techniques
2. Analyze numerical and analytical problems critically to design fuzzy neural networks.
3. Demonstrate problem solving skills in designing efficient Fuzzy Algorithms.
4. Apply appropriate Genetic techniques to solve problems in the field of soft computing

M. Tech. I-Semester

(16MT13806) ASIC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on VLSI Design at UG Level.

COURSE DESCRIPTION:

ASIC design categories; Design Libraries; Design Entry; Logic Synthesis; Simulation; Testing; Physical design flow of ASIC.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - ASIC Design Styles.
 - ASICs Design Libraries.
 - ASICs Design Issues.
 - ASIC Construction.
2. Analyze problems critically in the field of ASIC Design.
3. Design Application Specific ICs for use in various systems.
4. Solve engineering problems and arrive at optimal solutions in pertaining to ASIC Design.
5. Initiate research in ASIC Design.
6. Apply appropriate techniques, resources and tools to engineering activities to provide appropriate Solution for the development of ASICs.
7. Contribute to multidisciplinary scientific work in the field of ASIC Design.

M. Tech. - I Semester**(16MT13807) TRANSFORM TECHNIQUES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

Course on Signal Processing at UG Level.

COURSE DESCRIPTION:

Continuous Wavelet Transforms; Discrete Wavelet Transforms; Multi Resolution Analysis; Wavelet packets; Applications of Wavelet Transforms.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Multiresolution Analysis
 - Continuous wavelets
 - Discrete wavelets and Filter design.
 - Alternative Wavelets & Wavelet packets
2. Analyze complex engineering problems critically in the area of Signal Processing and communications.
3. Design, conduct experiments, analyze and interpret complex engineering problems and apply appropriate research methodologies for conducting research in Signal Processing.
4. Solve engineering problems with wide range of solutions in the areas of Biomedical Signal Processing, Image Processing, Radar Signal Processing and Communications and arrive at optimum solutions.
5. Initiate research in Transform Techniques.
6. Use appropriate techniques, resources and tools to engineering activities in the fields of Signal Processing and Communications.
7. Contribute to collaborative multidisciplinary scientific work/research by initiating research work on Data compression, Noise reduction, Communications, Image and signal Processing.

M. Tech. - I Semester**(16MT13831) DIGITAL SYSTEM DESIGN AND TESTING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES:

A Course on Digital Design at UG Level

COURSE DESCRIPTION:

Design and simulation of digital circuits; Implementing digital circuits in FPGAs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Behavioral system modeling: concurrency and event-driven simulation
 - Digital design modeling using various styles (behavioral, structural and dataflow)
 - Designing Combinational and sequential circuits
 - Verifying the Functionality of Designed circuits using function Simulator
 - Checking for critical path time calculation
 - Placement and routing in FPGA
 - Implement digital designs in FPGA device.
2. Conceptualize and solve problems in logic verification and timing calculation of Digital circuits.
3. Undertake projects efficiently in Digital system design to achieve optimization for high device utilization and performance in industrial needs.
4. Contribute to multidisciplinary groups in design and development of digital systems.

5. Create, develop and use modern CAD tools to analyze problems of RTL schematic, Technology schematic, and system implementation.
6. Communicate effectively in verbal and written forms.

M.Tech. – I Semester

(16MT13832) IMAGE & VIDEO PROCESSING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITE:

A course on Image & Video Processing

COURSE DESCRIPTION: Fundamentals of images, image transforms, enhancement, restoration, image compression and coding and video processing.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate knowledge in
 - Image Transforms
 - Image Enhancement & Restoration Techniques
 - Image Segmentation & Compression Techniques
 - Video Processing
2. Understand various applications of image processing in industry, Medicine, and defense.
3. Solve engineering problems for feasible and optimal solutions in the core area of Image and video Processing.
4. Initiate research in image and video processing.
5. Acquire an appreciation for the Image and video processing issues and techniques and be able to apply these techniques to real world problems.
6. Contribute positively to multidisciplinary scientific research in Image and video Processing.
7. Communicate effectively in verbal and written forms.

M. Tech. – I Semester

(16MT13808) RESEARCH METHODOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --

COURSE DESCRIPTION:

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Acquire in-depth knowledge on
 - Research design and conducting research
 - Various data collection methods
 - Statistical methods in research
 - Report writing techniques.
2. Analyze various research design issues for conducting research in core or allied areas.
3. Formulate solutions for engineering problems by conducting research effectively in the core or allied areas.
4. Carryout literature survey and apply research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.

5. Select and Apply appropriate techniques and tools to complex engineering activities in their respective fields.
6. Write effective research reports.
7. Develop attitude for lifelong learning to do research.
8. Develop professional code of conduct and ethics of research.

M. Tech. -II Semester

(16MT23801) DETECTION AND ESTIMATION OF SIGNALS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Probability and Stochastic Processes at UG Level

COURSE DESCRIPTION:

Decision criteria for single and multiple observations; Estimation techniques; Properties of estimators; parameter Estimation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Different decision criteria
 - Estimation techniques and their properties
 - Selection of a good estimator for the given specifications.
 - Kalman Filter
 - Statistical estimation of parameters
2. Analyze complex engineering problems critically for conducting research in the field of signal detection and estimation.
3. Design optimum filters for solving problems in the field of Communications.
4. Solve engineering problems to obtain solutions for the design of optimum receivers.
5. Initiate research in detection and estimation of signals.
6. Apply appropriate techniques, resources to complex engineering activities in the field of Communications.
7. Contribute to multidisciplinary scientific work in the field of Communications and Radar Systems.

M. Tech. - II Semester

(16MT23802) EMBEDDED SYSTEM DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

Courses on Digital Logic Design and Programming using 'C' language at UG Level

COURSE DESCRIPTION: Embedded Hardware Challenges and Choice; Real Time Interfacing; Software Architectures; Programming Concepts and Language support; Operating System Concepts; Development Tools; System Design Concepts.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Embedded Hardware
 - Software Architectures
 - Embedded Programming Languages
 - Embedded Development Tools
 - Operating System concepts
 - Design Techniques

2. Analyze critically and resolve the issues pertaining to the selection of Hardware, Software architecture, Development tools, operating system and system components from the available lot
3. Solve complex engineering problems in embedded domain with societal impact.
4. Contribute positively in designing and developing solutions with embedded Systems with open mindedness, objectivity and rational approach.
5. Initiate research in Embedded system design.
6. Model embedded systems with chosen set of Hardware, development tools with an understanding of their limitations
7. Apply reasoning and demonstrate skills to take up inter disciplinary research in embedded domain

M. Tech. - II Semester

(16MT23803) INFORMATION THEORY AND CODING TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Digital Communications at UG Level

COURSE DESCRIPTION:

Information theory; Channel capacity; Channel coding techniques – Linear block codes, Cyclic codes, Convolutional codes; Reed-Solomon and Turbo codes.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate knowledge in
 - Various aspects of source and channel coding techniques
 - Channel capacity
 - Performance evaluation of various source coding techniques
2. Analyze complex engineering problems critically in the domain of information, source encoding.
3. Design encoder, Syndrome circuits to solve complex engineering problems.
4. Conceptualize and Solve engineering problems for feasible and optimal solutions in the core area of information theory and coding techniques.
5. Initiate research in information theory and coding techniques.
6. Contribute positively to multidisciplinary scientific research in communications with objectivity and rational analysis.

M. Tech.- II Semester

(16MT23804) LOW POWER CMOS VLSI DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on VLSI Design at UG Level.

COURSE DESCRIPTION:

Needs For Low Power VLSI Chips; Principles Of Low Power Design; Simulation and Probabilistic Analysis of Low Power; Logic and Circuit Analysis; Special Techniques Of Low Power Design, Performance Management of an Architecture or a System.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Design of logic Circuits for low power Requirements
 - Power Estimation of Analysis
 - Low power architecture & Systems
 - Low Power Techniques

- Analyze complex problems critically in the domain of low power CMOS Circuit, effects and issues of devices, for conducting research in VLSI Design.
- Solve engineering problems with wide range of solutions of low power design challenges, tradeoff between area, speed and power requirements.
- Apply appropriate research methodologies in Low power CMOS devices of complex engineering activities in the field of VLSI Design.
- Apply appropriate techniques, Resources and tools in, evaluating electrical properties of low power CMOS devices based on second order effects.
- Contribute positively to multidisciplinary scientific research work in the design and development of Ultra Low power Integrated Circuits suited for wide range of applications.

M. Tech.-II Semester

(16MT23805) WIRELESS COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on Digital Communications at UG Level.

COURSE DESCRIPTION:

Introduction to cellular wireless communication; Radio propagation in mobile atmosphere; Equalization along with Diversity techniques; several access techniques; Introduction to wireless networking; Multicarrier modulation techniques.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- Demonstrate advanced knowledge in
 - Cellular systems and wireless standards
 - Radio wave propagation in wireless environment
 - Equalization and diversity techniques
 - Multiple access techniques and networking
 - Multicarrier modulation
- Analyze complex engineering problems critically for conducting research in wireless systems.
- Design a Digital Communication System/ Subsystem for societal needs.
- Solve engineering problems with wide range of solutions in wireless communications.
- Apply appropriate techniques to engineering activities in the field of wireless communications.

M. Tech. -II Semester

(16MT23806) DISPLAY TECHNOLOGIES AND DEVICES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Semiconductor Devices and Circuits at UG Level.

COURSE DESCRIPTION:

Introduction to display optics, Inorganic display technologies; Measurements of display systems; Characteristics of liquid crystal display, thin film transistor, Active matrix LCD and organic LED Displays.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- Gain in-depth knowledge in
 - Display Optics
 - Display Technologies
 - Display Measurements.
- Analyze problems in Measurements of parameters in display systems.
- Conceptualize and implement various displays to address complex engineering problems for wide range of solutions in different display technologies.
- Apply appropriate tools, models and technologies to enhance visualization in display Devices.

M. Tech. -II Semester**(16MT23807) OPTICAL COMMUNICATIONS AND NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: --**COURSE DESCRIPTION:**

Non linear properties of fibers; characteristics of fiber materials; optical cable design and connectors; optical components; modulation and demodulation schemes; error detecting and correcting codes; optical network management and control.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate Knowledge in
 - Linear and Non-linear Characteristics of Optical fiber.
 - Fiber design considerations.
 - Minimization of Losses in Cable design.
 - Understanding the operation of advanced fiber optic components.
 - Modulation and demodulation techniques.
 - Access networks.
 - Network Control and Management.
2. Analyze complex engineering problems critically in the domain of optical communication for conducting research.
3. Design of optical cable and transmission layer in the field of optical Communications.
4. Solve engineering problems related to optical communication to meet societal and industrial needs.
5. Apply appropriate techniques to complex engineering activities in the field of optical communications.

M. Tech. -II Semester**(16MT23808) REAL TIME SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

Courses on Digital system design, Operating systems and embedded systems.

COURSE DESCRIPTION:

Real time system reference model; Real time scheduling approaches; Fault tolerant real time systems; Real time operating system concepts; Commercial RTOS.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Characterizing Real Time Systems
 - Various Scheduling approaches
 - Fault tolerant techniques
 - Real Time Operating System Services
2. Analyze critically various Operating Systems using Contemporary bench marks.
3. Consider trade-offs in Real Time System designing to solve engineering problems to exhibit specific behavior, given a set of performance goals and technology.
4. Familiarize with fault tolerant and scheduling techniques to overcome ever increasing embedded system design complexity combined with reduced time-to-market window to revolutionize embedded system design process.
5. Initiate research in Real Time Systems.
6. Explore tools and derive pseudo code using RTOS, for developing efficient embedded Systems.
7. Carry out multidisciplinary research in designing RTOS based systems.

M. Tech. - II Semester**(16MT23809) SPEECH PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
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PRE-REQUISITES: Courses on Signals & Systems and Digital Signal Processing in UG

COURSE DESCRIPTION:

Acoustic theory of speech production; Models for speech signals and speech processing systems; Mathematical analysis of speech signals - homomorphic and LPC models; Speech and speaker recognition systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Digital model representation of speech signal
 - LPC analysis
 - Homomorphic models
2. Analyze complex engineering problems critically for conducting research in speech signal processing.
3. Solve engineering problems using efficient algorithms for feasible and optimal solutions in Speech signal processing field.
4. Initiate research in speech signal processing.
5. Apply speech and speaker verification techniques to complex engineering activities in the field of speech processing.
6. Contribute to scientific research in Speech and speaker identification and verification systems with objectivity and rational analysis.

M.Tech. - II SEMESTER

(16MT23831) COMMUNICATIONS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES: Simulation Lab at UG Level

COURSE DESCRIPTION:

Design and simulation of communication systems - QPSK communication system over AWGN channel, Baseband Direct Sequence Spread Spectrum (DS/SS) System; Generation of different density and distribution functions; Generation of maximal and Gold code sequences.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate Knowledge in
 - Generation of Maximal and Gold Sequences & verification of their properties.
 - Design of communication system for band limited channels for Zero ISI.
 - Evaluating the performance of QPSK over AWGN Channel and Rayleigh Fading Channels.
 - Simulation of Code matched filter in Spread Spectrum Communication System.
 - Simulation of baseband Direct Sequence Spread Spectrum (DS/SS) System.
 - Performance evaluation of RAKE Receiver over Slow Fading Channel.
 - Simulation of Rayleigh Fading Channel Using Either Clarke's Model or Jake's Model for different Doppler Spreads.
2. Analyze engineering problems for feasible and optimal solutions in the core area of communication.
3. Design of Matched filter for spread spectrum communications.
4. Use MATLAB Toolbox to simulate complex engineering activities in the field of communication.
5. Demonstrate knowledge and understanding of engineering principles to execute the Projects effectively in the field of communications.

M. Tech. – II Semester

(16MT23832) EMBEDDED SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES: Digital Logic Design, C-Programming, Embedded System Design Courses at UG Level

COURSE DESCRIPTION: MSP430 Programming; Timers; Interrupts; Parallel and Serial Ports; ADC; SPI; Applications

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate knowledge in on-chip resources available in MSP430 Based microcontrollers such as: Parallel Ports, Timers, ADC, Serial ports.
2. Analyze critically various on-chip resources, programming alternatives towards efficient system design.
3. Solve complex engineering problems in embedded domain.
4. Design embedded systems using microcontrollers such as the MSP430.
5. Initiate research in embedded system design.
6. Contribute positively to multidisciplinary scientific research in Embedded domain.
7. Communicate effectively in verbal and written forms.

**M. Tech. -II Semester
(16MT23833) SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of seminar topic; literature survey; preparation of technical report and presentation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.
4. Plan, organize, prepare and present effective written and oral technical report on the topic.
5. Adapt to independent and reflective learning for sustainable professional growth in Digital Electronics and Communication Systems.
6. Contribute to multidisciplinary scientific work in the field of Digital Electronics and Communication Systems.
7. Understand ethical responsibility towards environment and society in the field of Digital Electronics and Communication Systems.
8. Engage in lifelong learning for development of technical competence in the field of Digital Electronics and Communication Systems.

**M. Tech. – II Semester
(16MT23810) INTELLECTUAL PROPERTY RIGHTS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PRE-REQUISITES: --

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge on
 - Intellectual Property
 - Trade Marks & Secrets
 - Law of Copy Rights, Patents
 - New development of Intellectual Property
2. Analyze the different forms of infringement of intellectual property rights.

3. Solve problems pertaining to Intellectual Property Rights.
4. Stimulate research zeal for patenting of an idea or product.
5. Write effective reports required for filing patents.
6. Develop life-long learning capabilities.
7. Develop awareness of the relevance and impact of IP Law on their academic and professional lives.
8. Develop attitude for reflective learning.

M. Tech. -III & IV Semester

(16MT33831 & 16MT43831) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	-	-	-	28

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate capacity to identify an advanced topic for project work in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.
4. Solve engineering problems pertinent to the chosen topic for feasible solutions.
5. Use the techniques, skills and modern engineering tools necessary for project work.
6. Do time and cost analysis on the project.
7. Plan, prepare and present effective written and oral technical report on the topic.
8. Adapt to independent and reflective learning for sustainable professional growth.
9. Contribute to multidisciplinary scientific work in the field of Digital Electronics and Communication Systems
10. Understand ethical responsibility towards environment and society in the field of Digital Electronics and Communication Systems.
11. Engage lifelong learning for development of technical competence in the field of Digital Electronics and Communication Systems.

Program: M.Tech. VLSI

M. Tech. - I SEMESTER

(16MT15701) ANALOG IC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE:

Courses on Semiconductor Devices and Circuits and VLSI design at UG Level.

COURSE DESCRIPTION:

MOS Device physics; Characteristics of amplifiers; Feedback circuits and operational amplifiers; Stability and frequency compensation of operational amplifiers; Nonlinear Analog circuits & other applications

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Sub threshold and Short Channel effects.
 - Current Mirrors.
 - Frequency response and Noise Characteristics of Amplifier.
 - Effect of Loading in Feedback Circuits.
 - One stage operational Amplifiers.
 - Ring Oscillator.
2. Analyze complex engineering problems critically in the domain of analog IC design for conducting research.
3. Design analog integrated Circuits for societal needs.
4. Develop Skills to solve engineering problems for feasible and optimal solutions in the core area of analog ICs.
5. Initiate research work on Reusable Design for the development of analog IC design.
6. Apply appropriate technique to implement accurate models for devices.

M. Tech. - I Semester

(16MT15702) COMPUTATIONAL METHODS IN MICROELECTRONICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Mathematics at UG Level.

COURSE DESCRIPTION:

Linear and Nonlinear Systems modeling; Approximation; Interpolation; Curve Fitting; Numerical Integration; Finite Difference Techniques; Initial Value problems; Energy Methods and Minimization; Finite Element Methods; Dynamic methods; Method of Characteristics; Finite Volume Methods; Grid Generation and Error Estimation; Device and Process Simulation; Layout and Yield estimation algorithms; Symbolic analysis and Synthesis of Analog ICs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Computation Tools.

- FDM, FEM, FVM.
 - Grid Generation.
 - Refinement Algorithms.
 - Errors in Meshing.
 - Application to device and process simulation.
2. Analyze the errors of Computational tools and judge independently the best suited Tool for fast Computation of simulation for conducting research in CAD Tools design.
 3. Develop skills to solve problems of Meshing, Grid Generation to improve speed and accuracy of CAD Tools.
 4. Initiate research work on designing methods to obtain accurate solutions.
 5. Apply appropriate techniques, resources and tools to model devices for engineering activities to obtain fast and accurate designs.

M. Tech. - I Semester

(16MT15703) DEVICE MODELING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Semiconductor Devices and Circuits at UG Level

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Static and Dynamic Characteristics
 - Threshold Variations
 - Effects of MOS Layers
 - Modeling at low and High Frequencies.
2. Analyze complex engineering problems critically for conducting research in MOS device structures.
3. Solve engineering problems with wide range of solutions in different MOSFET technologies.
4. Initiate research methodologies in Modeling and Simulation of complex engineering activities in the field of VLSI Design at Circuit Level Implementation.
5. Apply appropriate techniques, resources and tools to engineering activities in modeling MOS structures.
6. Contribute positively to multidisciplinary scientific research in design and development of Integrated Circuits suited for wide range of applications.

M. Tech. I - Semester

(16MT15704) DIGITAL IC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Digital IC Applications and VLSI Design at UG Level.

COURSE DESCRIPTION:

Introduction to MOS transistors; Characteristics of CMOS digital circuits; Transistor sizing; memory design; Design strategies; Design of subsystems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Static and dynamic characteristics of CMOS.
 - Alternative CMOS Logics
 - Transistor sizing
 - Adders Design
 - Design rules to develop layouts
 - Estimation of Delay and Power
2. Analyze complex engineering problems critically in the domain of CMOS Digital Integrated Circuits for conducting research.
3. Solve engineering problems for feasible and optimal solutions in the core area of CMOS Digital ICs.
4. Initiate research in Digital IC Applications.
5. Apply the Digital CMOS techniques for usage of modern CAD tools and their Limitations.
6. Contribute to multidisciplinary scientific work in the field of modern digital circuits like processor, memory designs.

M. Tech. - I Semester

(16MT15705) IC FABRICATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Engineering Physics, Engineering Chemistry, Material Science, VLSI Design at UG Level

COURSE DESCRIPTION:

IC Fabrication process - Crystal growth, Wafer preparation, Epitaxial growth, Oxidation, Lithography, Etching, Deposition, Ion- Implantation, Metallization and Packaging of VLSI devices.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Wafer preparation.
 - Lithography and Etching.
 - Diffusion process.
 - Assembly Techniques and Packaging.
2. Analyze IC fabrication methodologies and evaluate component effects on IC design for VLSI and ULSI domain.
3. Solve engineering problems by proposing potential solutions leading to better IC chip designs.
4. Initiate research in IC fabrication
5. Contribute to multidisciplinary scientific work in the field of Low power IC Fabrication.
6. Apply appropriate techniques to complex engineering activities in the field of VLSI Technology.

M.Tech. – I Semester

(16MT23808) REAL TIME SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

Courses on Digital system design, Operating systems and embedded systems.

COURSE DESCRIPTION:

Real time system reference model; Real time scheduling approaches; Fault tolerant real time systems; Real time operating system concepts; Commercial RTOS.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Demonstrate advanced knowledge in
 - Characterizing Real Time Systems
 - Various Scheduling approaches
 - Fault tolerant techniques
 - Real Time Operating System Services
9. Analyze critically various Operating Systems using Contemporary bench marks.
10. Consider trade-offs in Real Time System designing to solve engineering problems to exhibit specific behavior, given a set of performance goals and technology.
11. Familiarize with fault tolerant and scheduling techniques to overcome ever increasing embedded system design complexity combined with reduced time-to-market window to revolutionize embedded system design process.
12. Initiate research in Real Time Systems.
13. Explore tools and derive pseudo code using RTOS, for developing efficient embedded Systems.
14. Carry out multidisciplinary research in designing RTOS based systems.

I M. Tech. – I Semester

(16MT15706) ADVANCED DIGITAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: Courses on Digital Signal Processing at UG level

COURSE DESCRIPTION:

Digital filter banks; Parametric and Non-Parametric Power Spectrum Estimation methods; computationally efficient algorithms; Applications of DSP.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Filter banks and Wavelets
 - Linear Prediction
 - Efficient power Spectral Estimation Techniques
 - Applications of Multirate signal processing
2. Analyze complex engineering problems critically in the field of Signal Processing.
3. Design optimum filters, multirate DSP systems and computationally efficient DSP algorithms for societal needs.
4. Solve engineering problems for feasible and optimal solutions in the field of digital signal processing.
5. Initiate research in advanced digital signal processing.
6. Learn and apply appropriate techniques, including prediction and modeling to complex engineering activities with an understanding of the limitations.
7. Contribute to scientific research in Radar signal processing ,Inter disciplinary areas like Speech and Image processing and Remote sensing with objectivity and rational analysis.

M. Tech. – I Semester

(16MT15707) FPGA ARCHITECTURES & APPLICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on VLSI Design at UG Level.

COURSE DESCRIPTION:

Fundamentals of Programmable devices; Logic Implementation using PLDs and FPGAs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Programmable Logic Devices
 - Different FPGA Architectures
 - Digital Implementation using FPGA
 - FPGA Applications
2. Analyze complex problems critically for digital implementation issues, to conduct research in Digital VLSI Design.
3. Solve engineering problems with wide range of solutions in FPGA Implementation.
4. Initiate research methodologies in Modeling, Simulation and Implementation of complex engineering applications in the field of Digital Design at different levels of abstraction.
5. Apply appropriate techniques, Resources and tools in, Modeling complex engineering applications with an understanding of limitations.
6. Contribute to multidisciplinary scientific work in the field of FPGA Devices.

M. Tech. – I Semester

(16MT15708) RFIC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on Analog IC Design at UG Level/ PG Level.

COURSE DESCRIPTION:

Basic Concepts of RF Circuits; Transceiver Architectures; Low Noise Amplifier; Mixers; Oscillators; Power Amplifiers and Phased Locked Loops.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in RFIC
 - Basic Concepts.
 - Transceiver Architectures.
 - Low Noise Amplifiers.
 - Mixers.
 - Voltage Controlled Oscillators.
 - Phase Locked Loop.
 - Power Amplifiers.
2. Analyze the problems in Radio Frequency Integrated Circuits.
3. Solve problems in transceiver architectures.
4. Initiate research work on designing RF systems for the wireless communications.
5. Apply appropriate techniques to overcome problem of non-idealities in the design of RFIC circuits, Implement various techniques to arrive at Efficient Designs of RFIC Circuits and Model techniques for Linearization of devices used in RFICs.

M. Tech. - I Semester

(16MT15731) ANALOG IC DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

A Course on Linear IC Applications at UG Level.

COURSE DESCRIPTION:

Modeling and simulation of analog circuits using SPICE.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate knowledge in design of analog circuits.
2. Exhibit skills in SPICE Coding and verification of analog circuits.
3. Solve problems in Modeling and analysis of MOSFETs and OPAMPs.
4. Develop Skills to solve problems of design and analysis of analog circuits.
5. Initiate research in analog IC design.
6. Able to use CAD Tools to arrive at an optimized solution for analog signal design.
7. Contribute positively to multidisciplinary scientific research in design and development of Analog Integrated Circuits to solve problems arising in Integrated circuit Technology.
8. Communicate effectively in Verbal and written form of designs developed.

M. Tech. - I Semester**(16MT15732) DIGITAL IC DESIGN LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

A Course on Digital IC Applications at UG Level.

COURSE DESCRIPTION:

Modeling, Simulation, Synthesis and Implementation of digital circuits using HDLs;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in design of digital circuits.
2. Exhibit analytical skills in
 - Behavioral system modeling: concurrency and event-driven simulation.
 - Digital design modeling using various styles (behavioral, structural and dataflow)
 - Designing Combinational and sequential circuits
 - Verifying the Functionality of Designed circuits using function Simulator
 - Checking for critical path time calculation
 - Placement and routing in FPGA
 - Implement digital designs on FPGA device for conducting research in the field of Digital Circuits.
3. Conceptualize and Solve problems in logic verification and timing calculation of Digital circuits.
4. Initiate research in digital IC design.
5. Acquire research skills in the domain of Digital Systems.
6. Create, develop and use modern CAD tools to analyze problems of RTL, Technology schematic, and system implementation.
7. Contribute positively to multidisciplinary scientific research in design and development of Digital Integrated Circuits to solve problems arising in Integrated circuit Technology.
8. Communicate effectively in Verbal and written forms for the designs developed.

M. Tech. – I Semester**(16MT13808) RESEARCH METHODOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --**COURSE DESCRIPTION:**

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

9. Acquire in-depth knowledge on
 - Research design and conducting research
 - Various data collection methods
 - Statistical methods in research
 - Report writing techniques.
10. Analyze various research design issues for conducting research in core or allied areas.
11. Formulate solutions for engineering problems by conducting research effectively in the core or allied areas.
12. Carryout literature survey and apply research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
13. Select and Apply appropriate techniques and tools to complex engineering activities in their respective fields.
14. Write effective research reports.
15. Develop attitude for lifelong learning to do research.
16. Develop professional code of conduct and ethics of research.

M. Tech. – II Semester**(16MT25701) LOW POWER VLSI DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE:

A Course on VLSI Design at UG Level.

COURSE DESCRIPTION:

Low Power Design Limitations; SOI and MOS/BICMOS Processes; Deep submicron processes; Integration/Isolation Considerations; CMOS/Bi-CMOS and Advanced Bi-CMOS Logic Gates; Design and Quality Measures of Low Power Latches & Flip-Flops; Special Low Power Techniques.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Limitations of Low Power Design.
 - SOI Technology.
 - BiCMOS Processes.
 - MOSFET and BJT Behavior and Modeling.
 - BiCMOS Logic Gates Design.
 - Special low power techniques.
1. Analyze the low power BiCMOS circuits, the effects of devices and judge independently the best suited device for fabrication of smart devices for conducting research in ULSI design.
3. Solve problems of Low power design challenges, tradeoff between area, speed and power requirements.

4. Initiate research in low power VLSI design.
5. Apply appropriate techniques, resources and tools to engineering Activities in low power VLSI circuits.
6. Contribute to multidisciplinary scientific work in the field of low power Circuits.

M. Tech. - II Semester

(16MT25702) MIXED SIGNAL DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on Analog Design at UG Level.

COURSE DESCRIPTION:

Switched capacitor circuits - analysis and application; Design and characterization of Phase locked loops; Data converters – types; Design for different sampling rates.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Switched Capacitor Circuits
 - PLL
 - Data Converters – ADC and DAC
2. Analyze complex engineering problems critically for conducting research in Data Converters for Communication Systems.
3. Solve engineering problems with wide range of solutions to increase Data Rate of ADC and DAC.
4. Design a mixed signal system/subsystem for societal needs.
5. Initiate research in mixed signal design.
6. Apply appropriate techniques, resources and tools to engineering activities in development of Data Converters.
7. Contribute positively to multidisciplinary scientific research in design and development of Mixed Integrated Circuits suited for wide range of applications.

M.Tech. - II Semester

(16MT25703) NANOELECTRONICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Courses on Basic Engineering Physics, Basic Engineering Chemistry and Electronic Devices at UG level.

COURSE DESCRIPTION:

Introduction to wave particle nature and mechanics; Crystal structure of semiconducting material; Material for nanoelectronics; Different techniques of nanostructure fabrication; Nanostructure Characterization; Electron transport mechanism.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - wave particle nature, wave mechanics,

- crystal structure of semiconducting material
 - different techniques of nanostructure fabrication,
 - characterization of the nanostructure and electron in well
2. Analyze
 - Crystal structure of nanomaterials
 - Nanostructure based device
 3. Design and develop new nanodevices for advanced technological applications.
 4. Efficiently solve complex problems in the field of nanoelectronics.
 5. Involve and resolve the future research challenges in the fields related to Nanoelectronics.
 6. Contribute to multidisciplinary research in biotechnology, MEMS, other nanotechnology fields.

M. Tech. – II Semester
(16MT25704) PHYSICAL DESIGN AUTOMATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on VLSI Design and Digital IC Design at UG Level.

COURSE DESCRIPTION:

Basics of VLSI design; Layout optimization; Simulation and synthesis; Physical design of FPGAs and MCMs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Algorithmic graph theory
 - Tractable and Intractable problems
 - Layout compaction such as floor planning, placement and routing
 - Binary-Decision diagrams
 - Simulation and Synthesis in High level abstraction
 - FPGA and MCM technologies
2. Analyze problems arising in circuit implementation.
3. Design an Integrated circuit with high level synthesis.
4. Solve engineering problems and arrive at optimal solutions pertaining to design automation.
5. Initiate research in physical design automation.
6. Apply appropriate techniques to Model and Simulate complex engineering designs using FPGA and MCM's.
7. Contribute positively to multidisciplinary applications in the design and development of Integrated Circuits.
8. Understand ethical responsibility towards environment and society in the development of automated designs.

M. Tech. - II Semester

(16MT25705) TESTING AND TESTABILITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE:

A Course on Digital Logic Design at UG Level.

COURSE DESCRIPTION:

Design for testability; Fault modeling and simulation; Test analysis for digital circuits; Design strategies for testability.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - The basic faults that occur in digital systems
 - Testing of stuck at faults for digital circuits
 - Design for testability
2. Analyze testing issues in the field of digital system design critically for Conducting Research.
3. Solve engineering problems by modeling different faults for fault free Simulation in Digital circuits.
4. Apply appropriate research methodologies to develop New testing Strategies for digital and mixed signal circuits and systems.
5. Apply appropriate techniques, Resources and tools in, Modeling to Complex Engineering activities with an understanding of the limitations.
6. Contribute to multidisciplinary scientific work in the field of testing of Stuck at Faults for digital circuits.

M. Tech. – II Semester**(16MT13806) ASIC DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on VLSI Design at UG Level.

COURSE DESCRIPTION:

ASIC design categories; Design Libraries; Design Entry; Logic Synthesis; Simulation; Testing; Physical design flow of ASIC.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Gain in-depth knowledge in
 - ASIC Design Styles.
 - ASICs Design Libraries.
 - ASICs Design Issues.
 - ASIC Construction.
9. Analyze problems critically in the field of ASIC Design.
10. Design Application Specific ICs for use in various systems.
11. Solve engineering problems and arrive at optimal solutions in pertaining to ASIC Design.
12. Initiate research in ASIC Design.
13. Apply appropriate techniques, resources and tools to engineering activities to provide appropriate Solution for the development of ASICs.
14. Contribute to multidisciplinary scientific work in the field of ASIC Design.

M. Tech. – II Semester
(16MT25707) CO – DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

Courses on Computer Architecture, Digital Design, Software Design, and Embedded Systems.

COURSE DESCRIPTION:

Issues and Algorithms in CO- Design; Prototyping and its Emulation on Target Architectures; Compilation Techniques; Design Specification; Verification Tools for Embedded Processor Architectures; System- Level Languages with its Specification and Design.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Various design steps starting from system specifications to hardware/software implementation
 - Process optimization techniques while considering various design decisions
2. Analyze complex problems critically in the domains of case studies using contemporary high-level methods, for conducting research in VLSI Design.
3. Solve engineering problems by considering trade-offs in the way hardware and software components of a system work together to exhibit a specific behavior for given a set of performance goals and technology with wide range of solutions in Real time embedded system design.
4. Apply appropriate research methodologies in Modeling and Simulation of complex engineering activities in the field of Real time embedded system design.
5. Apply appropriate techniques, Resources and tools in, Modeling to complex engineering activities with an understanding of the limitations
6. Contribute to multidisciplinary scientific work in the field of Real time embedded system design.
7. Understand ethical responsibility towards environment and society in the field of Real time embedded system design.

M. Tech. - II SEMESTER
(16MT25708) SYSTEM-ON-CHIP DESIGN AND VERIFICATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE:

Courses on Embedded systems and VLSI design.

COURSE DESCRIPTION:

System on Chip Design Process; System level Design Issues; Test Strategies; Macro Design and Verification; Reusable Macros; System on Chip Verification; Communication Architectures for SoCs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - System on Chip Design Processes.
 - Macro Level Design.
 - Verification Techniques.
 - On-Chip Communication Architectures.
 - Bus Functional Model based Verification.
2. Analyze the problems in SoC Design for Low Power Architecture Design.

3. Develop Skills to solve problems of Reusable Macros.
4. Initiate research work on Reusable Design for the development of SoC Architectures.
5. Implement various Verification techniques to arrive at Efficient Designs of SoC Architectures.

M. Tech. -II Semester

(16MT25709) WIRELESS SENSOR NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

A Course on Computer Networks and Wireless Communication and Networks at UG Level.

COURSE DESCRIPTION:

WSN architecture, types, Quality measures of wireless channels, various MAC protocols, Sensor deployment and routing related protocols, congestion control in WSNs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain in-depth knowledge in
 - Wireless Sensor Networks
 - Physical layer
 - Data link layer
 - Network layer
 - Transport layer
2. Analyze various design issues for conducting research related to Datalink, network and transport protocols of wireless sensor network architecture.
3. Design and develop feasible and optimal solutions for societal use.
4. Solve complex engineering problems pertaining to the field of wireless sensor networks.

M.Tech. – II Semester

(16MT25731) MIXED SIGNAL AND PHYSICAL DESIGN AUTOMATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITE:

A course on Circuit Level Design and Layouts.

COURSE DESCRIPTION:

Design and Verification of Analog and Mixed Signal Circuits.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in backend and frontend design.
2. Exhibit analytical skills in
 - Backend Design - Schematic or SPICE Entry, Simulation, Layout, DRC, PEX, Post Layout Simulation.
 - Frontend Design - HDL Design Entry, Logic Simulation, RTL Logic Synthesis, Post Synthesis Timing Simulation, Partition, Floorplanning, Place & Route, Compaction, Verification, Design for Testability, Static Timing Analysis, Power Analysis.
3. Solve problems in physical design cycle, functional verification, timing and Power Analysis of Digital circuits.
4. Initiate research in the field of mixed signal and physical design automation.

5. Develop Skills to solve problems of layout design and build solutions for optimizing design for area, power and speed.
6. Use CAD Tools to arrive at an optimized solution for mixed signal design.
7. Contribute positively to multidisciplinary scientific research in design and development of Mixed/Analog Integrated Circuits to solve problems arising in physical design and Integrated circuit Technology.
8. Communicate effectively in Verbal and written form of designs developed.

M.Tech. - II Semester

(16MT25732) NANOELECTRONICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

A course on Circuit Level Design

COURSE DESCRIPTION:

Demonstration of the lab; Design, fabrication and verification of the nanoelectronic devices.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Clean room,
 - Substrate preparation
 - Device fabrication
 - Device characterization
 - Device verification
2. Able to analyze
 - Nanostructure of the Devices
 - New material and Device characterization
3. Think laterally to get involved efficiently in research field of nanoelectronics.
4. Efficiently solve complex problem in the design of nanoelectronic devices.
5. Design and develop new nanodevice for advance technological application.
6. Use tools for verifying developed nanodevices.
7. Communicate effectively in verbal and written form for the experiments.
8. Utilize and implement the practical knowledge in multidiscipline areas.

M. Tech. - II Semester

(16MT25733) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PRE-REQUISITES: --

COURSE DESCRIPTION:

Identification of seminar topic; literature survey; preparation of technical report and presentation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate knowledge to identify an advanced topic for seminar in core and allied areas of VLSI.

2. Extract and analyze information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically.
4. Plan, prepare and present effective written and oral technical report on the work done.
5. Develop enthusiasm and commitment to engage in lifelong learning for technical competence in the field of VLSI.
6. Consider and assess the impact of the seminar topic outcome on environment and society.
7. Undertake corrective measures for both the technical and ethical mistakes.

M. Tech. – II Semester

(16MT23810) INTELLECTUAL PROPERTY RIGHTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PRE-REQUISITES: --

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

9. Demonstrate in-depth knowledge on
 - Intellectual Property
 - Trade Marks & Secrets
 - Law of Copy Rights, Patents
 - New development of Intellectual Property
10. Analyze the different forms of infringement of intellectual property rights.
11. Solve problems pertaining to Intellectual Property Rights.
12. Stimulate research zeal for patenting of an idea or product.
13. Write effective reports required for filing patents.
14. Develop life-long learning capabilities.
15. Develop awareness of the relevance and impact of IP Law on their academic and professional lives.
16. Develop attitude for reflective learning.

M. Tech. - III & IV Semester

(16MT35731 & 16MT45731)PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	-	-	-	28

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate capacity to identify an advanced topic for project work in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.

4. Solve engineering problems pertinent to the chosen topic for feasible solutions.
5. Use the techniques, skills and modern engineering tools necessary for project work.
6. Do time and cost analysis on the project.
7. Plan, prepare and present effective written and oral technical report on the topic.
8. Adapt to independent and reflective learning for sustainable professional growth.
9. Contribute to multidisciplinary scientific work in the field of VLSI.
10. Understand ethical responsibility towards environment and society in the field of VLSI.
11. Engage lifelong learning for development of technical competence in the field of VLSI.

Program: M.Tech. COMMUNICATION SYSTEMS

I M. Tech.– I Semester

(16MT15706) ADVANCED DIGITAL SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Courses on Digital Signal Processing at UG level

COURSE DESCRIPTION:

Digital filter banks; Parametric and Non-Parametric Power Spectrum Estimation methods; computationally efficient algorithms; Applications of DSP.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Gain in-depth knowledge in
 - Filter banks and Wavelets
 - Linear Prediction
 - Efficient power Spectral Estimation Techniques
 - Applications of Multirate signal processing
9. Analyze complex engineering problems critically in the field of Signal Processing.
10. Design optimum filters, multirate DSP systems and computationally efficient DSP algorithms for societal needs.
11. Solve engineering problems for feasible and optimal solutions in the field of digital signal processing.
12. Initiate research in advanced digital signal processing.
13. Learn and apply appropriate techniques, including prediction and modeling to complex engineering activities with an understanding of the limitations.
14. Contribute to scientific research in Radar signal processing, Inter disciplinary areas like Speech and Image processing and Remote sensing with objectivity and rational analysis.

I M. Tech. – I Semester

(16MT13802) DIGITAL COMMUNICATION TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

Course on Digital Communications at UG Level, Review of random Variables and Processes

COURSE DESCRIPTION:

Characterization of Communication Signals and Systems; Digital Modulation Techniques; Optimum Receivers for the Additive Gaussian Noise Channel; Spread Spectrum Technique; Multichannel and Multicarrier Systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

5. Demonstrate in-depth knowledge in
 - Characterization of communication signals and systems.
 - Digital modulation techniques
 - Communication over AWGN channels
 - Optimum receivers
 - Spread spectrum techniques
 - Multi-carrier communication system
6. Analyze numerical and analytical problems critically for conducting research in the field of Digital Communication Systems.
7. Solve engineering problems and arrive at optimal solutions pertaining to digital communications.

8. Apply appropriate techniques to complex engineering activities in the field of signal processing and communications.

M. Tech. - I Semester

(16MT23803) INFORMATION THEORY AND CODING TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on Digital Communications at UG Level

COURSE DESCRIPTION:

Information theory; Channel capacity; Channel coding techniques – Linear block codes, Cyclic codes, Convolutional codes; Reed-Solomon and Turbo codes.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

7. Demonstrate knowledge in
 - Various aspects of source and channel coding techniques
 - Channel capacity
 - Performance evaluation of various source coding techniques
8. Analyze complex engineering problems critically in the domain of information, source encoding.
9. Design encoder, Syndrome circuits to solve complex engineering problems.
10. Conceptualize and Solve engineering problems for feasible and optimal solutions in the core area of information theory and coding techniques.
11. Initiate research in information theory and coding techniques.
12. Contribute positively to multidisciplinary scientific research in communications with objectivity and rational analysis.

M. Tech. - I Semester

(16MT23807) OPTICAL COMMUNICATIONS AND NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: --

COURSE DESCRIPTION:

Non linear properties of fibers; characteristics of fiber materials; optical cable design and connectors; optical components; modulation and demodulation schemes; error detecting and correcting codes; optical network management and control.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

6. Demonstrate Knowledge in
 - Linear and Non-linear Characteristics of Optical fiber.
 - Fiber design considerations.
 - Minimization of Losses in Cable design.
 - Understanding the operation of advanced fiber optic components.
 - Modulation and demodulation techniques.
 - Access networks.
 - Network Control and Management.
7. Analyze complex engineering problems critically in the domain of optical communication for conducting research.
8. Design of optical cable and transmission layer in the field of optical Communications.
9. Solve engineering problems related to optical communication to meet societal and industrial needs.
10. Apply appropriate techniques to complex engineering activities in the field of optical communications.

M. Tech. - I Semester**(16MT16101) RF CIRCUIT DESIGN**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Concept of Basic Electronics and Wave Theory at UG level

COURSE DESCRIPTION:

Fundamental concepts of transmission line theory; RF Electronics; high frequency circuit behavior; design of tuning and matching networks; RF Passive and active components; RF Transistor amplifier design; Oscillators and RF Mixers.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - RF Electronics
 - Transmission line analysis
 - Matching and biasing networks
 - RF Passive and Active components
 - RF Transistor amplifier design
 - Oscillators and RF Mixers.
2. Analyze complex problems critically in the domains of RF field, RF Passive and Active components as well as a smart antenna techniques in the field of RF Circuits.
3. Design RF circuits for use in various systems as per societal needs.
4. Solve engineering problems to arrive at optimal solutions in compliance with public health and safety, societal and environmental factors in the core areas of RF Circuit design.
5. Apply appropriate techniques to complex engineering activities in the field of wireless communication systems and allied areas.
6. Understand ethical responsibility towards environment and society in the field of microwave and wireless systems.

M. Tech. - I Semester**(16MT13801) COMPUTER NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

A Course on Computer Networks and Wireless Communication and Networks at UG Level

COURSE DESCRIPTION:

Advanced computer networks and its architectures; Protocols & Network security; Mobile adhoc networks.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Demonstrate in-depth knowledge on
 - Architectures and functioning of advanced computer networks like Ethernet, SONET/SDH, Wi-Fi, Frame Relay, ATM networks etc.
 - Protocols like IPv6, MPLS, RSVP, VoIP associated with advanced computer networks.
 - Security features associated with advanced computer networks.
9. Analyze various design issues for conducting research related to the Internet protocol (IP), Wireless LANs and ATM network technologies prominent in high performance scenario.

10. Design and develop techniques for solutions pertaining to the advanced networking technologies.
11. Formulate solutions for engineering problems pertaining to the advanced networking technologies.
12. Initiate research in advanced computer networks.
13. Apply appropriate techniques and tools to complex engineering activities in the field of advanced computer networks.
14. Contribute positively to multidisciplinary scientific research in design and development of Protocols for adhoc network architectures.

M. Tech.-I Semester

(16MT16102) DIGITAL SATELLITE COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: A Course on Satellite Communications at UG level

COURSE DESCRIPTION:

Orbital mechanics and satellite sub-systems; Non-geostationary satellite systems; Demand assignment multiple access techniques and packet communications; Spread spectrum communications; Satellite applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in
 - Satellite Orbits and Sub-Systems
 - NGSO Constellation Designs
 - DAMA Interfaces
 - Satellite Packet Communications and ALOHA systems
 - Spread spectrum Communications
 - Satellite Applications such as VSAT, MSAT, Direct Broadcast Satellite Television.
2. Investigate and analyze engineering problems critically in the field of satellite system design and communications.
3. Design efficient Digital Satellite Systems/ Subsystems and solve engineering problems in the area of satellite communications.
4. Solve engineering problems with feasible and economical solutions in digital satellite communications.
5. Apply appropriate techniques, resources and tools to engineering activities in the field of digital satellite communications.
6. Develop ethical attitude towards environment in the field of digital satellite communications.

M. Tech. -I Semester

(16MT16103) SOFTWARE DEFINED RADIO

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES:

A Course on Wireless Communication, Digital Signal Processing and Antennas at UG Level.

COURSE DESCRIPTION:

Principles of software defined radio; Multirate digital filter banks; Analysis and Synthesis of signals performance; Smart antennas with applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge in the evolving paradigm of Software defined radio and technologies for its implementation.
2. Analyze complex problems critically in the domains of Radio frequency Implementation issues, multirate signal processing in SDR, as well as Smart antenna techniques for better spectrum exploitation for conducting research.
3. Design a Software defined Radio System/ Subsystem for public needs.

4. Initiate research in Software Defined Radio.
5. Apply appropriate techniques for the development of scientific and technological knowledge in designing software defined radios and their usage for cognitive radio.
6. Contribute to multidisciplinary scientific work in the fields of Satellite and Microwave Communications.
7. Understand ethical responsibility towards environment and society in the field of SDR.

M. Tech. -I Semester

(16MT13807) TRANSFORM TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Course on Signal Processing at UG Level.

COURSE DESCRIPTION:

Continuous Wavelet Transforms; Discrete Wavelet Transforms; Multi Resolution Analysis; Wavelet packets; Applications of Wavelet Transforms.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Gain in-depth knowledge in
 - Multiresolution Analysis
 - Continuous wavelets
 - Discrete wavelets and Filter design.
 - Alternative Wavelets & Wavelet packets
9. Analyze complex engineering problems critically in the area of Signal Processing and communications.
10. Design, conduct experiments, analyze and interpret complex engineering problems and apply appropriate research methodologies for conducting research in Signal Processing.
11. Solve engineering problems with wide range of solutions in the areas of Biomedical Signal Processing, Image Processing, Radar Signal Processing and Communications and arrive at optimum solutions.
12. Initiate research in Transform Techniques.
13. Use appropriate techniques, resources and tools to engineering activities in the fields of Signal Processing and Communications.
14. Contribute to collaborative multidisciplinary scientific work/research by initiating research work on Data compression, Noise reduction, Communications, Image and signal Processing.

M. Tech. - I SEMESTER

(16MT16131) COMMUNICATIONS LAB-I

Int. Marks	Ext. Marks	Max. Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES: Simulation Lab at UG Level

COURSE DESCRIPTION:

Design and simulation of communication systems - Baseband Communication Systems with Optimum terminal filters, QPSK communication system for AWGN channel, Baseband Direct Sequence Spread Spectrum (DS/SS) System; Generation of different density and distribution functions; Generation of maximal and Gold code sequences.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Gain advanced knowledge in
 - Generation of Maximal and Gold Sequences & verification of their properties.
 - Design of communication system for band limited channels for Zero ISI.

- Evaluating the performance of QPSK over AWGN Channel, 16MPSK and 16QAM.
 - Simulation of Code matched filter in Spread Spectrum Communication System.
 - Design of Baseband Communication Systems with Optimum terminal filters.
 - Simulation of baseband Direct Sequence Spread Spectrum (DS/SS) System.
 - Equalization of Multipath Channel using LMS or RLS Algorithms.
2. Analyze complex and critical engineering problems in the field of communications.
 3. Use MATLAB Toolbox to simulate complex engineering activities in the field of communication.
 4. Demonstrate knowledge and understanding of engineering principles to execute the Projects effectively in the field of communications.
 5. Understand ethical responsibility towards environment & society in the field of communications.
 6. Communicate effectively in verbal & written forms.

M. Tech. - I SEMESTER

(16MT16132) RF CIRCUITS & OPTICAL COMMUNICATIONS LAB

Int. Marks	Ext. Marks	Max. Marks	L	T	P	C
50	50	100	-	-	4	2

PRE- REQUISITES:

Antennas, Microwaves and Optical Communication lab at UG level

COURSE DESCRIPTION:

Design and simulation of Various antennas; Measurement of various parameters; characteristics of couplers; non-ideal behaviour of lumped circuit components; characteristics of microwave passive components; Measurement of 4 channel CWDM using modulation; PC to PC communication; Characterization of Optial circulator and Bragg-grating.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate advanced knowledge required in
 - Measurement of Impedance, Coupling and cross talk in 3 wire pickup.
 - Design and simulation of different antennas.
 - Design and measurement of PC to PC communication.
 - Characterization of branch line directional copupler, capacitive coupling and inductive coupling.
 - Study of non ideal behaviour of lumped circuit components, 3 dB power divider and filters.
 - Designing WDM system and measurement of 4 channel CWDM by internal and external modulation.
 - Wavelength division multiplexing & de-multiplexing of analog/digital signals over 1310 nm and 1550 nm wavelengths.
2. Analyse of engineering problems for feasible and optimal solutions in the core area of RF, Microwave and Optical Communications.
3. Use RF Spice Pro Software to complex engineering activities in the domain of RF, Microwave and Optical communications.
4. Demonstrate Knowledge and understanding of Engineering Principles to execute the Projects effectively in the field of RF, Microwave and Optical communications.
5. Understand ethical responsibility towards environment & society in the field of communications.
6. Communicate effectively in verbal & written forms in the core area of RF, Microwave and Optical communications

M. Tech. – I Semester

(16MT13808) RESEARCH METHODOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --

COURSE DESCRIPTION:

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

17. Acquire in-depth knowledge on
 - Research design and conducting research
 - Various data collection methods
 - Statistical methods in research
 - Report writing techniques.
18. Analyze various research design issues for conducting research in core or allied areas.
19. Formulate solutions for engineering problems by conducting research effectively in the core or allied areas.
20. Carryout literature survey and apply research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
21. Select and Apply appropriate techniques and tools to complex engineering activities in their respective fields.
22. Write effective research reports.
23. Develop attitude for lifelong learning to do research.
24. Develop professional code of conduct and ethics of research.

M. Tech. -II Semester

(16MT26101) ADAPTIVE SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on Signal Processing at UG Level

COURSE DESCRIPTION: Development of adaptive filter theory: Method of steepest descent, Least-Mean-Square Algorithm, recursive least square algorithm, Kalman filtering algorithm and order-recursive adaptive filters.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Adaptive systems
 - Linear Optimum Filters
 - steepest descent
 - LMS,RLS Algorithms
 - Kalman filtering
 - Order-recursive adaptive filtering
 - Blind deconvolution
2. Analyze problems critically in the field of adaptive signal processing.
3. Design an Optimum adaptive filter for solving problems in the field of analog and digital communications.
4. Solve engineering problems and arrive at optimal solutions pertaining to communications.
5. Initiate research in adaptive signal processing.
6. Apply appropriate techniques to complex engineering activities in the field of signal processing and communications.
7. Contribute to multidisciplinary scientific work in the field of communications, Bio-Medical, Instrumentation, and control engineering.

M. Tech.-II Semester

(16MT23801) DETECTION AND ESTIMATION OF SIGNALS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on Probability and Stochastic Processes at UG Level

COURSE DESCRIPTION:

Decision criteria for single and multiple observations; Estimation techniques; Properties of estimators; parameter Estimation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Demonstrate advanced knowledge in
 - Different decision criteria
 - Estimation techniques and their properties
 - Selection of a good estimator for the given specifications.
 - Kalman Filter
 - Statistical estimation of parameters
9. Analyze complex engineering problems critically for conducting research in the field of signal detection and estimation.
10. Design optimum filters for solving problems in the field of Communications.
11. Solve engineering problems to obtain solutions for the design of optimum receivers.
12. Initiate research in detection and estimation of signals.
13. Apply appropriate techniques, resources to complex engineering activities in the field of Communications.
14. Contribute to multidisciplinary scientific work in the field of Communications and Radar Systems.

M. Tech.-II Semester**(16MT13804) IMAGE & VIDEO PROCESSING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on Digital Communications & Digital Signal Processing at UG Level

COURSE DESCRIPTION:

Image Fundamentals and its transforms; image enhancement techniques; Image compression, Image Restoration & Image Segmentation; Video Processing basics like Representation, Sampling, Motion estimation, Filtering and Compression.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

7. Gain in-depth knowledge in
 - e. Image Transforms
 - f. Image Enhancement & Restoration Techniques
 - g. Image Segmentation & Compression Techniques
 - h. Video Processing
8. Analyze complex engineering problems critically in the domain of Image Processing for conducting research.
9. Solve engineering problems for feasible and optimal solutions in the core area of Image Processing.
10. Initiate research in image and video processing.
11. Apply appropriate tools and techniques to complex engineering activities in the field of Image Processing.
12. Contribute positively to multidisciplinary scientific research in Image Processing.

M. Tech. - II Semester

(16MT26102) SMART ANTENNAS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

A Course on Antennas and Wave Propagation at UG Level

COURSE DESCRIPTION:

Smart antenna configurations and architecture; Beam forming methods; Direction of Arrival (DOA) estimating methods, simulation of smart antennas and space time processing.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge on
 - Smart antenna architecture and configurations
 - Methods of estimating DOA
 - Beam forming techniques
 - Design and simulation of smart antennas
 - Space time processing
2. Analyze various design issues for conducting research related to smart antennas.
3. Design and develop smart antennas for wireless applications.
4. Formulate solutions for engineering problems pertaining to smart antennas in the field of communication.
5. Apply appropriate techniques to complex engineering activities in the field of Smart antennas.

M. Tech. - II Semester**(16MT23805) WIRELESS COMMUNICATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: A Course on Digital Communications at UG Level.

COURSE DESCRIPTION:

Introduction to cellular wireless communication; Radio propagation in mobile atmosphere; Equalization along with Diversity techniques; several access techniques; Introduction to wireless networking; Multicarrier modulation techniques.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

6. Demonstrate advanced knowledge in
 - Cellular systems and wireless standards
 - Radio wave propagation in wireless environment
 - Equalization and diversity techniques
 - Multiple access techniques and networking
 - Multicarrier modulation
7. Analyze complex engineering problems critically for conducting research in wireless systems.
8. Design a Digital Communication System/ Subsystem for societal needs.
9. Solve engineering problems with wide range of solutions in wireless communications.
10. Apply appropriate techniques to engineering activities in the field of wireless communications.

M. Tech. -II Semester
(16MT26103) EMI /EMC

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Courses on Electromagnetic waves and Transmission lines, Antennas and wave propagation & Microwave engineering at UG Level.

COURSE DESCRIPTION:

Electromagnetic interference & compatibility; EMI/EMC Standards; Radiated Interference Measurement; Conducted Interference Measurement; Effects of Grounding, Shielding, Bonding; EMI Filters; EMI Cables; EMI Connectors; EMI Components.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - electromagnetic interference effects
 - standards of EMC
 - Radiated and conducted interference measurements
 - Effects of grounding at high frequencies
 - EMC Filters, Cables, Connectors, and Components
2. Analysis and design of electronic systems for real time applications.
3. Solve engineering problems and arrive at optimal solutions pertaining to EMI/EMC.
4. Initiate research in electromagnetic interference and compatibility.
5. Apply appropriate techniques to complex engineering activities in the field of electronic systems.
6. Ability to contribute multidisciplinary scientific research on radiated measurements.
7. Demonstrate knowledge and understanding of effects of Electromagnetic Interference and apply the same in practice, manage projects effectively in practical implementing issues.
8. Understand ethical responsibility towards environment and society in the field of communication applications.

M. Tech. -II Semester
(16MT26104) RADAR SIGNAL PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

Pre-requisite: A course on Radar systems at UG level.

Course Description: Radar range equation and matched filter; Detection of radar signals in the presence of noise; Wave form selection and radar clutter; Pulse compression and Phase coding techniques.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Demonstrate knowledge in
 - Characteristics of matched filter
 - Detection criteria of radar signals in noise environment.
 - Radar waveform design requirements.
 - Pulse compression techniques
 - Different coding techniques.
2. Analyze complex engineering problems critically in the domain of information, source encoding.
3. Conceptualize and Solve engineering problems for feasible and optimal solutions in the core area of information theory and coding techniques.
4. Initiate research in radar signal processing.

5. Apply different detection techniques to extract the radar echo signals in the presence of Noise.
6. Contribute to multidisciplinary scientific work in the field of Communication and dynamics of environment.

M. Tech. - II Semester

(16MTL23809) SPEECH PROCESSING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Courses on Signals & Systems and Digital Signal Processing in UG

COURSE DESCRIPTION:

Acoustic theory of speech production; Models for speech signals and speech processing systems; Mathematical analysis of speech signals - homomorphic and LPC models; Speech and speaker recognition systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

2. Demonstrate in-depth knowledge in
 - Digital model representation of speech signal
 - LPC analysis
 - Homomorphic models
7. Analyze complex engineering problems critically for conducting research in speech signal processing.
8. Solve engineering problems using efficient algorithms for feasible and optimal solutions in Speech signal processing field.
9. Initiate research in speech signal processing.
10. Apply speech and speaker verification techniques to complex engineering activities in the field of speech processing.
11. Contribute to scientific research in Speech and speaker identification and verification systems with objectivity and rational analysis.

M. Tech. -II Semester

(16MT25709) WIRELESS SENSOR NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: --

A Course on Computer Networks and Wireless Communication and Networks at UG Level.

COURSE DESCRIPTION:

WSN architecture, types, Quality measures of wireless channels, various MAC protocols, Sensor deployment and routing related protocols, congestion control in WSNs.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

5. Gain in-depth knowledge in
 - Wireless Sensor Networks
 - Physical layer
 - Data link layer
 - Network layer
 - Transport layer
6. Analyze various design issues for conducting research related to Datalink, network and transport protocols of wireless sensor network architecture.
7. Design and develop feasible and optimal solutions for societal use.
8. Solve complex engineering problems pertaining to the field of wireless sensor networks.

M. Tech. - II SEMESTER**(16MT26131) COMMUNICATIONS LAB-II**

Int. Marks	Ext. Marks	Max. Marks	L	T	P	C
50	50	100	-	-	4	2

PRE- REQUISITES: Simulation lab at UG level

COURSE DESCRIPTION:

Simulation of communication systems over communication channels with and without line coding; Design and simulation of Busgang Blind channel; Minimum Mean Square Error and zero force equalizer; Adaptive equalizers using LMS and RLS algorithms.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge in
 - Design of CDMA communication system and evaluate its performance over a Gaussian and multipath Rayleigh fading channel.
 - Design and simulation of an adaptive equalizer using LMS and RLS algorithms.
 - Design and simulation of M-ary QAM system over an AWGN fading channel and evaluate its performance.
 - Simulating communication system using convolutional codes & Viterbi Decoding.
 - BER evaluation for BPSK modulation system with Minimum Mean Square Error (MMSE) equalization and Zero force Equalization in 3 tap ISI channel.
2. Analyze engineering problems for feasible and optimal solutions in the core area of advanced Communications.
3. Design of various components of communication systems.
4. Use MATLAB Toolboxes to solve complex engineering activities in the domain of advanced communications.
5. Understand ethical responsibility towards environment & society in the field of communications.
6. Communicate effectively in verbal & written forms.

M.Tech – II Semester**(16MT13832) IMAGE & VIDEO PROCESSING LAB**

Int. Marks	Ext. Marks	Max. Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITE:

A course on Image & Video Processing

COURSE DESCRIPTION: Fundamentals of images, image transforms, enhancement, restoration, image compression and coding and video processing.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

8. Demonstrate knowledge in
 - Image Transforms
 - Image Enhancement & Restoration Techniques
 - Image Segmentation & Compression Techniques
 - Video Processing
9. Understand various applications of image processing in industry, Medicine, and defense.
10. Solve engineering problems for feasible and optimal solutions in the core area of Image and video Processing.
11. Initiate research in image and video processing.

12. Acquire an appreciation for the Image and video processing issues and techniques and be able to apply these techniques to real world problems.
13. Contribute positively to multidisciplinary scientific research in Image and video Processing.
14. Communicate effectively in verbal and written forms.

**M. Tech. -II Semester
(16MT26133) SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of seminar topic; literature survey; preparation of technical report and presentation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.
4. Plan, organize, prepare and present effective written and oral technical report on the topic.
5. Adapt to independent and reflective learning for sustainable professional growth in communication systems.
6. Contribute to multidisciplinary scientific work in the field of Communication Systems.
7. Understand ethical responsibility towards environment and society in the field of Communication Systems.
8. Engage in lifelong learning for development of technical competence in the field of Communication Systems.

M. Tech. – II Semester

(16MT23810) INTELLECTUAL PROPERTY RIGHTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PRE-REQUISITES: --

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

17. Demonstrate in-depth knowledge on
 - Intellectual Property
 - Trade Marks & Secrets
 - Law of Copy Rights, Patents
 - New development of Intellectual Property
18. Analyze the different forms of infringement of intellectual property rights.
19. Solve problems pertaining to Intellectual Property Rights.
20. Stimulate research zeal for patenting of an idea or product.
21. Write effective reports required for filing patents.
22. Develop life-long learning capabilities.
23. Develop awareness of the relevance and impact of IP Law on their academic and professional lives.
24. Develop attitude for reflective learning.

M. Tech.-III & IV Semester

(16MT36131 & 16MT46131) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	--	--	--	28

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Demonstrate capacity to identify an advanced topic for project work in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.
4. Solve engineering problems pertinent to the chosen topic for feasible solutions.
5. Use the techniques, skills and modern engineering tools necessary for project work.
6. Do time and cost analysis on the project.
7. Plan, prepare and present effective written and oral technical report on the topic.
8. Adapt to independent and reflective learning for sustainable professional growth.
9. Contribute to multidisciplinary scientific work in the field of Communication Systems.
10. Understand ethical responsibility towards environment and society in the field of Communication Systems.
11. Engage lifelong learning for development of technical competence in the field of Communication Systems.

Program: M.Tech. ELECTRICAL POWER SYSTEMS

M. Tech. I-Semester

16MT10701:ADVANCED CONTROL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Control Systems at UG level.

COURSE DESCRIPTION:

Advanced concepts of controllability, observability; Analysis of non-linear systems; Lyapunov stability; design of controllers and observers; optimal control concepts.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge in canonical forms, principle of duality, controllability, observability, effect of feedback, stability of nonlinear control systems and the concept of optimal control.
- CO2. apply/analyse describing function, Phase-Plane methods and Lyapunov's stability criterion for stability analysis of non-linear systems.
- CO3. solve problems in the area of non-linear systems.
- CO4. initiate research in stability and optimal control systems applied to various real-time applications.
- CO5. use modern techniques in the design and study of controllers, observers for stability of non-linear systems.

M. Tech. I-Semester

16MT10702: HIGH VOLTAGE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Engineering Mathematics, Electromagnetic fields and Electrical Circuits at UG level.

COURSE DESCRIPTION:

Breakdown mechanisms in solids, liquids, gases and composite dielectrics materials; conventional methods of generation and measurement of high DC, AC, impulse voltages and currents; determine the ability of an electrical apparatus to meet guaranteed test procedures and standards.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
 - behavior of various insulation materials,
 - generation of high voltage and currents,
 - measuring techniques for high voltage and currents,
 - testing of various electrical apparatus,
 - overvoltage phenomena and protection against them.
- CO2. analyze the
 - behavior of insulation materials,
 - circuits for generation and measurement of high voltages,
 - testing circuits for testing of high voltage equipment.
- CO3. evaluate various high voltage generation, measuring and testing parameters of high voltage circuits.
- CO4. initiate research skills in design of
 - new methods of generation of high voltages,
 - measuring and testing circuits for high voltage systems,
 - composite insulation systems to improve the dielectric strength.

M. Tech. I-Semester

16MT10703: POWER ELECTRONIC CONVERTERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power Electronics at UG level

COURSE DESCRIPTION:

Power semiconductor devices; Characteristics of power switching devices; Gate and base drive circuits; Multipulse controlled rectifiers; Power factor improvement techniques; Voltage source converters; Current source converters; Switching mode regulators; Resonant converters; Voltage control of single phase and three phase inverters; Multilevel inverters.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- operation and performance of power electronic converters,
 - control strategies of power devices and converters.
- CO2. analyze the performance of multi pulse AC/DC converters and DC/DC converters.
- CO3. evaluate the power converter modules for various operating/control parameters.
- CO4. initiate research in designing appropriate power converter schemes to meet/solve the industrial requirements/problems.

M. Tech. I-Semester

16MT10704: POWER SYSTEM SECURITY AND STATE ESTIMATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Engineering mathematics, numerical methods, fundamental of power system, Power system operation and Control and Power system Analysis at UG level

COURSE DESCRIPTION:

Power system network matrices; Balanced and unbalanced short circuit analysis; AC and DC Load flow studies; Power system security; Methods of power system state estimation

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate in-depth knowledge on
- formation of power system network matrices,
 - load flow solutions and fault analysis for various operating conditions,
 - state estimation and security analysis of power systems,
 - Energy Management System (EMS) and control center.
- CO2. analyze state and security aspects of power system network for various operational issues and contingencies.
- CO3. develop skills in evaluating the state and security of power system network.
- CO4. initiate research in developing algorithms to investigate the state & security of power system network and design appropriate control strategy to meet the required specifications.

M. Tech. I-Semester

16MT10705: REACTIVE POWER COMPENSATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power Systems at UG level

COURSE DESCRIPTION:

Reactive Power compensation: Ideal compensator; Line and load compensation ; Compensating devices; Reactive power coordination; Quality of power supply; Distribution side management; Reactive power management in domestic and industrial sectors.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- concepts of reactive power compensation,
 - different methods of reactive power compensation,
 - load patterns and loss reduction methods in distribution lines.
- CO2. analyze different types of reactive power compensation methods
- CO3. develop skills in evaluating size and location of compensator to improve power system profile.
- CO4. initiate research in reactive power management for commercial and industrial applications.
- CO5. follow standards and practices for maintaining quality of power.

M. Tech. I-Semester

16MT10706: EHVAC TRANSMISSION

Int. Marks	Ext. Marks	Total marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Transmission of electric power, Distribution of Electric Power and Power System Analysis at UG level.

COURSE DESCRIPTION:

Transmission Line Trends and Preliminaries, Voltage Gradients of Conductors, Corona Effects, Electrostatic Fields, Power-Frequency Voltage Control and Over Voltages.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- EHVAC conductor parameters, configurations, electrical and mechanical aspects,
 - corona interference, effects and relevant parameters in EHVAC systems,
 - electrostatic field interference and effects,
 - voltage control methods in EHVAC system.
- CO2. analyze
- various electrical parameters of conductor with various configurations,
 - various parameters of corona phenomenon in EHVAC system.
- CO3. demonstrate skills in evaluation of various parameters of EHV lines
- CO4. initiate research in designing strategies to minimize adverse effects of EHVAC system.

M. Tech. I-Semester

16MT10707: MICROCONTROLLERS AND APPLICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Digital logic design, Microprocessors and Microcontrollers at UG level

COURSE DESCRIPTION:

8051 Microcontroller: Architecture, Programming and Interfacing; PIC Microcontrollers: Architecture, features, programming and Interfacing

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on architecture and salient features of 8051 and PIC microcontrollers.
- CO2. critically analyze a microcontroller and develop a suitable interface for interfacing and control operations.
- CO3. develop skills in evaluating stand-alone systems and develop programs for interfacing and control.
- CO4. undertake research by identifying a suitable microcontroller for solving complex electrical engineering problems.
- CO5. use modern tools like PROTEUS, MPLAB, SCILAB, PIC 'C' Compiler etc., for the design, analysis and implementation of the system.

M. Tech. I-Semester

16MT10708: POWER SYSTEM RELIABILITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: Probability and Statistics at UG level

COURSE DESCRIPTION:

Fundamentals of Reliability Engineering; Evaluation of Power system operating capacity reserve; Evaluation of Frequency and Duration Techniques; Reliability Analysis of Interconnected Systems; Power Distribution System Reliability Analysis

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- conceptual algorithms for planning, security and reliable operation of power system,
 - system risks during normal and adverse weather conditions.
- CO2. analyze complex power system network structures for computation of reliability indices.
- CO3. evaluate the reliability of power system network using reliability indices.
- CO4. initiate research in developing various algorithms for determining the power system network reliability for various operating scenarios.

M. Tech. I-Semester

16MT10709: SOLAR AND WIND ENERGY CONVERSION SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power Electronics and Non-Conventional Energy Resources at UG level

COURSE DESCRIPTION:

Non-Conventional energy resources; Wind and Solar energy systems: design and operation; Power Conditioning Schemes for Solar and Wind Energy systems; Impact of power quality problems.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on various renewable energy sources.
CO2. analyze
- various operational aspects of renewable energy sources,
 - various power quality and conditioning issues while integrating renewable energy sources.
- CO3. develop skills in estimating wind & solar power generation and other parameters.
CO4. initiate research in designing of wind and solar power systems.

M. Tech. I-Semester

16MT10731: HIGH VOLTAGE ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES: High Voltage Engineering and Electrical Measurements at UG level.

COURSE DESCRIPTION:

To conduct experiments on Breakdown mechanisms in dielectrics materials; Generation & measurement of high DC, AC, impulse voltages and currents and testing high voltage electrical apparatus.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- behavior of various insulation materials,
 - generation of high voltage and currents,
 - measuring techniques for high voltage and currents,
 - testing of various electrical apparatus.
- CO2. analyze the behavior of insulation systems, circuits for high voltage generation, measurement and testing.
CO3. evaluate various parameters of high voltage generating, measuring and testing circuits.
CO4. initiate research to design a suitable setup for measuring and testing of High Voltage.
CO5. follow the IEC standards and safety measures for efficient operation and testing of high voltage equipment.
CO6. function effectively as an individual and as a member in a team
CO7. prepare laboratory report that clearly communicates the experimental information.
CO8. practice professional code of ethics.

M. Tech. I-Semester

16MT10732: POWER SYSTEMS SIMULATION-I LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

Power system operation and control, Power system analysis, Power quality, Power electronics and Control Systems at UG and PG level.

COURSE DESCRIPTION:

Modelling, simulation and analyze operation, control of power system Networks and Power electronics converters.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on various problems in electrical engineering through modern tools and simulate the methods to mitigate using software packages in field of power system and power electronics.
CO2. analyze the simulated observations of power system networks, power electronic circuits and their behavior through theoretical perspective.
CO3. evaluate various parameters of the power systems/power electronic circuits
CO4. interpret the observations of network/circuits and design a suitable control strategy to meet the required specifications.

- CO5. select and apply modern software tools for solving problems in the existing power system.
 CO6. function effectively as an individual and as a member in a team
 CO7. prepare laboratory report that clearly communicates the experimental information.
 CO8. practice the professional code of ethics.

M. Tech. I-Semester

16MT13808: RESEARCH METHODOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PRE-REQUISITES:

COURSE DESCRIPTION:

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- research design and conducting good research,
 - various data collection methods,
 - statistical methods in research,
 - report writing techniques.
- CO2. analyze various research design issues for conducting research in core or allied areas
 CO3. formulate solutions for engineering problems by conducting research effectively in the core or allied areas
 CO4. carryout literature survey and apply good research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
 CO5. select and apply appropriate techniques and tools to complex engineering activities in their respective fields
 CO6. write effective research reports.
 CO7. develop attitude for lifelong learning to do research
 CO8. develop professional code of conduct and ethics of research.

M. Tech. II-Semester

16MT20701: FLEXIBLE AC TRANSMISSION SYSTEM

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power Electronics and Power Systems at UG level and Power Electronic Converters and Reactive Power Compensation and management at I-Sem. of M.Tech. EPS

COURSE DESCRIPTION:

Need for Flexible AC transmission systems; objectives of shunt and series compensation, phase angle regulators; FACTS controllers: shunt, series and combined; Coordination of various FACTS controllers.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
- compensation schemes for real and reactive power control,
 - Static Shunt, Series and Shunt-Series compensation,
 - FACTS devices.
- CO2. analyze FACTS devices for the appropriate control operation.
 CO3. evaluate feasibility of FACTS device and controllers for flexible operation of system.
 CO4. initiate research to develop/design new FACTS controllers for reliable operation of power system.

M. Tech. II-Semester

16MT20702: INTELLIGENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Engineering Mathematics, Electrical Machines & Power Systems at UG level.

COURSE DESCRIPTION:

Neural Networks; Fuzzy Logic Systems; Genetic Algorithms; Hybrid Intelligent Systems; Swarm intelligence; Applications.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on soft computing techniques.
- CO2. analyze complex engineering problems with intelligent techniques.
- CO3. solve electrical engineering problems using intelligent systems.
- CO4. initiate research related to applications of soft computing in the fields of electrical engineering and allied areas.
- CO5. select and apply suitable intelligent techniques for engineering problems.

M. Tech. II-Semester

16MT20703: POWER SYSTEM STABILITY AND CONTROL

Int. marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Electrical Machines, Control systems, Power system analysis, Power System operation and control at UG level and Advanced control systems and Power System Security and State Estimation at PG level.

COURSE DESCRIPTION:

Introduction to the synchronous machine classical model; state space models of synchronous machine; Methods of Excitation systems and modelling; Effect of excitation on stability; Analysis of Voltage stability

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
 - various power system stability issues of a small and large power system networks,
 - modeling of SMIB, multi-machine and excitation systems,
 - voltage control and reactive power management concepts.
- CO2. analyze the power system network for stability and control.
- CO3. develop skills in evaluating power system stability.
- CO4. initiate research to develop / design new control strategies or methodology for enhancing stability of power system.

M. Tech. (EPS), II-Semester

16MT20704: RESTRUCTURED POWER SYSTEM

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power system operation and control, FACTS and Reactive Power Compensation and Management at UG level.

COURSE DESCRIPTION:

Features of Restructured Power systems; Market models; Information and transmission services; Electricity pricing and forecasting; Ancillary services management.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on:
 - operation of deregulated electricity market,
 - key issues of electricity market models and their functionalities in different scenarios,
 - electricity pricing, forecasting methods and ancillary service management in competitive market.
- CO2. analyze market models to provide power exchange among various entities of deregulated power system.
- CO3. solve market models, evaluating transmission losses and to regulate congestion in tie-lines for reliable operation in the competitive premise
- CO4. design and develop various forecasting methods for pricing, planning and operation of deregulated power systems.

M. Tech. II-Semester

16MT20705: STATIC AND DIGITAL PROTECTION OF POWER SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Switchgear and Protection, Microprocessors and Microcontrollers at UG level.

COURSE DESCRIPTION:

Fundamentals of static and digital relays; Amplitude and Phase Comparators; characteristics of Static over current and differential relays; Static Distance relays; Numerical relays.

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge on

- digital and numerical relays,
- operation of static and microprocessor based relays.

CO2. analyze different power system protection schemes.

CO3. evaluate various protection schemes for power system components.

CO4. initiate research related to design and application of appropriate digital relays in the fields of electrical engineering.

M. Tech. II-Semester

16MT20706: ENERGY AUDITING, CONSERVATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Generation of Electric Power and Managerial Economics and Financial Analysis at UG level.

COURSE DESCRIPTION:

Basic Principles of Energy Audit; Energy Management; Energy Efficient Motors and Lighting; Energy Instruments; Computation of Economic Aspects and Analysis.

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge on energy conservation and management.

CO2. analyze the economic aspects of energy management.

CO3. evaluate and practice various auditing schemes for domestic and industrial systems.

CO4. design and apply various energy instruments for energy auditing and lighting systems.

M. Tech. II-Semester

16MT20707: HIGH VOLTAGE DC TRANSMISSION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power Electronics and Power systems at UG level and Power Electronic converters at PG level

COURSE DESCRIPTION:

HVDC Transmission: Capabilities, Applications and planning; Analysis and control of power converter; Harmonics and Filters; Types of Multi-Terminal DC Systems and control; Faults and Protection.

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge on:

- HVDC transmission systems,
- operation of static converters and its control,
- different types of faults and protection schemes in HVDC systems.

CO2. analyze various static converters in HVDC systems, harmonics, filters and MTDC systems.

CO3. evaluate the performance of HVDC systems.

CO4. initiate research in designing filter circuits and control techniques for HVDC systems.

M. Tech. II-Semester

16MT20708: POWER QUALITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Distribution of Electric Power and Power Electronics at UG level

COURSE DESCRIPTION:

Power Quality concepts; harmonics and voltage regulation using conventional methods; power quality enhancement using custom power devices; power quality issues in distributed generation.

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge on

- various power quality issues and mitigation techniques,
- operational issues in distributed generation.

CO2. analyze

- harmonic distortion due to commercial and industrial loads,
- the suitability of various custom power devices.

CO3. evaluate various power quality indices.

CO4. initiate research to develop/design new schemes and techniques for power quality enhancement.

CO5. apply the appropriate principles and techniques for integration of distributed generation and utilities.

M. Tech. II-Semester**16MT20709: SMART GRID TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: Power Systems at UG level

COURSE DESCRIPTION:

Concept of smart grid; various information and communication technologies for Smart Grid; Smart metering; Demand side integration; Energy management systems

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge on

- smart grid initiatives and technologies,
- information and communication technologies for the smart grid,
- sensing, measurement, control and automation.

CO2. demonstrateskills in analyzing fault levels and state of the system.

CO3. evaluate various information security protocols adhering the standards of smart grid.

CO4. initiate research on modern techniques for implementation in smart grid.

M. Tech. II-Semester**16MT20731: POWER SYSTEMS AND RELAYS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES: Electrical Machines and Power Systems at UG Level

COURSE DESCRIPTION:

Relay testing, fault analysis, determination of sequence reactances of power system components, dielectric strength of transformer oil and synchronous machine power angle characteristics.

OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge in power system protection and testing of relays by combining existing and novel technology.

CO2. analyze protective schemes and testing methods in the field of power systems.

CO3. demonstrate skills in evaluating the power system network parameters and relay settings for appropriate protection.

CO4. initiate research to design/develop a suitable protection scheme for power system components/networks.

CO5. apply modern numerical and processor based relays for protection and relaying.

CO6. function effectively as an individual and as a member in a team

CO7. prepare laboratory report that clearly communicates the experimental information.

CO8. practice professional code of ethics

M. Tech. II-Semester
16MT20732:POWER SYSTEMS SIMULATION-II LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:Power system analysis, FACTS, Power system operation & control, Power quality and Switchgear and protection at UG and PG level.

COURSE DESCRIPTION:

Modelling, simulation and analyze operation and control of power system networks.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on various power system problems through modern tools and disseminate them using software packages in field of power system and power electronics.
- CO2. analyze the simulated observations of power system networks, power electronic circuits and their behavior through theoretical perspective.
- CO3. evaluate various parameters of the power systems
- CO4. interpret the observations of power system network and design a suitable control strategy to meet the required specifications.
- CO5. select and apply modern software tools for solving real time problems in the existing power system
- CO6. function effectively as an individual and as a member in a team
- CO7. prepare laboratory report that clearly communicates the experimental information.
- CO8. practice professional code of ethics.

M. Tech. II-Semester
16MT20733: SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of seminar topic; literature survey; preparation of technical report and presentation.

COURSE OUTCOMES:On successful completion of the course, student will be able to

- CO1. demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
- CO2. extract information pertinent to the topic through literature survey.
- CO3. comprehend the extracted information through analysis and synthesis critically on the topic.
- CO4. contribute to multidisciplinary scientific work in the field of Power systems.
- CO5. manage time and resources effectively and efficiently.
- CO6. plan, organize, prepare and present effective written and oral technical report on the topic.
- CO7. engage in lifelong learning for development of technical competence in the field of Power Systems.
- CO8. understand ethical responsibility towards environment and society in the field of Electrical engineering.
- CO9. adapt to independent and reflective learning for sustainable professional growth in Electrical power systems.

M. Tech. II-Semester
16MT23810: INTELLECTUAL PROPERTY RIGHTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES:On successful completion of the course, student will be able to

- CO1. demonstrate knowledge on
 - Intellectual Property,
 - Trade Marks & Secrets,
 - Law of Copy Rights, Patents,
 - New development of Intellectual Property.

- CO2. analyze the different forms of infringement of intellectual property rights.
- CO3. solve problems pertaining to Intellectual Property Rights.
- CO4. stimulate research zeal for patenting of an idea or product.
- CO5. write effective reports required for filing patents.
- CO6. develop life-long learning capabilities.
- CO7. develop awareness of the relevance and impact of IP Law on their academic and professional lives.
- CO8. develop attitude for reflective learning.

M. Tech. III & IV-Semester

16MT30731 & 16MT40731: PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	--	--	--	28

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES: On successful completion of the course, the student will be able to

- CO1. demonstrate capacity to identify an advanced topic for project work in core and allied areas.
- CO2. analyze the problem and derive an optimal solution pertinent to the chosen topic.
- CO3. solve engineering problems and provide a wide range of potential solutions.
- CO4. comprehend extracted information through the literature survey for design and development of engineering problems pertinent to the chosen topic.
- CO5. use the techniques, skills and modern engineering tools necessary for project work.
- CO6. contribute to multidisciplinary scientific work in the field of Electrical power Systems.
- CO7. execute the project effectively and efficiently considering economical and financial factors.
- CO8. plan, prepare and present effective written and oral technical report on the topic.
- CO9. engage in lifelong learning for development of technical competence in the field of Electrical power systems and allied fields.
- CO10. understand ethical responsibility towards environment and society in the field of Electrical Engineering.
- CO11. adapt to independent and reflective learning for sustainable professional growth.

Program: M.Tech. POWER ELECTRONICS AND DRIVES

M. Tech. (PED) – I Semester

(16MT1BS01)APPLIED MATHEMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Course on Engineering Mathematics at UG Level.

COURSE DESCRIPTION:

Matrix theory, Calculus of variations, One dimensional random variables, Linear programming and Fourier series.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- matrix theory and eigen vectors
- functions of several variables
- probability theory and distributions
- optimization processes
- fourier series

CO2. analyze and solve problems involving

- matrix factorizations
- variations in moving boundaries
- probability distributions
- optimization methods
- power signals

CO3. design mathematical models for power signals, power electronic circuits and drives.

CO4. develop advanced skills in analyzing the complex problems involving periodic and non-periodic functions in power signals, power electronic circuits and allied areas.

M. Tech. (PED) – I Semester

(16MT12301)ADVANCED POWER SEMICONDUCTOR DEVICES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES:Courses on Electronic Devices and Power Electronics at UG Level.

COURSE DESCRIPTION:

Construction, types, switching, operating characteristics and applications of power semiconductor devices; Design of firing, protective circuits and heat sinks for various power semiconductor devices.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- construction, operation and characteristics of various power semiconductor devices.
- applications of power semiconductor devices.
- operation of firing and protection circuits.
- thermal protection of power semiconductor devices.

CO2. analyze various characteristics of power semiconductor devices.

CO3. design firing and protective circuits for power converters.

CO4. initiate research ideas in selecting the appropriate power semiconductor devices for desired applications.

CO5. select and apply the appropriate controlling and firing circuits for different power converters.

M. Tech. (PED) – I Semester
(16MT12302) ANALYSIS OF INVERTERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Power Electronics at UG Level.

COURSE DESCRIPTION:

Operation and performance of single phase and three phase voltage source inverters; Voltage control of single phase and three phase inverters; Design of PWM inverter; Current Source Inverters; Multilevel inverters and resonant inverters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- operation of various configurations of inverters.
- various voltage control methods.
- Pulse Width Modulation techniques.

CO2. analyze& comprehend the operating modes of inverters under different configurations subjected to various loads.

CO3. evaluate the performance of various types of inverters and PWM controllers.

CO4. conduct investigations to provide feasible solutions for the problems in the field of power inverters.

CO5. select appropriate controlling technique for improving the performance of inverters.

M. Tech. (PED) – I Semester
(16MT12303) ANALYSIS OF POWER CONVERTERS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Engineering Mathematics, Electrical circuits and Power Electronics at UG Level.

COURSE DESCRIPTION:

Single phase and three phase converters - Types, operation of controlled and uncontrolled converters; Analysis of isolated and non-isolated converters; AC voltage controllers; Choppers.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- operation of various types of AC–DC and DC-DC converters, AC voltage controllers.
- Total Harmonic Distortion.
- forced commutation circuits.

CO2. analyze& comprehend the operating modes of converters with different configurations subjected to various loads.

CO3. develop skills in evaluating the performance of various power converters.

CO4. initiate research ideas to provide feasible solutions for AC-DC and DC-DC converters.

CO5. select appropriate controlling techniques for improving the performance of Chopper.

M. Tech. (PED) – I Semester
(16MT12304) MODELLING OF ELECTRICAL MACHINES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on DC Machines, Transformers and Induction Machines, Synchronous Machines.

COURSE DESCRIPTION:

Modelling and analysis of DC, induction and synchronous machines in stationary and rotating reference frames

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate potential knowledge on modelling of DC, induction and synchronous machines.
- CO2. analyze the performance of DC, induction and synchronous machines.
- CO3. design DC, induction and synchronous machines meeting the needs of industry.
- CO4. apply appropriate transformation technique to obtain reference frame variables.

M. Tech. (PED) – I Semester**(16MT12305) ELECTRIC AND HYBRID-ELECTRIC VEHICLES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Power Electronics, Special Electrical Machines and Power Semiconductor Drives at UG Level

COURSE DESCRIPTION:

Transportation vehicles and their impact in society; Concept and configurations of Electric Vehicles (EV); Principle, Types and operation of Hybrid-Electric Vehicles (HEVs); Power Electronic converters in HEVs; Different motor drives & energy storage technologies in EVs and HEVs.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
 - fundamental concepts of Electric Vehicles (EVs) and Hybrid-Electric Vehicles (HEVs).
 - utilization of power converters in electric mobility.
 - deployment of various electrical drives used in EVs and HEVs.
 - battery energy storage technologies used in EVs and HEVs.
 - different applications of EVs and HEVs such as aircraft, ships and locomotives.
- CO2. analyze
 - the practical aspects of power converters in EVs/HEVs.
 - suitability of a motor drive in a vehicle application.
- CO3. develop skills in evaluating the basic schemes of series & parallel HEVs and energy storage technologies in EVs/HEVs.
- CO4. undertake research by implementing
 - special electrical machines such as Switched Reluctance Motor and Permanent Magnet Brushless DC Motor for EVs/HEVs.
 - DC-DC boost converter for HEVs.
- CO5. select and apply the appropriate power converter & energy storage techniques for designing EVs and HEVs in the applications of aircraft, ships and locomotives.
- CO6. demonstrate
 - the effects of modern transportation on society and environment.
 - the need to develop sustainable technologies in place of conventional vehicles.

M. Tech. (PED) – I Semester**(16MT12306) INTELLIGENT CONTROLLERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Engineering Mathematics, Power Electronics, Electrical machines and Control Systems at UG level.

COURSE DESCRIPTION:

Neural Networks; Fuzzy Logic Systems; Genetic Algorithms; Hybrid Intelligent Systems; Swarm Intelligence; Applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge of soft computing techniques to build intelligent systems.
- CO2. analyze complex engineering problems with intelligent techniques.

- CO3. design and develop intelligent systems for power electronic controllers.
 CO4. initiate research related to applications of soft computing in the fields of power converters and allied areas.
 CO5. select and apply suitable intelligent techniques for appropriate power converter fed drives

M. Tech. (PED) – I Semester

(16MT10707)MICROCONTROLLERS AND APPLICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Digital logic design, Microprocessors and Microcontrollers at UG level.

COURSE DESCRIPTION:

8051 Microcontroller: Architecture, Programming and Interfacing; PIC Microcontrollers: Architecture, features, programming and Interfacing

COURSE OUTCOMES: On successful completion of the course, the students will be able to

CO1. demonstrate knowledge on

- architecture of 8051 and PIC microcontroller
- salient features of 8051 and PIC

CO2. analyze and develop a suitable interface with an appropriate microcontroller for the control operations.

CO3. develop programs for stand-alone systems.

CO4. do research by identifying a suitable microcontroller for solving complex problems in the domain of Power Electronics and Drives.

CO5. use tools like PROTEUS, MPLAB, SCILAB, PIC 'C' Compiler etc., for the design, analysis and implementation of the system.

M. Tech. (PED) – I Semester

(16MT10705)REACTIVE POWER COMPENSATION AND MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Power Systems at UG level

COURSE DESCRIPTION:

Reactive Power compensation: Ideal compensator; Line and load compensation ; Compensating devices; Reactive power coordination; Quality of power supply; Distribution side management; Reactive power management in domestic and industrial sectors.

COURSE OUTCOMES: On successful completion of the course the students will be able to

CO1. demonstrate advanced knowledge on:

- necessity for reactive power compensation
- different methods of reactive power compensation.
- types of load patterns and loss reduction methods in distribution lines.

CO2. analyzedifferent types of compensations

CO3. developskills in designing a compensator for industrial applications.

CO4. do research in reactive power management in commercial and industrial applications

M. Tech. (PED) – I Semester

(16MT12331)POWER ELECTRONICS DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PREREQUISITES: Courses on Electronic Devices and Power Electronics at UG Level.

COURSE DESCRIPTION: Design and development of various power converters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate practical knowledge on:

- design and development of power converters.
- Understanding of gate firing circuits.

CO2. analyze and relate physical observations and measurements of various power converters with theoretical principles.

CO3. solve engineering problems related to power converters and firing circuits to provide feasible solutions.

CO4. initiate research ideas to provide solutions for design of power converters.

CO5. select and apply

- suitable commutation circuit for various power converters.
- PWM technique for multilevel inverters.

CO6. prepare laboratory reports that clearly communicate experimental information.

CO7. practice professional code of ethics.

CO8. function effectively as an individual and as a member in the team to solve various problems.

M. Tech. (PED) – I Semester

(16MT12332) POWER ELECTRONICS SIMULATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PREREQUISITES: Courses on Electronic Devices and Power Electronics at UG Level.

COURSE DESCRIPTION: Design and analysis of various converters and inverters.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on various power converters.

CO2. analyze the performance of various power converters.

CO3. evaluate the output characteristics of different types of Power converters.

CO4. initiate research ideas to provide solutions for design of power converters.

CO5. select and apply appropriate control techniques for power converters.

CO6. function effectively as an individual and as a member in the team to solve various problems.

CO7. prepare laboratory reports that clearly communicate experimental information.

CO8. practice professional code of ethics.

M. Tech. (PED) – I Semester

(16MT13808) RESEARCH METHODOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	--	2	--	--

PREREQUISITES: --

COURSE DESCRIPTION:

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO9. demonstrate knowledge on

- research design and conducting good research,
- various data collection methods,
- statistical methods in research,
- report writing techniques.

CO10. analyze various research design issues for conducting research in core or allied areas

CO11. formulate solutions for engineering problems by conducting research effectively in the core or allied areas

- CO12. carry out literature survey and apply good research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
- CO13. select and apply appropriate techniques and tools to complex engineering activities in their respective fields
- CO14. write effective research reports.
- CO15. develop attitude for lifelong learning to do research
- CO16. develop professional code of conduct and ethics of research.

M. Tech. (PED) – II Semester

(16MT22301) LINEAR AND NON-LINEAR CONTROL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Course on Control systems in UG Level.

COURSE DESCRIPTION:

Design of compensators and controllers; describing function, phase plane analysis, Lyapunov's stability analysis; Full order observer and reduced order observer; Nonlinear control design.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- various compensators and controllers.
 - stability in the sense of Lyapunov.
 - nonlinear control design.
- CO2. analyze the stability of nonlinear system using
- describing function approach.
 - phase plane analysis.
 - Lyapunov's method.
- CO3. design suitable compensator and controllers using root locus and Bode plot.
- CO4. solve stability problems using Lyapunov method.
- CO5. select appropriate techniques for analyzing stability of the system.

M. Tech. (PED) – II Semester

(16MT22302) POWER ELECTRONICS IN RENEWABLE ENERGY SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Analysis of power converters, Analysis of inverters and Modelling of electrical machines.

COURSE DESCRIPTION:

Solar energy conversion system; Types of photovoltaic systems – Stand-alone, hybrid and grid connected systems; Wind Energy Conversion Systems; Types of WECS - stand-alone, hybrid and grid connected systems; Hybrid systems – PV-diesel, PV-wind and wind-diesel hybrid systems.

COURSE OUTCOMES: On successful completion of this course, student will be able to

- CO1. demonstrate potential knowledge on
- photo-voltaic panels and wind turbines.
 - various possible hybrid systems.
 - operation of stand-alone and grid connected renewable energy systems.
 - applications of various renewable energy systems.
- CO2. analyze the performance of converters used for various conversion systems.
- CO3. solve engineering problems pertaining to Renewable Energy Conversion Systems to provide feasible solutions.
- CO4. initiate research to design PV system, wind energy system and controller for power converters.
- CO5. select and apply appropriate controlling technique and converters for applications of various Renewable energy systems.
- CO6. possess knowledge in turbines, gears and generators and contribute positively to collaborative-multidisciplinary scientific research.
- CO7. Follow professional code for safe and reliable operation of electrical appliances and power grid.

M. Tech. (PED) – II Semester
(16MT22303)SOLID STATE AC DRIVES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Analysis of inverters and modeling of electrical machines.

COURSE DESCRIPTION:

Open loop and closed loop speed control of induction motor; Synchronous motor drive; Induction motor drive, torque control, field oriented control, flux vector estimation, synchronous motor control.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- operating regions of various AC drives.
- speed control of induction motor drives.
- control of synchronous motor drives.
- field oriented control of induction machines.

CO2. analyze the operation and performance of power converter fed AC motors.

CO3. solve engineering problems pertaining to AC drives to provide feasible solutions.

CO4. initiate research to design open loop and closed loop controllers for controlling of AC motors.

CO5. select and apply appropriate power circuit configuration for the speed control of AC motor drives.

M. Tech. (PED) – II Semester
(16MT22304)SOLID STATE DC DRIVES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Analysis of power converters and Modelling of electrical machines.

COURSE DESCRIPTION:

Operation, characteristics, speed control and applications of DC motors; Performance characteristics and parameters of single phase, three phase and twelve pulse converters fed DC motor; Open loop, closed loop and digital control of DC drives.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate knowledge on

- power circuit configuration.
- steady state operation and transient dynamics of motor load system.
- characteristics of DC motors.

CO2. analyze

- the operation of converter/chopper fed DC drives.
- single phase and three phase converter fed drives.
- the closed loop control and digital control of DC drives.

CO3. design speed controllers for closed loop solid-state DC drives.

CO4. solve engineering problems pertaining to electrical drives to provide feasible solutions.

CO5. select and apply appropriate power circuit configuration of the phase controlled rectifiers and choppers for the speed control of DC drives.

M. Tech. (PED) – II Semester
(16MT22305)SPECIAL ELECTRICAL MACHINES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: Courses on Electrical Machines, Control Systems and power electronics at UG level and Modelling of electrical machines at PG level

COURSE DESCRIPTION:

Construction, operation, types, characteristics and applications of Stepper Motors, Switched Reluctance Motor, PM Brushless DC Motor, Synchronous Reluctance, Linear Induction and synchronous Motors.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on
- construction and operation of various types of special electrical machines.
 - characteristics of special electrical machines.
 - open loop and closed loop operation of special electrical machines.
- CO2. analyze the operation and performance of special electrical machines for various operating conditions.
- CO3. design suitable accessories / controllers for desired operation and control of special electrical machines.
- CO4. solve engineering problems pertaining to special electrical machines to provide feasible solutions.
- CO5. select and apply appropriate technique and tools for control and operation of special electrical machines in domestic and industrial applications.
- CO6. apply the conceptual knowledge of special electrical machines in relevance to industry and society.

M. Tech. (PED) – II Semester**(16MT20701)FLEXIBLE AC TRANSMISSION SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:Power Electronics and Power Systems at UG level, Analysis of Power Converters and Analysis of Inverters

COURSE DESCRIPTION:

Need for Flexible AC transmission systems; objectives of shunt and series compensation, phase angle regulators; FACTS controllers: shunt, series and combined; Coordination of various FACTS controllers.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO5. demonstrate knowledge on:
- compensation schemes for real and reactive power control.
 - Static Shunt, Series and Shunt-Series compensation.
 - FACTS devices and controllers
- CO6. analyze and adopt a suitable FACTS device for the appropriate control.
- CO7. develop skills in coordination of multiple FACTS controllers in an interconnected power systems.
- CO8. develop new FACTS controllers for reliable and flexible control of power system.
- CO9. employ modern techniques in coordination of FACTS devices for reliable and efficient operation.

M. Tech. (PED) – II Semester**(16MT20707)HIGH VOLTAGE DC TRANSMISSION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:Power Electronics and Power Systems at UG level, Analysis of Power Converters and Analysis of Inverters.

COURSE DESCRIPTION:

HVDC Transmission: Capabilities, Applications and planning; Analysis and control of power converter; Harmonics and Filters; Types of Multi-Terminal DC Systems and control; Faults and Protection.

COURSE OUTCOMES: On successful completion of the course the students will be able to

- CO5. demonstrate knowledge on:
- HVDC transmission systems.
 - operation of static converters and its analysis.
 - different types of faults and protection schemes in HVDC systems.
- CO6. analyze various static converters operation in HVDC systems, harmonics, filters and MTDC systems.

- CO7. evaluate the performance of HVDC systems under various operating conditions.
 CO8. develop new control techniques for HVDC converter systems.
 CO9. follow professional code of ethics.

**M. Tech. (PED) – II Semester
 (16MT20708) POWER QUALITY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: --

COURSE DESCRIPTION:

Power Quality concepts; harmonics and voltage regulation using conventional methods; power quality enhancement using custom power devices; power quality issues in distributed generation.

COURSE OUTCOMES: On successful completion of the course the students will be able to

CO6. demonstrate knowledge on:

- various power quality issues and mitigation.
- operating conflicts in distributed generation.

CO7. analyze

- harmonic distortion due to commercial and industrial loads.
- the suitability of various custom power devices.

CO8. evaluate various power quality indices.

CO9. initiate research to develop/design new schemes and techniques for power quality enhancement.

CO10. apply the appropriate principles and techniques for integration of distributed generation and utilities.

**M. Tech. (PED) – II Semester
 (16MT20709) SMART GRID TECHNOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES:--

COURSE DESCRIPTION:

Concept of smart grid; various information and communication technologies for Smart Grid; Smart metering; Demand side integration; Energy management systems

COURSE OUTCOMES: On successful completion of the course the students will be able to

CO1. demonstrate knowledge in

- Smart grid initiatives and technologies
- Information and communication technologies for the smart grid.
- Sensing, measurement, control and automation.

CO2. apply skills in fault calculation and state estimation.

CO3. apply various information security tools in the smart grid technology.

CO4. extend research activities on implementation of smart grid.

CO5. develop usage of modern techniques to integrate renewable energy sources into the smart grid.

**M. Tech. (PED) – II Semester
 (16MT22331) ELECTRIC DRIVES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PREREQUISITES: Courses on Analysis of inverters and converters.

COURSE DESCRIPTION: Design and development of various AC and DC drives.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. demonstrate practical knowledge on design and development of power converter fed drives.

- CO2. analyze and relate physical observations and measurements of various power converter fed drives with theoretical principles.
- CO3. solve engineering problems related to power converter fed drives to provide feasible solutions.
- CO4. initiate research ideas to provide solutions for design of power converter fed drives.
- CO5. select and apply suitable controlling techniques for various power converter fed drives.
- CO6. prepare laboratory reports that clearly communicate experimental information.
- CO7. practice professional code of ethics.
- CO8. function effectively as an individual and as a member in the team to solve various problems.

M. Tech. (PED) – II Semester
(16MT22332)ELECTRIC DRIVES SIMULATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PREREQUISITES:Courses on Analysis of inverters and Analysis of converters.

COURSE DESCRIPTION:Design and analysis of various converter fed drives.

COURSE OUTCOMES: On successful completion of the course, students will be able to

- CO1. demonstrate knowledge on various power converter fed drives.
- CO2. analyze the operating characteristics of various power converter fed drives.
- CO3. provide feasible solutions pertaining to electric drives.
- CO4. initiate research related to applications of electric drives.
- CO5. select and apply appropriate speed control techniques for power converter fed drives.
- CO6. prepare laboratory reports that clearly communicate experimental information.
- CO7. practice professional code of ethics.
- CO8. function effectively as an individual and as a member in the team to solve various problems.

M. Tech. (PED) – II Semester
(16MT22333)SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PREREQUISITES: --

COURSE DESCRIPTION:

Identification of seminar topic; literature survey; preparation of technical report and presentation.

COURSE OUTCOMES: On successful completion of the course, student will be able to

- CO10.demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
- CO11.extract information pertinent to the topic through literature survey.
- CO12.comprehend the extracted information through analysis and synthesis critically on the topic.
- CO13.contribute to multidisciplinary scientific work in the field of Power systems.
- CO14.manage time and resources effectively and efficiently.
- CO15.plan, organize, prepare and present effective written and oral technical report on the topic.
- CO16.engage in lifelong learning for development of technical competence in the field of Power Systems.
- CO17.understand ethical responsibility towards environment and society in the field of Electrical engineering.
- CO18.adapt to independent and reflective learning for sustainable professional growth in Electrical power systems.

**M. Tech. (PED) – II Semester
(16MT23810)INTELLECTUAL PROPERTY RIGHTS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: -

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge on

- Intellectual Property,
- Trade Marks & Secrets,
- Law of Copy Rights, Patents,
- New development of Intellectual Property.

CO2. analyze the different forms of infringement of intellectual property rights.

CO3. solve problems pertaining to Intellectual Property Rights.

CO4. stimulate research zeal for patenting of an idea or product.

CO5. write effective reports required for filing patents.

CO6. develop life-long learning capabilities.

CO7. develop awareness of the relevance and impact of IP Law on their academic and professional lives.

CO8. develop attitude for reflective learning.

**M. Tech. (PED) III & IV-Semester
(16MT32301 & 16MT42301)PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	--	--	--	28

PREREQUISITES: --

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES: On successful completion of the course, the student will be able to

CO1. demonstrate capacity to identify an advanced topic for project work in core and allied areas.

CO2. analyze the problem and derive an optimal solution pertinent to the chosen topic.

CO3. solve engineering problems and provide a wide range of potential solutions.

CO4. comprehend extracted information through the literature survey for design and development of engineering problems pertinent to the chosen topic.

CO5. use the techniques, skills and modern engineering tools necessary for project work.

CO6. contribute to multidisciplinary scientific work in the field of Electrical power Systems.

CO7. execute the project effectively and efficiently considering economical and financial factors.

CO8. plan, prepare and present effective written and oral technical report on the topic.

CO9. engage in lifelong learning for development of technical competence in the field of Electrical power systems and allied fields.

CO10. understand ethical responsibility towards environment and society in the field of Electrical Engineering.

CO11. adapt to independent and reflective learning for sustainable professional growth.

Program: M.Tech. COMPUTER SCIENCE

M. Tech. (CS) – I Semester (16MT10501) ADVANCED COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION:

Computer Networks and Protocols, Data Link Layer, LAN and Network Routing; Transport Layer and Internet Protocols; Wireless and Optical Networks; MANETs and Wireless Sensor Networks

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1. Gain knowledge on principles of computers, network topologies, routing mechanisms.
- CO2. Analyze the computer network with suitable network protocols and routing algorithms.
- CO3. Formulate solutions for engineering problems pertaining to the advanced networking technologies.
- CO4. Develop techniques for subnet masks and addresses to fulfill networking requirements.
- CO5. Conduct Research to solve the problems related to Routing Algorithms in Networks.

M. Tech. I Semester (16MT10502) ADVANCED DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES: A Course on "Database Management System".

COURSE DESCRIPTION:

Concepts of Database System and Architectures, Data modeling using ER-Model; SQL, Objects Relational Database and XML; Database Design and File Organizations; Query Processing, Concurrency and Recovery; Distributed DBMS Architecture and Design.

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

- CO1: Gain Advanced knowledge in
- Database System Concepts , Languages , Interfaces and Architectures
 - Query Languages , Relational Databases and XML
 - Database Design and File Organization.
 - Query Processing and Recovery
 - Distributed Database Architecture and Design
- CO2: Analyze database management architecture and categorize languages and database objects.
- CO3: Design a wide range of potential solutions for the database problems using ER-diagrams SQL, Normalization and XML.
- CO4: Initiate Research to develop new Architectural models and Query processing using SQL in database Systems.
- CO5: Apply appropriate modern techniques, resources and tools for the real world problems in databases.

M. Tech (CS) – I Semester (16MT10503) ADVANCED OPERATING SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Operating Systems"

COURSE DESCRIPTION

Process management and process scheduling; Concurrency, synchronization and deadlocks; Memory management, file system and secondary storage; I/O systems, protection and security; Introduction to Distributed Systems, Synchronization in Distributed Systems

COURSE OUTCOMES:

After Successful completion of the course, students will be able to:

CO-1: Gain advanced knowledge in

- Process management concepts.
- Synchronization and Deadlocks
- Inter Process Communication.
- Group Communication.
- Remote Procedure Call.

CO-2: Analyze how operating system manages resources among the users.

CO-3: Formulate solutions for engineering problems pertaining to the advanced Operating Systems

CO-4: Design real time solutions for the problems related to CPU Scheduling, concurrency and Synchronization

CO-5: Apply the concepts of semaphores, monitors, message-passing and other forms of synchronization to maintain Concurrency.

M. Tech (CS) I Semester

(16MT10504) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	0	--	4

PRE-REQUISITES: A Course on "Database Management System".

COURSE DESCRIPTION: Concepts of Data Warehousing and Data mining; Pre-processing techniques in Data Warehouses; Data cube computation and OLAP query processing; Data Mining process and System architecture; relationship with data warehouse and OLAP Systems; Data mining Techniques and Applications.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Gain knowledge in -

- Multidimensional data model and Data warehouse Architecture.
- Data mining algorithms.
- Association Rules, Classification and Prediction and Cluster Analysis.

CO2: Analyse data mining algorithms for complex industrial problems.

CO3: Solve engineering problems to get wide variety of solutions by applying data mining algorithms.

CO4: Ability to carry out research in Spatial Mining, Spatio Temporal Mining, Text Mining Multimedia Mining and web Mining

CO5: Create and apply appropriate techniques & tools of data mining to solve real world problems.

M.Tech (CS) I-Semester

(16MT12502) DATA STRUCTURES AND ALGORITHMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Computer Programming".

COURSE DESCRIPTION:

Introduction to Data Structures and Algorithms; Searching and Sorting; Trees and Graphs; Divide and Conquer; Greedy method; Dynamic Programming, Back Tracking; Branch and Bound.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1. Gain knowledge on:

- Linear data structures including Stack, Queue and Linked Lists and Non-linear data structures like Trees and Graphs.
- Divide and Conquer Method, Greedy Method, Dynamic Programming, Backtracking and Branch & Bound algorithms.

CO2. Analyze the efficiency of algorithms using space and time complexities.

CO3. Solve real world problems using algorithm design techniques.

CO4. Apply Dynamic programming techniques to provide software solutions.

**M. Tech (CS) – I Semester
(16MT10505) COMPUTER VISION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on "Computer Graphics"

COURSE DESCRIPTION:

Concepts of Cameras, Measuring Light, Sources, Shadows and Shading; Linear filters, Edge detection; Segmentation by clustering, Segmentation by fitting a model; Finding templates using classifiers, Recognition by relations between Templates; Geometric camera models, Camera calibration.

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

CO -1: Gain knowledge in image processing techniques.

CO -2: Analyze the applicability of various techniques such as Fourier Transforms, Normalized Correlation, Estimating Derivatives in filtering and edge detection to generate quality images.

CO -3: Solve complex image segmentation problems using clustering and fitting models.

CO -4: Conduct Research on geometric methods and tools for camera calibration.

CO -5: Apply building classifiers, voting and search techniques and Image Processing tools for finding templates for real world images.

**M. Tech (CS) – I Semester
(16MT10506) INFORMATION RETRIEVAL SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITE:

A Course on "Database Management Systems"

COURSE DESCRIPTION:

Concepts of Information retrieval Systems; Indexing and data structures; indexing, Document and term clustering; user search techniques; Text search algorithms, information system Evaluation;

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO-1 : Acquire knowledge in fundamental concepts of

- Information Retrieval System capabilities
- Data Structures
- Indexing and Search Algorithms

CO -2: Analyze concepts of Database, Data Warehouses of real time applications related to Document Store, Document data warehouses like space research, judicial, biomedical, scientific documents.

CO -3 : Solve complex search problems like ranking, weighted, software text searches by implementing A* Search, Zipf and Information retrieval frame work

CO -4: Initiate research to identify and develop algorithms for indexing, clustering and searching.

CO -5: Create and apply online Information Retrieval Systems like search engines.

**M. Tech (CS) – I Semester
(16MT10507) INTERNET OF THINGS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	--	4

PRE-REQUISITES:

Courses on "Computer Networks" and "Java"

COURSE DESCRIPTION:

Domain Specific IoT's; M2M & System Management with Netconf-Yang; Developing Internet of Things Using Python; IoT Physical Devices & Case Studies Illustrating IoT Design

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1: Gain knowledge on

- o Building blocks of Internet of Things and characteristics.
- o Application areas of IoT
- o Concept of M2M (machine to machine) with necessary protocols

CO2: Analyze Domain specific IoT's, revolution of Internet in Mobile Devices.

CO3: Design and Develop Techniques for solutions to solve the problems in IoT using Python Scripting Language.

CO4: Conduct research on domain specific IoT's and IoT enabling Technologies.

CO5: Acquire knowledge to recognize the opportunities and contribute to collaborative-multidisciplinary Scientific Research.

M.Tech (CS) – I Semester

(16MT22504) SOFTWARE TESTING TECHNIQUES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Software Development Methodologies".

COURSE DESCRIPTION: Basic concepts of Software Testing; Testing Techniques – Levels of Testing; Testing Process – Test Planning; Test Metrics and Reports; Software Test Automation.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on the Software Testing types and Process for different programming environments.
2. Analyze and apply the appropriate testing techniques suitable for testing the software.
3. Perform testing by applying appropriate strategies for selecting test cases to meet requirements of the product.
4. Apply efficient modern software testing tools for automation.
5. Write test cases and perform defect reporting.

M. Tech (CS) I Semester

(16MT10531) DATABASE MANAGEMENT SYSTEMS & DATA WAREHOUSING AND DATA MINING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES:

Courses on "Database Management Systems" and "Data Warehousing and Data Mining"

Course Description:

Hands on practice and implementation of data mining algorithms - Apriori, Fp-tree; Bayesian classification; Back propagation; k-means clustering; Bisecting k-means clustering in C++.

Designing and implement basic SQL Queries, PL/SQL and advanced concepts in PL/SQL such as Object creation structures; Triggers; Embedded SQL using Oracle Database Management System Package.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO-1: Acquire Practical Knowledge on

- SQL Queries
- Triggers
- Data Mining Algorithms
- Classification , Prediction and Cluster Analysis

CO-2: Analyze Integrity Constraints on databases for validation and Data Mining algorithms for solving real time applications

CO-3: Develop and Design solutions to complex problems related to frequent item sets, classification and clustering.

CO-4: Apply advanced knowledge to identify research challenges, and issues related to databases and data mining.

CO-5: Use modern software tools and technologies for designing simple to complex applications in databases and Data warehousing and data mining.

CO-6: Attitude for independent and continuous learning for improved knowledge with newer versions of DBMS packages and data mining.

M. Tech. (CS) – I Semester
(16MT10532) DATA STRUCTURES AND COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

Courses on “Advanced Computer Networks” and “Data Structures”

COURSE DESCRIPTION:

Hands on practical experience on implementing data link layer farming methods and routing algorithms; Practical implementation of linked lists, stacks, queues, binary tree, binary search tree, AVL tree, B -tree, graphs, N-Queen’s problem using C++.

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

- CO-1.** Gain basic programming skills to implement
 - a. Framing mechanisms for data link layer,
 - b. Shortest path using Dijkstra’s routing mechanism
 - c. Distance vector routing mechanism
- d. Linear and non-linear data structures, backtracking problems.
- CO-2.** Analyze data structures for various problem solving techniques and typical performance measures of network models.
- CO-3** Design, conceptualize and solve real world problems by providing the best solutions for data structures and networking models.
- CO-4:.** Use modern software tools and technologies for designing simple to complex applications in real world.
- CO-5:** Apply advanced knowledge to identify research challenges, and contribute individually or in teams to the development of network projects for real world problems.
- CO-6:** Develop effective professional and business communication in data structures and networks.
- CO-7:** Attitude for independent and continuous learning for improved knowledge with newer versions of object oriented software and new simulation models of protocols.

M. Tech. I Semester
(16MT13808) RESEARCH METHODOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --

COURSE DESCRIPTION:

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types.

COURSE OUTCOMES: After completion of the course, students should be able to:

1. Acquire in-depth knowledge on
 - a. Research design and conducting research
 - b. Various data collection methods
 - c. Statistical methods in research
 - d. Report writing techniques.
2. Analyze various research design issues for conducting research in core or allied areas
3. Formulate solutions for engineering problems by conducting research effectively in the core or allied areas
4. Carryout literature survey and apply research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
5. Select and Apply appropriate techniques and tools to complex engineering activities in their respective fields
6. Write effective research reports.
7. Develop attitude for lifelong learning to do research.
8. Develop professional code of conduct and ethics of research.

M.Tech (CS) II-Semester
(16MT20501) ADVANCED COMPUTER ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PREREQUISITES: A course on “Computer Organization”.

COURSE DESCRIPTION

Quantitative design and analysis, memory hierarchy design; parallel computer models and network properties; pipelining, superscalar techniques, multiprocessors and multi computers; Multi-Vector, SIMD and Multi-Core computers

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1. Acquire knowledge of:
- Models and Computer Architectures.
 - Concepts of parallel computer models.
 - Scalable Architectures.
 - Pipelining, Superscalar processors, multiprocessors, SIMD and Multi core Computers.
- CO2. Analyze architectures of parallel computers, sub systems and their interconnection structures.
- CO3. Apply concepts and techniques of advanced computer architectures to solve engineering problems
- CO4. Conduct research in the area of parallel computer architecture development and warehouse scale computing.

M. Tech (CS) – II Semester (16MT20502) BIG DATA ANALYTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Courses on "Data Base Management Systems" & "Data Warehousing and Data Mining".

COURSE DESCRIPTION:

Concepts of Big Data, Types of Data Elements; Introduction to Hadoop, Hadoop Ecosystem; Map Reduce; Building Blocks of Hadoop; Big data analytics applications; Predictive and Descriptive Analytics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- CO-1: Gain knowledge in:
- Big data Characteristics
 - Hadoop Framework
 - Map Reduce.
 - Hadoop Release
- CO-2: Analyze and develop solutions for database systems for storing and analyzing the large data.
- CO-3: Apply Big Data Analytics for estimating the data sets to solve the real world problems.
- CO-4: Design and model for an effective database by using big data tools.
- CO-5: Carry out research on Predictive Analysis and Sentiment Analysis
- CO-6: Learning advance analytics techniques for effective Database monitoring.

M. Tech (CS) II-Semester (16MT20503) OBJECT ORIENTED ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Object Oriented Programming"

COURSE DESCRIPTION:

Concepts of Unified Modeling language; Sequence and collaboration diagrams; Behavioral Modeling; Unified Process and phases of unified process

COURSE OUTCOMES:

After successful completion of the course, the students will be able to:

- CO-1: Gain advanced knowledge in
- Object Oriented Methodologies
 - UML Diagrams
 - Unified Process
- CO-2: Analyze Various UML Models which are required for solving Real World problems.
- CO-3: Formulate solutions for engineering problems pertaining to the Object Oriented Analysis and Design
- CO-4: Design UML Diagrams Using Visual Modelling Tools
- CO-5: Apply unified process models for building of Applications, which is required for effective project management.

**M.Tech (CS) II Semester
(16MT12501) CLOUD COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: *Courses on "Operating Systems" and "Computer Networks"*

COURSE DESCRIPTION:

Virtualization, Case studies – XEN, VMware, Microsoft Hyper-V; Cloud architecture; Services and Applications; Cloud Programming; Industry practices and Case studies –Amazon Web Services, Google App Engine, and Microsoft Azure.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1:** Demonstrate knowledge on Virtualization models, Cloud Architecture, Services and Programming concepts.
- CO2:** Analyze the problems in existing cloud architectures.
- CO3:** Apply concurrent programming, throughput computing and Data intensive computing in Cloud programming.
- CO4:** Conduct research on emerging technologies in cloud and energy management in cloud
- CO5:** Apply virtualization techniques to optimize resource sharing.

**M.Tech (CS) II Semester
(16MT22505) WEB TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Object Oriented Programming".

COURSE DESCRIPTION: Web Technologies: HTML5, CSS, JavaScript, JQuery; Open source server-side scripting language- PHP; MySQL database concepts; and AJAX.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1:** Gain knowledge on web technologies.
- CO2:** Analyze the functionality of client as well as server side web technologies for validating web pages.
- CO3:** Gain programming skills to design and develop novel web applications
- CO4:** Apply web technologies to make web pages more interactive, scalable and user friendly web applications.

**M.Tech (CS) II-Semester
(16MT20504) EMBEDDED SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Courses on Computer Organization & Operating Systems

COURSE DESCRIPTION:

Concepts of Embedded System components, Micro controller programming; Programming in Embedded Systems, design using hardware and software components; Real-Time Operating systems, Embedded Product Development Life Cycle .

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

- CO-1:** Gain advanced knowledge in
 - Embedded system components.
 - Micro controller programming.
- CO-2:** Analyze critical problems related to programming for hardware and software components by conducting detailed research.
- CO-3:** Apply and solve issues in computer based systems using a range of solutions provided by Embedded Systems.
- CO-5:** Use appropriate techniques, tools, resources and usage of modern Embedded Product Development Life Cycle (EDLC) tools for the design and development of Embedded Systems.

**M. Tech (CS) II-Semester
(16MT20505) INFORMATION SECURITY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION

Concepts of cryptographic algorithms, public key and private key encryption; security models, Hash Algorithms; Intrusion Detection, IP Security; analysis of security principles in internet and system security

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1. Gain advanced knowledge in

- Symmetric and Asymmetric Encryption Algorithms
- Key distribution and message Authentication
- Hash algorithms and digital signature techniques
- IP security and Wireless network security
- Intrusion Detection and Firewall configurations

CO2. Analyze the symmetric algorithms, Public-Key Encryption and Hash Algorithms.

CO3. Develop solutions to solve the problems related to Public-Key Encryption, Digital signatures, Secure Hash Functions

CO4. Conduct research to identify efficient ciphers and cryptographic algorithms to provide novel solutions for Real-Time applications

CO5. Apply the appropriate Cryptographic Techniques and security Algorithms in the area of Information Security

**M.Tech (CS) – II Semester
(16MT20506) MOBILE COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION:

GSM architecture, Wireless MAC and CDMA Systems; Mobile IP network layer, Mobile Transport Layer; Databases, Data Dissemination and Broadcasting Systems; Synchronization in Mobile Devices and Mobile Computing Systems; Mobile Application Languages and Mobile Operating Systems.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1. Gain advanced knowledge in

- GSM and CDMA Systems.
- Mobile IP, and Mobile TCP
- Databases and Data Dissemination
- Mobile Data Synchronization

CO2. Analyze various methods in data dissemination and broadcasting models

CO3. Evaluate and implement novel applications to realize power computing and context-aware computing. .

CO4. Contribute positively to multidisciplinary scientific research on mobile application languages and mobile operating systems.

CO5. Apply Database Hoarding Techniques, Selective Indexing and Tuning Techniques to solve problems in Mobile Computing

**M. Tech (CS) – II Semester
(16MT20507) SOFTWARE PROJECT MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4			4

PRE-REQUISITES:

A course on "Software Engineering"

COURSE DESCRIPTION:

Concepts of Software Project Management; Software efforts estimation techniques; Software economics; life cycle phases; model based software architectures; project organizations & responsibilities.

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

- CO-1:** Gain knowledge on project planning and management, client management and project Scheduling and monitoring.
- CO-2:** Analyze the major and minor milestones, artifacts and metrics from management and technical perspective.
- CO-3:** Design software products using conventional and modern principles of software project management.
- CO-4:** Apply Software Metrics for a given Project to calculate Cost estimation models.
- CO-5:** Adopt team effectiveness through Work Breakdown Structures by optimal cost and schedule estimates
- CO-6:** Demonstrate skills of project management and process measurement in software projects.

M. Tech. II-Semester**(16MT20531) CLOUD COMPUTING & BIG DATA ANALYTICS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

Course on "Cloud Computing" and "Operating Systems"

COURSE DESCRIPTION:

Hands-on experience on creating Virtual machines on Windows and Linux platforms, Development of Service based web applications & their deployment and Mobile app development, Designing and implementing Hadoop cluster.

COURSE OUTCOMES:

After successful completion of this course , students will be able to:

- CO-1:** Demonstrate hands-on experience on Virtualization models, Cloud Environment and Hadoop cluster setup.
- CO-2:** Analyze the given experiment and measure the performance of services and datasets.
- CO-3:** Apply API development skills in web applications for Cloud deployment and develop solutions for real time applications using Hadoop.
- CO-4:** Devise virtual environments based on virtualization techniques and processing huge amount of data using Big data tools
- CO-5:** Develop written and oral communications in preparing and presenting reports.

M. Tech – II Semester**(16MT20532) OBJECT ORIENTED ANALYSIS & DESIGN LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

A Course on "Object Oriented Programming"

COURSE DESCRIPTION:

Concepts of Unified Modeling language; Sequence and collaboration diagrams; Behavioral Modeling; Unified Process and phases of unified process.

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

- CO-1:** Demonstrate knowledge on Object Oriented concepts, project planning and modeling concepts.
- CO-2:** Analyze and understand requirements of given real life problems.
- CO-3:** Design Structural and Behavioral Diagrams to solve real world problems.
- CO-5:** Apply UML to develop blueprints of a given problem.
- CO-6:** Develop written and oral communications in preparing and presenting reports.
- CO-7:** Update knowledge in object oriented analysis and design continuously

**M. Tech. (CS)-II Semester
(16MT20533) SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PRE-REQUISITES:--

COURSE DESCRIPTION:

Identification of seminar topic; literature survey; preparation of technical report and presentation

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1. Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
- CO2. Extract information pertinent to the topic through literature survey.
- CO3. Comprehend extracted information through analysis and synthesis critically on the topic.
- CO4. Plan, organize, prepare and present effective written and oral technical report on the topic.
- CO5. Adapt to independent and reflective learning for sustainable professional growth in Computer Science and software systems
- CO6. Contribute to multidisciplinary scientific working the field of Computer Science and software systems
- CO7. Understand ethical responsibility towards environment and society in the field of Computer Science and software systems
- CO8. Engage in lifelong learning for development of technical competence in the field of Computer Science and software systems

**M. Tech. – II Semester
(16MT23810) INTELLECTUAL PROPERTY RIGHTS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PRE-REQUISITES: --

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

1. Demonstrate in-depth knowledge on
 - Intellectual Property
 - Trade Marks & Secrets
 - Law of Copy Rights, Patents
 - New development of Intellectual Property
2. Analyze the different forms of infringement of intellectual property rights.
3. Solve problems pertaining to Intellectual Property Rights.
4. Stimulate research zeal for patenting of an idea or product.
5. Write effective reports required for filing patents.
6. Develop life-long learning capabilities.
7. Develop awareness of the relevance and impact of IP Law on their academic and professional lives.
8. Develop attitude for reflective learning.

**M. Tech. (CS) III & IV Semesters
(16MT30531 & 16MT40531) PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	--	--	--	28

PRE-REQUISITES: --

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to

- CO1. Demonstrate capacity to identify an advanced topic for project work in core and allied areas.
- CO2. Extract information pertinent to the topic through literature survey.

- CO3. Comprehend extracted information through analysis and synthesis critically on the topic.
- CO4. Solve engineering problems in the chosen topic with higher order skill to obtain solutions.
- CO5. Use the techniques, skills and modern engineering tools necessary for project work.
- CO6. Perform time and cost analysis on the project.
- CO7. Plan, prepare and present effective written and oral technical report on the topic.
- CO8. Adapt to independent and reflective learning for sustainable professional growth. CO9. Contribute to multidisciplinary scientific working the field of Computer Science and Software Systems
- CO10. Understand ethical responsibility towards environment and society in the field of Computer Science and Software Systems
- CO11. Engage lifelong learning for development of technical competence in the field of Computer Science and Software Systems.

Program: M.Tech. COMPUTER NETWORKS AND INFORMATION SECURITY

I M. Tech. (CN&IS) I-Semester (16MT10501) ADVANCED COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION:

Computer Networks and Protocols; Data Link Layer, LAN and Network routing; Transport Layer and Internet Protocols; Wireless and Optical Networks; MANETs and Wireless Sensor Networks

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1. Gain knowledge on principles of computers, network topologies, routing mechanisms.
- CO2. Analyze the computer network with suitable network protocols and routing algorithms.
- CO3. Formulate solutions for engineering problems pertaining to the advanced networking technologies.
- CO4. Develop new techniques for subnet masks and addresses to fulfill networking requirements.
- CO5. Conduct research to solve the problems related to routing algorithms in Network applications.

I M. Tech (CN&IS)I-Semester (16MT10504) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	--	4

PRE-REQUISITES:

A course on "Database Management Systems"

COURSE DESCRIPTION

Concepts of Data Warehousing and Data Mining; Pre-processing Techniques in Data Warehouses; Data cube computation and OLAP query processing; Data Mining process and System architecture; relationship with data warehouse and OLAP Systems; Data mining Techniques and Applications

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1. Gain knowledge in:
 - Multidimensional data model and Data Warehouse architectures. .
 - Data mining algorithms.
 - Association Rules, Classification and Prediction and Cluster Analysis.
- CO2. Analyse data mining algorithms for complex industrial problems.
- CO3. Solve engineering problems to get wide variety of solutions by applying data mining algorithms.
- CO4. Ability to carry out research in spatial mining, spatio temporal mining, text mining, multimedia and web mining
- CO5. Create and apply appropriate techniques & tools of data mining to solve real world problems

I M. Tech (CN&IS) I-Semester (16MT20505) INFORMATION SECURITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION

Concepts of cryptographic algorithms, public key and private key encryption, security models, Hash Algorithms, Intrusion Detection, IP Security, analysis of security principles in internet and system security

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1. Gain advanced knowledge in

- Symmetric and Asymmetric Encryption Algorithms
- Key distribution and message Authentication
- Hash algorithms and digital signature techniques
- IP security and Wireless network security
- Intrusion Detection and Firewall configurations

CO2. Analyze the symmetric algorithms, Public-Key Encryption and Hash Algorithms.

CO3. Develop solutions to solve the problems related to Public-Key Encryption, Digital signatures, Secure Hash Functions

CO4. Conduct research to identify efficient ciphers and cryptographic algorithms to provide novel solutions for real time applications

CO5. Apply the appropriate Cryptographic Techniques and security Algorithms in the area of Information Security

I M.Tech (CN&IS) I-Semester (16MT20506) MOBILE COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION:

GSM architecture, Wireless MAC, and CDMA Systems; Mobile IP network layer; Mobile Transport Layer; Databases, Data dissemination and Broadcasting systems; Synchronization in mobile devices and Mobile Computing Systems; Mobile Application Languages and Mobile Operating Systems.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Gain advanced knowledge in

- GSM and CDMA Systems.
- Mobile IP, and Mobile TCP
- Databases and Data Dissemination
- Mobile Data Synchronization

CO2. Analyze various methods in data dissemination and broadcasting models

CO3. Evaluate and implement novel applications to realize power computing and context-aware computing.

CO4. Contribute positively to multidisciplinary scientific research in design and development of mobile application languages and mobile operating systems for mobile.

CO5. Apply Database hording Techniques, Selective indexing and Tuning techniques to solve mobile computing problems.

I M. Tech (CN&IS) I-Semester (16MT22505) WEB TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:

A course on "Object Oriented Programming"

COURSE DESCRIPTION:

Web Technologies: HTML5, CSS, JavaScript, JQuery; Open source server-side scripting language- PHP; MySQL database concepts; and AJAX

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

CO1. Gain knowledge on web technologies.

CO2. Analyze the functionality of client as well as server side web technologies for validating web pages.

CO3. Gain programming skills to design and develop novel web applications

CO4. Apply web technologies to make web pages more interactive, scalable and user friendly web applications.

M. Tech (CNIS) I-Semester**(16MT16301) DESIGN OF SECURE PROTOCOLS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on "Cryptography and Network Security, "

COURSE DESCRIPTION:

Pseudo-random-Bit generation and algorithm modes; Symmetric and asymmetric cryptography; Authentication protocols and Hash functions; Modern cryptography and its applications, Security implementations over resource constrained networks.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Gain advanced knowledge on Basic Cryptography Techniques Pseudo-random-Bit generators used in Cryptography.

CO2. Analyze various Authentication Protocols and security threats of systems against various attacks possible over the Internet services to provide secure access to the system.

CO3. Solve the security issues by adopting mathematical and logical operators such as hash functions.

CO4. Carryout research on advanced and modern Cryptographic protocol solutions to resolve security problems in the real world.

CO5. Evaluate the use of Cryptographic algorithms and tools in providing security to resource constraint networks and e-commerce systems.

I M. Tech (CN&IS) I-Semester**(16MT16302) ETHICAL HACKING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	--	4

PRE-REQUISITES:

Courses on "Computer networks, Cryptography & Network security"

COURSE DESCRIPTION:

Introduction to hacking concepts; Password hacking Techniques; Denial of service attacks; Web application vulnerabilities; Wireless hacking & physical security; overview of cryptography and penetration testing methodologies.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Gain Knowledge on

- Hacking and its societal issues
- Hacking methods
- Types of hacking
- Tools of hacking

CO2: Analyze system, network vulnerabilities which give a scope to perform hacking.

- CO3: Develop skills to solve the different security risks that arise from hacking.
 CO4: Design new techniques and tools to solve real world security problems.
 CO5: Apply appropriate ethical hacking techniques to provide solution for a given security problem
 CO6. Undertake research to solve security problems at host, data and Network level.

**I M. Tech (CN&IS) I-Semester
 (16MT10507) INTERNET OF THINGS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	--	4

PRE-REQUISITES:

Courses on "Computer Networks" and "Java"

COURSE DESCRIPTION:

Domain Specific IoT's; M2M& System Management with Netconf-Yang; Developing Internet of Things Using Python; IoT Physical Devices & Case Studies Illustrating IoT Design

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Gain knowledge on

- o Building blocks of Internet of Things and characteristics.
- o Application areas of IoT
- o Concept of M2M (machine to machine) with necessary protocols

CO2: Analyze Domain specific IoT's, revolution of Internet in Mobile Devices.

CO3: Design and Develop Techniques for solutions to solve the problems in IoT using Python Scripting Language.

CO4: Conduct research on domain specific IoT's and IoT enabling Technologies.

CO5: Acquire knowledge to recognize the opportunities and contribute to collaborative-multidisciplinary Scientific Research.

**I M.Tech. (CN&IS) I Semester
 (16MT22508) SOFTWARE SECURITY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:

Courses on "Software Engineering," and "Network Security"

COURSE DESCRIPTION:

Importance of Security in Software - Security a Software Issue, Secure Software; Requirements Engineering for Secure Software; Security Principles in SDLC - Secure Software Architecture and Design, Secure Coding and Testing; Security and Complexity - System Assembly Challenges; Governance and Managing for more Secure Software.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Gain knowledge on security issues in:

- Requirement Engineering
- Architecture and Design
- Coding and Testing

CO2: Analyze complex software projects to describe security risks and mitigation techniques.

CO3: Applying methods to detect software security defects, SQUARE process model for requirement gathering and coding practices & security testing for identifying security failures.

CO4: Initiate research issues in code analysis techniques to improve software security.

**I M. Tech. (CN&IS) I-Semester
(16MT16331) COMPUTER NETWORKS & INFORMATION SECURITY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

Courses on "Computer Networks" and "Information Security"

COURSE DESCRIPTION:

Hands experience on Data Link Layer Farming Methods; Routing Algorithms; Implementation of DES, RSA; AES Algorithms, Secure Hash Algorithms and Digital Signature Standards.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Gain knowledge to implement

- Framing mechanisms for data link layer
- Shortest path routing algorithms
- Symmetric encryption algorithms- DES,AES and Asymmetric algorithm-RSA
- Secure Hash algorithms and digital signatures

CO2. Analyze the routing algorithms, Symmetric-key encryption and public-key encryption algorithms.

CO3. Develop the solutions to solve the problems in networks and information security systems.

CO4. Implement routing and encryption techniques using C or JAVA to provide solutions to the real world problems.

**M. Tech (CN&IS) I-Semester
(16MT16332) WEB TECHNOLOGIES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES:

Course on "Programming in C, and Java"

COURSE DESCRIPTION:

This course is hands-on and project-based; students will construct a substantial dynamic web application based on the concepts, technologies, and techniques presented during lecture.

COURSE OUTCOMES:

After completion of this course the students will be able to:

CO1. Gain knowledge in designing web pages using HTML, CSS, JS, PHP.

CO 2. Analyze the design problems in HTML Web pages with CSS

CO3. Design a dynamic webpage with HTML, CSS, Java Script, PHP concepts

CO4. Assess the HTML Website using XML Parsers

CO 5. Engage in lifelong learning by incorporating the best design practices.

**I M. Tech.(CN&IS) I-Semester
(16MT13808) RESEARCH METHODOLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --

COURSE DESCRIPTION:

Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types.

COURSE OUTCOMES: After completion of the course, students should be able to:

- CO1. Acquire in-depth knowledge on
 - Research design and conducting research
 - Various data collection methods
 - Statistical methods in research
 - Report writing techniques.

- CO2. Analyze various research design issues for conducting research in core or allied areas
- CO3. Formulate solutions for engineering problems by conducting research effectively in the core or allied areas
- CO4. Carryout literature survey and apply research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
- CO5. Select and Apply appropriate techniques and tools to complex engineering activities in their respective fields
- CO6. Write effective research reports.
- CO7. Develop attitude for lifelong learning to do research.
- CO8. Develop professional code of conduct and ethics of research.

**I M. Tech (CN&IS) II-Semester
(16MT20502) BIG DATA ANALYTICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Courses on "Data Base Management Systems" & "Data Warehousing and Data Mining"

COURSE DESCRIPTION:

Concepts of Big Data; Types of Data Elements; Introduction to Hadoop; Hadoop Ecosystems; MapReduce; Building Blocks of Hadoop; big data analytics applications; Predictive and Descriptive Analytics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1. Demonstrate in depth knowledge in

- Big data Characteristics
- Hadoop Framework
- MapReduce.
- Hadoop Release

CO2. Analyze and develop solutions for database systems for storing and analyzing the large data.

CO3. Apply Big Data Analytics for estimating the data sets to solve the real world problems

CO4. Design and model for an effective database by using big data tools.

CO5. Carry out research on predictive analysis and sentiment analysis.

CO5. Learning advance analytics techniques for effective Database monitoring.

**I M.Tech. (CNIS) II Semester
(16MT12501) CLOUD COMPUTING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:

Courses on "Operating Systems" and "Computer Networks"

COURSE DESCRIPTION:

Virtualization, Case studies – XEN, VMware, Microsoft Hyper-V; Cloud architecture; Services and Applications; Cloud Programming; Industry practices and Case studies –Amazon Web Services, Google App Engine, and Microsoft Azure.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1: Demonstrate knowledge on Virtualization models, Cloud Architecture, Services and Programming concepts.

CO2: Analyze the problems in existing cloud architectures.

CO3: Apply concurrent programming, throughput computing and Data intensive computing in Cloud programming.

CO4: Conduct research on emerging technologies in cloud and energy management in cloud

CO5: Apply virtualization techniques to optimize resource sharing.

**I M. Tech (CN&IS) II-Semester
(16MT26301) INTRUSION DETECTION SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

Courses on "Computer Networks" and "Network security"

COURSE DESCRIPTION:

Introduction to threats , attacks and intrusions; Network security monitoring and Sinkhole design; Traffic threat assessment and network incident response; Malicious bots and botnet construction; introduction to network forensics and Intrusion prevention systems(IPS) in host and network level.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1: Gain Knowledge on Intrusions, security monitoring, Network Forensic principles and Intrusion Prevention system (IPS).

CO2: Analyze the threats and vulnerabilities in the network traffic for designing the solutions.

CO3: Detect, identify and mitigate the security attacks from the network traffic to provide the solutions to the real word problems.

CO4: Conduct research to identify novel solutions for detecting and mitigation of Intrusions in public and private networks.

CO5: Gain exposure on IDS and IPs tools of Intrusion and Extrusion detection for NSM data collections.

**I M.Tech (CN&IS). II-Semester
(16MT26302) NETWORK PROGRAMMING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

Courses on "Computer Networks" and "Unix Programming"

COURSE DESCRIPTION:

Concepts of Unix Standards; Protocol Usage by common internet application; Elementary TCP Sockets; Handling server process termination; crashing and rebooting; IPV6socket options; Interface with UDP; Function and IPV6 support; I/O multiplexing IPC creating and opening channels, permissions; Terminal Modes, Remote login overview;

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Gain knowledge in

- Basic concepts of UNIX standards, networks and socket functions.
- TCP and UDP socket API and related functions.
- DNS and address conversions.
- I/O Multiplexing, IPC and RPC.

CO2: Analyze the key protocols that support the Internet and several common programming interfaces for network communication.

CO3: Solve I/O Multiplexing issues using TCP socket programming.

CO4: Design client server architecture by developing new TCP and UDP socket functions.

CO5: Apply appropriate techniques and tools to implement algorithms for modern network architectures.

**I M. Tech (CN&IS)– II Semester
(16MT26303) WIRELESS NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSE DESCRIPTION:

Queueing theory; Mobile Radio Propagation; Channel Coding and Error Control; Multiple Radio Access, Multiple Division Techniques For Traffic Channels; Ad Hoc Networks and Sensor Networks; Wireless LANs; PANs, BANs and MANs.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1. Acquire knowledge in physical layer, data link layer, network layer and transport layer of wireless networking models.
- CO2. Analyse the traffic theories, mobile radio propagation, channel coding, cellular concepts to measure the performance.
- CO3. Conduct research to develop routing protocols for MANETs to solve real world problems.
- CO4. Develop solution for complex problems using networking tools

**I M.Tech (CN&IS). II-Semester
(16MT10506) INFORMATION RETRIEVAL SYSTEMS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITE:

A Course on "Database Management Systems"

COURSE DESCRIPTION:

Concepts of Information retrieval Systems; Indexing and data structures; indexing, Document and term clustering; user search techniques; Text search algorithms, information system Evaluation;

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1 : Acquire knowledge in fundamental concepts of
 - Information Retrieval System capabilities
 - Data Structures
 - Indexing and Search Algorithms
- CO2: Analyze concepts of Database, Data Warehouses of real time applications related to Document Store, Document data warehouses, judicial, biomedical, scientific documents.
- CO3: Solve complex search problems like ranking , weighted ,software text searches by implementing A* Search, Zipf and Information retrieval frame work
- CO4: Initiate research to identify and develop algorithms for indexing, clustering and searching
- CO5: Create and apply online Information Retrieval Systems like search engines.

**I M. Tech. (CN&IS) II-Semester
(16MT26304) COMPUTER FORENSICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Information Security"

COURSE DESCRIPTION:

Concepts of computer forensic technologies and cybercrime; Evidence collection and data seizure; Initial Response and Forensic Duplication; Forensic Data Analysis and Validation; Processing crimes and incident scenes; Mobile Device Forensics, Network forensics and E-Mail Investigations

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

- CO1: Acquire knowledge in
 - Computer Forensic Fundamentals and Technologies
 - Evidence and Data Capture and Computer Forensic Analysis
 - Law Enforcement crime and incident scenes
- CO2: Analyze and validate forensic data related to mobile devices, E-Mails.
- CO3: Provide solutions for a wide range of forensic problems like attack on routers, E-Mail crimes.
- CO4: Conduct research and contribute in groups for the development of new forensics tools.
- CO5: Create and apply appropriate forensic tools, techniques to capture the evidence and investigate crimes

**I M Tech (CN&IS) II-Semester
(16MT26305)DATABASE SECURITY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A course on "Database Management Systems"

COURSE DESCRIPTION:

Explore database access controls; data obscurity and physical database security; Password Policies, Privileges; fraud detection through the use of audit tables & triggers and obscurity through the use of encryption; views & virtual private databases.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1: Acquire knowledge in

- Information System Security
- Design of Secure Databases.
- Database System Models and Applications.
- Need for database security architecture.

CO2: Analyze fundamental database security threats, vulnerabilities and associated risks.

CO3: Implement specific database security solutions that include: access controls, audit/control and obscurity (encryption, views, and VPDs) mechanisms.

CO4: Create database security architecture, database user roles using SQL Server

CO5: Conduct research on establishment of strong passwords and manage th resources through database audit/access controls.

CO6: Recognize database security issues, implementation methods to database security mechanisms and strategies in life- long learning.

**I M. Tech (CN&IS). II-Semester
(16MT26306)SOCIAL NETWORKS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	--	--	4

PRE-REQUISITES:

A Course on "Computer Networks"

COURSEDESCRIPTION:

Concepts of Tweet rank model; Rich Media Communications patterns; Data Pre-Processing; Challenges of DOSN; Web accessibility analysis; Collaborative tagging; Visualization and Applications of Social Networks

COURSE OUTCOMES:

CO1: Gain knowledge on

- Social Media Analysis
- Mining and Privacy.
- Visualization and Applications of Social Networks.

CO2: Analyze the mining techniques, social network Infrastructures and Communities.

CO3: Apply the Baye's Conditional Probabilities technique in the real world applications of social networks.

CO4: Initiate research to identify solutions for security and privacy in social networks.

CO4: Develop effective communication among peers in the area of Social Networks.

CO5: Acquire professional code of conduct and social responsibility to contribute for development of society.

**I M. Tech (CN&IS) – II Semester
(16MT20531) CLOUD COMPUTING & BIG DATA ANALYTICS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	4	2

PRE-REQUISITES:

Course on "Cloud Computing" and "Operating Systems"

COURSE DESCRIPTION:

Hands-on experience on creating Virtual machines on Windows and Linux platforms, Development of Service based web applications & their deployment and Mobile app development, Designing and implementing Hadoop cluster.

COURSE OUTCOMES:

After successful completion of this course , students will be able to:

- CO1: Demonstrate hands-on experience on Virtualization models, Cloud Environment and Hadoop cluster setup.
- CO2: Analyze the given experiment and measure the performance of services and datasets.
- CO3: Apply API development skills in web applications for Cloud deployment and develop solutions for real time applications using Hadoop.
- CO4: Devise virtual environments based on virtualization techniques and processing huge amount of data using Big data tools
- CO5: Develop written and oral communications in preparing and presenting reports.

**I M. Tech. (CN&IS) -II Semester
(16MT26331) WIRELESS NETWORKS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PRE-REQUISITES:--**COURSE DESCRIPTION:**

This course introduces hands-on experience in designing and implementing wireless networking models.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

- CO1. Gain practical knowledge on wireless network simulation.
- CO2. Analyze performance measures of multi-hop wireless network models.
- CO3. Design wireless networking models and validate networking protocols.
- CO4. Compare and Contrast performance measures of new networking models.
- CO5. Develop simulation models for wireless networking by using QUALNET.

**I M. Tech. (CN&IS)-II Semester
(16MT26332) SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PRE-REQUISITES:--**COURSE DESCRIPTION:**

Identification of seminar topic; literature survey; preparation of technical report and presentation:

COURSE OUTCOMES:

On successful completion of this course, the students will be able to

- CO1. Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
- CO2. Extract information pertinent to the topic through literature survey.
- CO3. Comprehend extracted information through analysis and synthesis critically on the topic.
- CO4. Plan, organize, prepare and present effective written and oral technical report on the topic.
- CO5. Adapt to independent and reflective learning for sustainable professional growth in Computer networks & information Security.
- CO6. Contribute to multidisciplinary scientific work in the field of Computer networks & information Security
- CO7. Understand ethical responsibility towards environment and society in the field of Computer networks & information Security.
- CO8. Engage in lifelong learning for development of technical competence in the field of Computer Networks & information Security

M. Tech. – II Semester (CN&IS)
(16MT23810) INTELLECTUAL PROPERTY RIGHTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-		-	2	-	-

PRE-REQUISITES: --

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. Demonstrate in-depth knowledge on

- Intellectual Property
- Trade Marks & Secrets
- Law of Copy Rights, Patents
- New development of Intellectual Property

CO2. Analyze the different forms of infringement of intellectual property rights.

CO3. Solve problems pertaining to Intellectual Property Rights.

CO4. Stimulate research zeal for patenting of an idea or product.

CO5. Write effective reports required for filing patents.

CO6. Develop life-long learning capabilities.

CO7. Develop awareness of the relevance and impact of IP Law on their academic and professional lives.

CO8. Develop attitude for reflective learning.

M. Tech. (CNIS)-III & IV Semesters
(16MT36331 & 16MT46331) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	--	--	--	28

PRE-REQUISITES: --

COURSE DESCRIPTION:

Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

CO1. Demonstrate capacity to identify an advanced topic for project work in core and allied areas.

CO2. Extract information pertinent to the topic through literature survey.

CO3. Comprehend extracted information through analysis and synthesis critically on the topic.

CO4. Solve engineering problems pertinent to the chosen topic for feasible solutions.

CO5. Use the techniques, skills and modern engineering tools necessary for project work.

CO6. Do time and cost analysis on the project.

CO7. Plan, prepare and present effective written and oral technical report on the topic.

CO8. Adapt to independent and reflective learning for sustainable professional growth.

CO9. Contribute to multidisciplinary scientific working the field of Computer Networks & Information Security

CO10. Understand ethical responsibility towards environment and society in the field of Computer Networks & Information Security.

CO11. Engage lifelong learning for development of technical competence in the field of Computer Networks & Information Security.

Program: M.Tech. SOFTWARE ENGINEERING

M.Tech. I Semester

(16MT12501) CLOUD COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on “Operating Systems” and “Computer Networks”

COURSE DESCRIPTION: Virtualization, Case studies – XEN, VMware, Microsoft Hyper-V; Cloud architecture; Services and Applications; Cloud Programming; Industry practices and Case studies –Amazon Web Services, Google App Engine, and Microsoft Azure.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate knowledge on Virtualization models, Cloud Architecture, Services and Programming concepts.
2. Analyze the problems in existing cloud architectures.
3. Apply concurrent programming, throughput computing and Data intensive computing in Cloud programming.
4. Develop research insights into emerging technologies and energy management.
5. Apply virtualization techniques to optimize resource sharing.

M.Tech. I Semester

(16MT12502) DATA STRUCTURES AND ALGORITHMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Computer Programming”.

COURSE DESCRIPTION:

Introduction to Data Structures and Algorithms; Searching and Sorting; Trees and Graphs; Divide and Conquer; Greedy method; Dynamic Programming, Back Tracking; Branch and Bound.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1. Gain knowledge on:
- Linear data structures including Stack, Queue and Linked Lists and Non-linear data structures like Trees and Graphs.
 - Divide and Conquer Method, Greedy Method, Dynamic Programming, Backtracking and Branch & Bound algorithms.
- CO2. Analyze the efficiency of algorithms using space and time complexities.
- CO3. Apply algorithm design techniques in providing solutions to real world problems.
- CO4. Apply Dynamic programming techniques to provide software solutions.

M.Tech. (SE) I Semester

(16MT12503) SOFTWARE DEVELOPMENT METHODOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Software Engineering”.

COURSE DESCRIPTION: Introduction-Software Process; Software Requirements and Analysis; Software Design; Software Implementation- Implementation Issues, Modern Programming Language Features; Software Testing and Maintenance.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate in depth knowledge on:
 - Software Paradigms, Agile Development, Software Reuse, and Testing
2. Perform requirements analysis and build requirements model.
3. Apply advanced software engineering methods in software development life cycle.

M.Tech. (SE) I Semester

(16MT12504) SOFTWARE MEASUREMENT AND METRICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Software measurement theory; Models of software engineering measurement; Software products metrics, software process metrics; Measuring & management and Software quality metrics.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge in:
 - Data collection and measures.
 - Product attributes
 - Software quality and Object oriented metrics.
2. Gain skills in analyzing what to measure and complexity assessment in software development.
3. Initiate research to improve Software Estimation and Quality in software development.
4. Apply OO metric tools for software measurement.
5. Apply project cost calculation procedures in software development.

M.Tech. (SE) I Semester

(16MT12505) SOFTWARE REQUIREMENTS AND ESTIMATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Software Engineering," and "Object Oriented Analysis & Design".

COURSE DESCRIPTION:

Introduction- Software requirements and risk management, Software Requirements Engineering; Requirements management, Software Requirements Modeling; Software Estimation, Size Estimation; Effort, Schedule and Cost Estimation; Requirements Management Tools, Software Estimation Tools.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on:
 - Requirements Engineering and Management
 - Estimation of software - size, effort, schedule and cost.
2. Analyze the problems in estimation & factors influencing estimation and build traceability matrix, links in requirement chain.
3. Solve size and cost estimation for software development using COCOMO II, Putnam Estimation and Algorithmic models.
4. Apply requirement management and estimation tools for software development.

5. Gain the understanding of the requirements engineering and management principles for effective software implementation.

M.Tech. (SE) I Semester

(16MT12506) DISTRIBUTED DATABASES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management Systems" and "Computer Networks"

COURSE DESCRIPTION: Distributed Databases Overview & Distributed Database Design; Translation of Global Queries to Fragment Queries, Optimization of Access Strategies; Management of Distributed Transactions, Distributed Database administration; Concurrency, Reliability; Case studies.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on query processing and optimization.
2. Gain analytical skills to implement distributed and parallel databases.
3. Initiate research in advanced Query Optimization, authorization and protection in database.
4. Apply transaction management techniques in distributed environment.

M.Tech. (SE) I Semester

(16MT12507) MACHINE LEARNING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: --Nil--

COURSE DESCRIPTION: Machine learning fundamentals, applications; Multivariate methods, Bayesian networks, Decision tree learning; Support Vector Machines, Statistical learning methods, Unsupervised learning; Kernel Machines; Combining Multiple Learners and Reinforcement learning.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on supervised, unsupervised, and reinforcement machine learning techniques.
2. Solve real-life problems using Multivariate Methods, Decision Trees, Kernel Machines and Combining Multiple Learners.
3. Initiate research in pattern recognition, classification and clustering techniques.

M.Tech. (SE) I Semester

(16MT12508) SOFTWARE RELIABILITY AND REUSE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Software Engineering" and "Probability and Statistics".

COURSE DESCRIPTION: Software reliability engineering process, Software reliability strategies, availability; Software reliability modeling; Software metrics for reliability assessment; Best practice of software reliability engineering, and neural networks for software reliability, software system failures, free software intensive system and reusable components.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to:

1. Gain knowledge on:
 - Software Reliability Modeling.
 - Software metrics for Reliability Assessment.
 - Software Reliability Estimation.
 - Best practices of Software Reliability Engineering.
2. Analyze software system failures and operational profile.
3. Solve Software system reliability issues using optimum reliability models.
4. Initiate research in producing failure free software intensive system.
5. Apply advanced methods to analyze complex legacy software systems and identify reusable components.

M.Tech. (SE) I Semester

(16MT12509) USER INTERFACE DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Software Development Methodologies”

COURSE DESCRIPTION: Characteristics & principles of User Interface Design; Requirement analysis-direct & indirect methods; Design- using Formatting menus & windows; Design-using Text boxes, multimedia and Windows layout.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain the knowledge on concepts of user interfaces and related business functions.
2. Analyze user requirements necessary for UI development.
3. Design interfaces using appropriate menus, windows, interfaces.
4. Solve real world problems by applying theoretical user interface concepts.
5. Usage and customize of advanced tools for various window layouts in project management and development of UI computing systems.

M.Tech. (SE) I Semester

(16MT12531) ADVANCED SOFTWARE ENGINEERING LAB-1

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITES: Courses on “Software Development Methodologies”, “Software Requirements and Estimation”, Data Structures and Algorithms” and “Object Oriented Analysis & Design”

COURSE DESCRIPTION: Software development life cycle activities- requirements specification using open source Requirement documentation tool, modeling using AgroUML tool; Implementation of various linear and non-linear data structures using C++; Refactoring using InsRefactor and SafeRefactor Eclipse Plugins.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate hands-on experience on:
 - Requirements Engineering and Management
 - Estimation of software-size, effort, schedule and cost.
2. Identify key entities and relationships in the problem domain and write succinct textual descriptions of problems, modeling and Implement linear and non-linear data structures using C++.
3. Identify and apply designing, estimating tools and methodologies for complex engineering problems.
4. Apply algorithm design approaches and C++ programming skills to solve real world applications.
5. Work individually and in teams collaboratively in implementing mini projects.
6. Demonstrate communication skills both oral and written for preparing and presenting reports.

- Engage in life-long learning and enthusiasm to upgrade knowledge and skills in latest technologies and tools.

M.Tech. I Semester

(16MT12532) CLOUD COMPUTING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITES: Courses on “Cloud Computing” and “Operating Systems”.

COURSE DESCRIPTION: Hands-on experience on creating Virtual machines on Windows and Linux platforms, Development of Service based web applications & their deployment and Mobile app development.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- Gain hands-on experience on Virtualization models and Cloud Environment.
- Analyze the given experiment and relate to existing architectures.
- Apply API development skills in web applications for Cloud deployment.
- Initiate research to develop novel Service based web solutions.
- Gain knowledge on investigative approach and identify suitable Cloud platforms for SOA based problems.
- Devise virtual environments based on virtualization techniques.
- Develop written and oral communications in preparing and presenting reports

M.Tech. (SE) I Semester

(16MT13808) RESEARCH METHODOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --

COURSE DESCRIPTION: Overview of Research, research problem and design, various research designs, data collection methods, statistical methods for research, importance of research reports and its types.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- Acquire in-depth knowledge on
 - Research design and conducting research
 - Various data collection methods
 - Statistical methods in research
 - Report writing techniques.
- Analyze various research design issues for conducting research in core or allied areas.
- Formulate solutions for engineering problems by conducting research effectively in the core or allied areas.
- Carryout literature survey and apply research methodologies for the development of scientific/technological knowledge in one or more domains of engineering.
- Select and Apply appropriate techniques and tools to complex engineering activities in their respective fields.
- Write effective research reports.
- Develop attitude for lifelong learning to do research.
- Develop professional code of conduct and ethics of research.

M.Tech. (SE) II Semester
(16MT22501) BIG DATA TECHNOLOGIES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management Systems, Data Warehousing and Data Mining"

COURSE DESCRIPTION: Fundamentals of Big Data; Data-parallel programming model- Hadoop, Hadoop I/O; MapReduce features, HDFS; Hive, HBase, Zookeeper; Sqoop and Case studies.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on Big Data storage, processing, querying and reporting.
2. Analyze complex analytical problems to provide optimal solutions.
3. Apply Big Data Technologies to solve real-world problems.
4. Initiate research using HDFS and MapReduce programming model for the implementation of parallelism.
5. Apply various Big Data tools: Sqoop, HBase, MapReduce and Mahout for data analytics.

M.Tech. (SE) II Semester
(16MT22502) SERVICE ORIENTED ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Software Engineering" and "Web Technologies"

COURSE DESCRIPTION: Introduction to SOA, Web services & Primitive SOA, Contemporary SOA, Principles of SOA, Service Layers, Delivery strategies, Service Modeling, Service and Business process design- Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL), and Web Services- Business Process Execution Language (WS-BPEL), SOA support in .NET and J2EE.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on:
 - Fundamentals of web services
 - Development strategies, Principles, Services, Layers and characteristics of service orientation.
2. Analyze complex business process critically in identifying appropriate service model logic.
3. Solve real time problems related to design the Web Services using XML Schema, WSDL, SOAP and BPEL.
4. Initiate research using XML Schema, WSDL, SOAP, BPEL and Service Oriented Enterprise model.
5. Apply the modern tools and techniques of .NET and J2EE to modeling the web services.

M.Tech. (SE) II Semester
(16MT22503) SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Software Development Methodologies," and "Object Oriented Programming".

COURSE DESCRIPTION: Envisioning Architecture - Software Architecture, Pattern System; Creating Architecture – Understanding the Requirements, Designing the Architecture, Documenting Software Architectures, Reconstructing Software Architectures; Analyzing Architectures and moving from one system to many – Evaluating the Architecture; Introduction to Design Patterns and Creational Patterns; Structural and behavioral patterns.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on:
 - Software architecture styles and business life cycle.
 - Various design issues and patterns.
2. Analyze and identify architectural styles and patterns to solve software design problems.
3. Solve Software Architecture design problems using design patterns.
4. Apply appropriate novel software pattern to solve real world problems in object oriented software design process

M.Tech. II Semester**(16MT22504) SOFTWARE TESTING TECHNIQUES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Software Development Methodologies”.

COURSE DESCRIPTION: Basic concepts of Software Testing; Testing Techniques – Levels of Testing; Testing Process – Test Planning; Test Metrics and Reports; Software Test Automation.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on the Software Testing types and Process for different programming environments.
2. Analyze and apply the appropriate testing techniques suitable for testing the software.
3. Design and apply appropriate strategies for selecting test cases to meet requirements of the product.
4. Apply efficient modern software testing tools for automation.
5. Write test cases and perform defect reporting.

M.Tech. II Semester**(16MT22505) WEB TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Object Oriented Programming”.

COURSE DESCRIPTION: Web Technologies: HTML5, CSS, JavaScript, JQuery; Open source server-side scripting language- PHP; MySQL database concepts; and AJAX.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1:** Gain knowledge on web technologies.
- CO2:** Analyze the functionality of client as well as server side web technologies for validating web pages.
- CO3:** Gain programming skills to design and develop novel web applications
- CO4:** Apply web technologies to make web pages more interactive, scalable and user friendly web applications.

M.Tech. (SE) II Semester
(16MT10502) ADVANCED DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Database Management Systems".

COURSE DESCRIPTION: Concepts of Database System Concepts and Architectures, Data modeling using ER-Model;SQL, Objects Relational Database and XML, Database Design and File Organizations, Query Processing, Concurrency and Recovery, Distributed DBMS Architecture and Design.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain Advanced knowledge in:
 - Database System Concepts , Languages , Interfaces and Architectures
 - Query Languages , Relational Databases and XML
 - Database Design and File Organization.
 - Query Processing and Recovery
 - Distributed Database Architecture and Design
2. Analyze database management architecture and categorize languages and database objects.
3. Design a wide range of potential solutions for the database problems using ER-diagrams, SQL, Normalization and XML.
4. Apply higher order skill and contribute for the development of technical knowledge to solve the problems innovatively.
5. Apply appropriate modern techniques, resources and tools for the real world problems in databases.

M.Tech. (SE) II Semester
(16MT22506) SOFTWARE PROCESS AND PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Software Engineering"

COURSE DESCRIPTION: Software Process Maturity Levels-Initial and the repeatable process, The Defined Process, The Managed Process and the Optimizing Process; Software management Renaissance, Software Management Disciplines and Framework, Next Generation Software Economics and Case Studies.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on:
 - Software process maturity levels and activities
 - Software project management strategies
2. Perform analysis of project management techniques for deploying software systems quickly.
3. Apply the skills to solve problems in modern software process and project management.
4. Conduct research to improve software process and project Controlling activities.
5. Apply software process management techniques to measure the quality of the software.
6. Learn how to optimize software project cost and schedule estimation techniques

M.Tech. (SE) II Semester
(16MT22507) SOFTWARE REVERSE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Software Engineering," and "Object Oriented Concepts".

COURSE DESCRIPTION: Foundations – Software Reverse Engineering, Applications and Tools, Low level software; Reverse Engineering Tools and applied Reversing; Object Flow Graph, Class and Object diagrams; Interaction, State and Package diagrams; Reversing Malware and Anti-reversing Techniques.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain knowledge on:
 - Finding malicious code.
 - Discovering unexpected flaws and faults.
 - Finding the use of others code.
 - Learning from others products of a different domain or purpose.
2. Analyze Software System and discover new opportunities for improving existing system.
3. Apply Anti-reversing techniques for Code obfuscation.
4. Design and develop Object Flow Graph, UML diagrams necessary for code reversing.
5. Apply Disassemblers, Debuggers and Decompilations tools and algorithms to implementing Reverse Engineering.
6. Exhibit ethical attitude in software reverse engineering.

M.Tech. II Semester
(16MT22508) SOFTWARE SECURITY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Software Engineering," and "Network Security".

COURSE DESCRIPTION: Importance of Security in Software - Security a Software Issue, Secure Software; Requirements Engineering for Secure Software; Security Principles in SDLC - Secure Software Architecture and Design, Secure Coding and Testing; Security and Complexity - System Assembly Challenges; Governance and Managing for more Secure Software.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- CO1: Gain knowledge on security issues in:
- Requirement Engineering
 - Architecture and Design
 - Coding and Testing
- CO2: Analyze complex software projects to describe security risks and mitigation techniques.
- CO3: Applying methods to detect software security defects, SQUARE process model for requirement gathering and coding practices & security testing for identifying security failures.
- CO4: Initiate research issues in code analysis techniques to improve software security.

M.Tech. (SE) II Semester
(16MT22531) ADVANCED SOFTWARE ENGINEERING LAB-2

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITES: Courses on “Software Development Methodology” and “Object Oriented Programming”

COURSE DESCRIPTION: Software development life cycle activities- Implementation of design patterns using enterprise architect; Creation of web service client; Implementation of Orchestration with BPEL; Test plan document; Regression testing, functional testing using QTP, RFT and Selenium; Performance testing using Load Runner, RPT and Web Performance Tool.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain hands-on experience on:
 - Web services
 - Design issues and patterns
2. Analyze software design problems, complex business process and identify architectural styles, patterns and appropriate service model logic to solve.
3. Gain software testing skills and practical experience by conducting software testing processes.
4. Apply various testing phases and automate testing process for the given application using Software Engineering concepts and practices to:
 - i. Identify customer's needs.
 - ii. Evaluate system for feasibility.
 - iii. Perform economic and technical analysis.
 - iv. Allocate functions to system elements.
 - v. Establish schedule, constraints and estimate cost.
 - vi. Create system definitions.
5. Apply QTP and RFT tools for automation testing of software process.
6. Work individually and in teams collaboratively in implementing mini projects.
7. Gain communication skills both oral and written for preparing and presenting reports.

M.Tech. (SE) II Semester
(16MT22532) BIG DATA TECHNOLOGIES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	4	2

PREREQUISITES: Courses on “Database Management Systems”, “Data Mining and Data Warehousing”, and “Big Data Technologies”.

COURSE DESCRIPTION: Hands on Java Programs; Data-parallel programming model- Hadoop, Hadoop I/O; MapReduce features, HDFS; Hive, HBase, Zookeeper; Sqoop and Case studies.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Gain hands-on experience on:
 - Map-Reduce, Sqoop, HBase and Mahout
2. Apply Big Data Technologies to solve contemporary problems
3. Gain skills on HDFS and MapReduce programming model concepts.
4. Initiate research insights into latest technologies of Big Data Analytics.
5. Apply various Big Data tools: Sqoop, HBase, MapReduce and Mahout.
6. Work individually and in teams collaboratively in implementing mini projects.
7. Demonstrate communication skills both oral and written for preparing and presenting reports.

M. Tech. (SE) – II Semester
(16MT22533) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PRE-REQUISITES: -Nil-

COURSE DESCRIPTION: Identification of seminar topic; literature survey; preparation of technical report and presentation.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.
4. Plan, organize, prepare and present effective written and oral technical report on the topic.
5. Adapt to independent and reflective learning for sustainable professional growth in Software Engineering.
6. Contribute to multidisciplinary scientific work in the field of Software Engineering.
7. Understand ethical responsibility towards environment and society in the field of Software Engineering.
8. Engage in lifelong learning for development of technical competence in the field of Software Engineering.

M.Tech. (SE) II Semester
(16MT23810) INTELLECTUAL PROPERTY RIGHTS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	2	-	-

PREREQUISITES: --

COURSE DESCRIPTION: Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate in-depth knowledge on
 - Intellectual Property
 - Trade Marks & Secrets
 - Law of Copy Rights, Patents
 - New development of Intellectual Property
2. Analyze the different forms of infringement of intellectual property rights.
3. Solve problems pertaining to Intellectual Property Rights.
4. Stimulate research zeal for patenting of an idea or product.
5. Write effective reports required for filing patents.
6. Develop life-long learning capabilities.
7. Develop awareness of the relevance and impact of IP Law on their academic and professional lives.
8. Develop attitude for reflective learning.

M. Tech. (SE) – III & IV Semesters
(16MT32531 & 16MT42531) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
200	200	400	--	--	--	28

PRE-REQUISITES: -Nil-

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Writing of thesis and presentation.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

1. Demonstrate capacity to identify an advanced topic for project work in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend extracted information through analysis and synthesis critically on the topic.
4. Solve engineering problems pertinent to the chosen topic for feasible solutions.
5. Use the techniques, skills and modern engineering tools necessary for project work.
6. Do time and cost analysis on the project.
7. Plan, prepare and present effective written and oral technical report on the topic.
8. Adapt to independent and reflective learning for sustainable professional growth.
9. Contribute to multidisciplinary scientific work in the field of Software Engineering.
10. Understand ethical responsibility towards environment and society in the field of Software Engineering.
11. Engage lifelong learning for development of technical competence in the field of Software Engineering.

MCA I - SEMESTER

(16MC1HS01) ACCOUNTING AND FINANCIAL MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE: —

COURSE DESCRIPTION:

General accounting principles; Computerized Accounting; Financial Management; Break Even Analysis and Capital Budgeting; Financial Statements.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate Knowledge in:

- Basic Principles and concepts of Financial Accountancy.
- Basic concepts of Financial Management.

CO2. Develop skills in:

- Managerial decision making of an organization.
- Practice of Financial Accounting and Financial Management.

CO3. Ascertain the profitability and soundness of the organization.

CO4. Analyze and synthesize financial information to provide valid conclusions.

MCA I - SEMESTER

(16MC1BS01) MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION:

Mathematical logic and predicates, functions and relations; algebraic structures; mathematical reasoning; recurrence relations; graphs and trees.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Gain knowledge in

- Mathematical concepts
- Mathematical logic
- Programming languages
- Discrete mathematical structures
- Recurrence relations and
- Graph theory

CO2. Formulate Complex Computing problems with substantial conclusions using:

- Mathematical reasoning
- Recurrence relations and
- Graph theory

CO3. Design and develop mathematical models in Computer Science for real time problems/ business applications.

CO4. Express statements with the precision of formal logic and synthesize arguments to test their validity and prove a given statement using mathematical induction or using direct and indirect methods.

CO5. Apply the principles of discrete mathematical Structures to solve complex Application Software.

MCA I - SEMESTER

(16MC10101) COMPUTER ORGANIZATION

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES:—

COURSE DESCRIPTION: Representation of data types used in digital computers; implementation of types of codes; construction of logical circuits by using logic gates; representation of types of instructions, instruction formats; description of the complete computer; representation of memory organization and input-output organization.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Understand the basic components of a system that optimizes resources:

- Processor
- Memories
- Input/output and Organization

CO2. Solve arithmetic operations on different types of number systems.

CO3. Design the system that must be cost effective with respect to the business needs.

CO4. Synthesize the system that can face new technical challenges.

CO5. Select an innovative system that works with diverse environments.

MCA I - SEMESTER

(16MC10102) OPERATING SYSTEMS

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES:—

COURSE DESCRIPTION: Design and implementation of operating system structure; Evaluation of Multithreading and CPU scheduling algorithms; Solving deadlocks and synchronization problems ; Implementation of memory management techniques; security threats ;

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Explore knowledge in-

- Operating system structure
- Process scheduling
- Process and thread synchronization

CO2. Analyze the performance of-

- CPU scheduling algorithms
- Page replacement Algorithms and
- Deadlocks

CO3. Design and implement software solutions for process and memory management.

CO4. Compare and contrast paging techniques using virtual memory.

CO5. Evaluate the key trade-offs between multiple approaches of operating system design.

CO6. Communicate effectively with operating system through application programs.

MCA I-SEMESTER

(16MC10103) PROGRAMMING in C

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION:

Computer systems and Environments; Analysis and Efficiency of algorithms done with problem solving approaches; basic elements of C and data types; working with conditional and unconditional statements along with iterations; Handling strings and derived data types using modular programming; Handling files and dealing with preprocess directives; Command line argument and its usage; develop programs to solve real world problems.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Exhibit knowledge in

- C Tokens
- Input/output Formatting styles
- Control statements
- Data types
- Dynamic allocation functions
- Preprocess Directives

CO2. Analyze the efficiency of algorithms to solve computational problems using top down approach.

CO3. Design and develop the solutions using the techniques-parameter passing mechanism, command line arguments and recursion for real world problems.

CO4. Implement the concepts of modular programming language which includes functions, pointers and structures to solve complex problems.

CO5. Adapt preprocess directives, sequential and random access to text/binary files for persistent data storage for real world applications using Turbo C.

CO6. Engage lifelong learning and develop programming competency.

MCA I - SEMESTER

(16MC1HS31) ENGLISH LANGUAGE LABORATORY

Int. Marks	Ext. Marks	Total Marks
50	50	100

L	T	P	C
-	-	3	2

PREREQUISITES: English at Under Graduation level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in

- Phonetics
- Information Transfer

CO2. Analyse the functional knowledge in

- Vocabulary
- Grammar

CO3. Design and develop functional skills for professional practice.

CO4. Apply the techniques of Listening and Reading skills to comprehend listening and Reading comprehension.

CO5. Function effectively as an individual and as a member in diverse teams to demonstrate

- Just A Minute
- Role Play

- CO6. Communicate effectively in public speaking in formal and informal situations.
- CO7. Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

MCA I - SEMESTER

(16MC10131) IT LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: —

COURSE DESCRIPTION: Peripherals of a computer and disassembling & assembling the PC; Linux file system and File handling utilities & Text processing utilities; Productivity tools including Word, Excel, Power Point, Access, publisher.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Acquire skills in:
- Identification of Functional parts of PC
 - Operating Systems
- CO2. Identify the appropriate features to design documents, excel spread sheets and power point presentations.
- CO3. Design documents, excel spread sheets, power point presentations, Access database and personal websites effectively.
- CO4. Update knowledge and skills in PC maintenance and usage of latest Operating Systems and MS-Office.
- CO5. Practice of ethical code of conduct in the usage of computer hardware and software.
- CO6. Engage in life-long learning and attitude to work in teams.
- CO7. Work together to customize the existing tools.

MCA I - SEMESTER

(16MC10132) PROGRAMMING IN C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "Programming in C".

COURSE DESCRIPTION: Program design and problem solving using the C programming language; Programming topics include control structures, functions, arrays, Strings, pointers, and file I/O and the usage of the preprocessor.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Solve problems using knowledge in
- C Tokens
 - Input/output Formatting styles
 - Control statements
 - Data types
- CO2. Design and develop the solutions using the techniques-parameter passing mechanism, command line arguments and handling files for real world problems making use of analysis of algorithms and verification.
- CO3. Demonstrate the concepts of C as modular programming language which includes functions, pointers and structures to solve real world complex problems.
- CO4. Engage lifelong learning and develop programming competency.

MCA II - SEMESTER

(16MC2BS01) PROBABILITY AND STATISTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:—

COURSE DESCRIPTION: Fundamental concepts of Probability; probability distributions; random variables; sampling, correlation and regression analysis; statistical quality control; testing of hypothesis.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Acquire knowledge of probability and probability distributions, random variables, sampling, testing of hypothesis, correlation and regression analysis and statistical quality control.
- CO2. Identify the association between variables using Correlation and Regression Analysis.
- CO3. Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance.
- CO4. Use testing of hypothesis for drawing valid inferences in research problems and making decisions in industry.
- CO5. Adapt and apply theorems and probability distributions to compute solutions based on practical situations.
- CO6. Assess the quality of the products produced in an industry using control charts.

MCA II-Semester

(16MC20101) DATABASE MANAGEMENT SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION: Concepts of relational database and its design; Representation of ER diagram to Relational model; SQL queries; Normal forms; Recovery and concurrency control mechanism, Storage and indexing mechanism.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Gain in-depth knowledge in
 - Database models and database architecture
 - Transaction processing and recovery management
 - Storage and Indexing mechanism
- CO2. Analyze the complex problems of real world applications.
- CO3. Design Relational Database Schema for a given Entity Relationship model.
- CO4. Interpret the data by applying normalization techniques for the development of database application projects.
- CO5. Use Structured Query Language DDL/DML/DCL commands to solve real time applications.

MCA II-SEMESTER

(16MC20102) DATA STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Programming in C".

COURSE DESCRIPTION: Writing Pseudo code using algorithms for implementing Abstract Data Type; Implementation of Stack, Queue, LIST, Graph, Tree ADT's and its applications; Implementation of Sorting and Searching techniques; Implementation of Binary Search Tree ADT, AVL- height balanced trees and its applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Gain knowledge in linear and non-linear data structures to solve computing problems.
- CO2. Identify and analyze the usage of various data structures, operations and associated algorithms.
- CO3. Design and develop variety of algorithms and programs in order to solve computing problems.
- CO4. Choose the appropriate data structure and algorithm design method to get an optimal solution for complex real world problem.
- CO5. Apply searching, sorting, tree traversal and graph traversal techniques to optimize the complexities of an application.
- CO6. Communicate effectively about complex computing activities by writing documentation.

MCA II-SEMESTER

(16MC20103) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Programming in C".

COURSE DESCRIPTION: Basic Principles of Object Oriented Programming, Representation of Java Classes and methods; Inheritance and Polymorphism using Java, Creation of Packages and Interfaces; Implementation of Utility Classes and Input/output; Exception handling mechanism and multithreading; Event handling techniques and GUI applications by using AWT and Swings.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Understand the usage of Object-Oriented Principles.
- CO2. Analyze to solve real world problems by using Java Programming language.
- CO3. Develop and execute various GUI Applications using AWT and Swings.
- CO4. Adapt and design applications using Java IDE tools.
- CO5. Recognize the need to engage independent learning for continual development as an application professional.
- CO6. Communicate effectively about complex computing activities by writing documentation.

MCA II-SEMESTER

(16MC20104) SOFTWARE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES:- -

COURSE DESCRIPTION: Software engineering core principles process models and agile process; design concepts and design issues; quality management principles; software configuration and product metrics; project estimation and risk management maintenance.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Understand concepts-process, models, methodologies and principles of software engineering.
- CO2. Identify and classify user requirements and software requirement specification.

- CO3. Analyze the architecture and Design application software using design engineering principles.
- CO4. Estimate and maintain software configuration management by synthesis of development process to provide valid conclusions.
- CO5. Apply risk and metrics management principles for quality assurance.
- CO6. Test and communicate quality of an application and as per needs of the stakeholder.

MCA - II Semester

(16MC20131) DATABASE MANAGEMENT SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on "Database Management Systems".

COURSE DESCRIPTION: Analyze problems and design of ER diagrams; Creation of Data Definition commands; Normalization techniques; Implementation of functions; Creation of Views, Indexes and Sequences; Implementation of simple and complex queries using Oracle SQL; Creation of packages and triggers.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Impart knowledge in applying normalization techniques for development of application software to realistic problems.
- CO2. Formulate queries using SQL DDL/DML/DCL commands.
- CO3. Design a database using ER diagrams, convert ER diagrams into relation schemas.
- CO4. Improve the database performance by optimizing the queries using Indexing and Hashing techniques.
- CO5. Exploit their knowledge in developing database applications using SQL language.

MCA - II SEMESTER

(16MC20132) DATA STRUCTURES THROUGH C LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on "Programming in C Lab" and "Data Structures".

COURSE DESCRIPTION

Implementing logical and physical representation of data, complexity and their efficiency. Implementing linked lists and their different variations, queues, stacks and their applications; tree structures and their different variations; Solving problems using graphs, sorting and searching techniques.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Apply abstract data type and their basic usability in different applications through C programming language.
- CO2. Identify and analyze suitable data structures to solve computing problems.
- CO3. Design and develop variety of c programs using data structures in order to solve computing problems.
- CO4. Choose the appropriate data structure and algorithm design method to get an optimal solution for complex real world problem.
- CO5. Apply searching, sorting, tree traversal and graph traversal techniques to optimize the complexities of an application.

CO6. Work together or as an individual to customize the applications.

MCA II-SEMESTER

(16MC20133) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on "Programming in C Lab" and "Object oriented Programming through JAVA".

COURSE DESCRIPTION: Implementation of recursive and non recursive functions; Usage of StringTokenizer class; Implementation of method overloading; Basic String Operations; Creation of package and Interfaces; Handling predefined and user defined exceptions; Creation of File and its Operations; Implementation of multithreading; Creating and testing Applets; Usage of Event handling techniques and GUI applications by using AWT and Swings.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Understand the basic concepts and structure of a Java Program.
- CO2. Analyze to solve real world problems by using Java Programming language.
- CO3. Develop and execute various GUI Applications using AWT and Swings.
- CO4. Adopt and design applications using Java IDEs tools.
- CO5. Recognize the need to engage independent learning for continual development as an application professional.
- CO6. Work together to customize the existing applications.

MCA -III Semester

(16MC3HS01) ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE REQUISITE: —

COURSE DESCRIPTION : Managements; Functions of Management; Elements of Corporate Planning Process; Environmental Analysis; Management of Change; Organizational Behavior; Individual Behavior; Concepts of Personality; Perception; Learning; HRM; Human Resource Planning; Job Design and Job Design; Recruitment; Selection; Training; BPO.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on managing behavior in an organization.
- CO2. Develop requisite skills for:
- CO3. Effective Human Resource Management.
- CO4. Optimum utilization of Human Resource.
- CO5. Develops effective communication among the work group of an organization.
- CO6. Provide life-long learning for effective operation of an organization.

MCA III-Semester

(16MC3BS01) OPERATIONS RESEARCH

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION: Operations research techniques; Linear Programming Problems; Transportation problem; Assignment problem; sequencing problem; Replacement problem; Inventory models; simulation models and PERT/CPM in project management.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Linear Programming Problem
- Utilization of Resources
- Transportation Problem, Assignment Problem, sequencing problem and replacement problem
- Inventory models PERT/CPM and
- Simulation

CO2. Analyze literature and solve complex computational problems using Linear Programming Problem (LPP) techniques.

CO3. Design and solve problems using LPP models, Transportation Problem, Assignment Problem, Sequencing Problem that meet optimized utilization of resources.

CO4. Synthesize data transformation by using complex operational models in Inventory, simulation models and Game Theory.

CO5. Apply operational modeling techniques-PERT and CPM in Project Management system.

MCA – III Semester

(16MC30101) COMPUTER NETWORKS

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION:

Computer network Applications; The physical layer; The data link layer; The medium access control sub-layer; The network layer; The transport layer; The application layer; Network security.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Concepts of computer networks
- Functionality of reference models and layers
- Interfaces between layers

CO2. Analyze issues related to data link layer and transport layers using channel allocation and connection management schemes.

CO3. Design techniques for error detection and correction mechanisms suitable to ensure data integrity, access control techniques.

CO4. Investigate diverse techniques used in service user and provider layers in terms of reliability, data integrity, collision resistance and access control mechanisms.

CO5. Apply algorithms and use simulators to calculate least-cost paths for a given network.

CO6. Use the skills by using diverse communication standards and networks with the technology advancements in data communication.

MCA III – Semester

(16MC30102) DATA WAREHOUSING AND DATA MINING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on “Data Base Management Systems”.

COURSE DESCRIPTION: Data Warehouse Components and Architecture; Data mining Functionalities; Data Preprocessing; Association Rule Mining; Classification and Clustering; Multimedia, Text, Web Data Mining and Applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Schemas of Data warehouse
- Data preprocessing methods
- Classification and Clustering techniques

CO2. Analyze frequent itemsets using Apriori and FP growth algorithms.

CO3. Design and develop solutions for different classification and prediction models.

CO4. Solve complex problems by adapting appropriate analysis and interpretation of different types of text, multimedia and web data.

CO5. Use WEKA tool for creation of weather, hospital, banking dataset and perform preprocessing on these datasets.

MCA III – Semester

(16MC30103) OBJECT ORIENTED ANALYSIS AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on “Object Oriented Programming Through JAVA” and “Software Engineering”

COURSE DESCRIPTION:

Things and Classes; Relationships; Class Diagrams; Object Diagrams; Usecase Diagrams; Interaction Diagrams; Activity Diagrams; State Chart Diagrams; Component Diagrams; Deployment Diagrams.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on Things, principles of Object Oriented Development.

CO2. Analyze the specifications of Class, Use case, Activity, Sequence and State diagrams and develop models using pre conditions and post conditions.

CO3. Design application artifacts to construct the Logical, Behavioral and Architectural model of an Application.

CO4. Solve complex behavior using common modeling techniques of things.

CO5. Make use of UML Tool such as Rational Rose or Visual Paradigm to design Class, Use Case, Sequence, Collaboration, Activity, State Chart, Component and Deployment Diagrams for the an Application.

MCA – III Semester

(16MC30131) COMPUTER NETWORKS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
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PREREQUISITES: A Course on “Computer Networks”.

COURSE DESCRIPTION: Implementing error detection and correction techniques; sliding window protocol; simulation of dynamic routing algorithms; congestion controlling mechanism; simulation of various Transport layer protocols.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on the concepts of networks, topologies, network devices and network simulators.
- CO2. Analyze Error detection and correction mechanisms to verify and correct the data.
- CO3. Develop networking protocols like TCP/IP, UDP, RPC, ARP and RARP.
- CO4. Investigate congestion control mechanisms such as Leaky Bucket algorithm to achieve flow control.
- CO5. Simulate dynamic routing protocols such as Distance Vector and Link state routing algorithms using NS2 simulator.
- CO6. Adapt policies and mechanisms to avoid unauthorized access over the network through access control mechanisms and authentication.
- CO7. Effectively communicate the routing paths through network simulators through visualization.
- CO8. Advanced communication techniques can be applied by an individual to interact with remote machine through client server programming.

MCA III – Semester

(16MC30132) DATA WAREHOUSING AND DATA MINING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A course on “Data Warehousing and Data Mining”.

COURSE DESCRIPTION:

Develop Transformations using Data Warehouse ETL tool; Creation of Datasets; Data Preprocessing; Association Rule Mining; Classification and Clustering; Multimedia, Text, Web Data Mining and Applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Data acquisition process
 - Data preprocessing methods
 - Data Mining algorithms
- CO2. Analyze frequent itemsets using Apriori and FP-growth algorithms.
- CO3. Design and construct data acquisition process from one data source to other target data source using data warehouse ETL tool.
- CO4. Develop solutions for complex computing problems by applying appropriate data mining algorithms to evaluate the accuracy and error measures using WEKA components.
- CO5. Use WEKA tool to preprocess weather, hospital, and banking datasets to discover knowledge for making future predictions effectively.
- CO6. Communicate effectively in implementing data mining problems with respect to documentation and visualization of hidden patterns.
- CO7. Apply the knowledge of data mining to assess and provide computing solutions for societal issues.
- CO8. Function effectively as an individual and as a member in a team to manage and implement data mining application in multidisciplinary environment.

MCA – III Semester

(16MC30133) OBJECT ORIENTED ANALYSIS AND DESIGN LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on “Object Oriented Analysis and Design”.

COURSE DESCRIPTION:

Analyze specifications; Design Class Diagrams; Object Diagrams; Usecase Diagrams; Interaction Diagrams; Activity Diagrams; State Chart Diagrams; Component Diagrams; Deployment Diagrams

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Library Management System
- ATM Application
- Online Bookshop
- Railway Reservation System

CO2. Analyze applications and specifications to develop static and behavioral models.

CO3. Design and construct the Logical, Behavioral and Architectural model of an Application.

CO4. Construct a project from beginning to end using UML Tool, Rational Rose for an Application Software.

CO5. Communicate effectively with all the team members about various logical and behavioral objects of an Application Software.

CO6. Asses the common modeling techniques to be applied for a system for the societal applications.

MCA IV-SEMESTER

(16MC40101) BIG DATA ANALYTICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on “Data warehousing and Data Mining” and “Object Oriented Programming through JAVA”.

COURSE DESCRIPTION:

Big data Analytics usage and Outcomes; Types of big data; Challenges of analyzing big data; Analytics tools for big data; Requirements of Hadoop; Adapting Hadoop File systems and I/O; MapReduce Application; Administration of Hadoop; Big data analytics; R Programming on Hadoop.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Acquire knowledge on

- Basic concepts of Big Data Analytics and current trends in Big Data
- MapReduce and R Tool
- HDFS and MapReduce in Big Data Hadoop.

CO2. Analyze the big data types as Structured, unstructured and semi-structured.

CO3. Design and develop methods using Map Reduce technique to solve:

- Varieties of data formats in Hadoop Framework for an application.
- Methods, Dimensions, and practices for Big Data applications.

- CO4. Solve complex problems in Big Data by adopting appropriate techniques to provide insights for small and medium business.
- CO5. Apply modern tools like HIVE and R to perform analytics in an user friendly environment on Hadoop platform.
- CO6. Demonstrate knowledge as an individual to manage Weather sensors application.

MCA IV-Semester

(16MC40102) LINUX PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Computer Networks".

COURSE DESCRIPTION: LINUX operating system features; Architecture of LINUX operating system; LINUX environment; Shell Script; Signals and Sockets.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate Knowledge on LINUX operating system and utilities.
- CO2. Analyze the Bourne shell, LINUX files, processes and signals to solve problems in Linux operating system.
- CO3. Design and develop the programs by using LINUX system tools like vi editor, File, Text, Network and Backup utilities.
- CO4. Solve Advanced C and Shell Script Programming problems in Linux Environment. Select and apply appropriate techniques like semaphores, Messages and Shared Memory to develop inter Process communication in Linux.
- CO5. Communicate effectively with Linux operating system through different application programs.

MCA IV-Semester

(16MC40103) WEB PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on "Object Oriented Programming through JAVA".

COURSE DESCRIPTION:

Concepts of HTML; Java Script and XML; Developing Web Applications using Servlets, JSP and PHP; Adopting Tomcat Server and XAMP Server for deploying Web Applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate Knowledge on
- Client side scripting
 - AJAX programming and Application Servers
 - HTML, DHTML, Java Script and XML
- CO2. Analyze 2-tier, 3-tier and MVC architectures for web application development.
- CO3. Design and develop web Applications using Dynamic HTML with Java Script, XML technology.
- CO4. Investigate and solve complex problems using Server-side technologies like servlets, JDBC technologies and adapt Tomcat Server and XAMPP Server for deployment.
- CO5. Use JSP and PHP to implement E-Commerce applications that has potential insights.

MCA–IV Semester

(16MC40104) SERVICE ORIENTED ARCHITECTURE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Software Engineering”.

COURSE DESCRIPTION: Web Services; Principles of SOA; Service Layers; Simple Object Access Protocol (SOAP); Web Services Description Language (WSDL).

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. Demonstrate knowledge on:

- Principles, services and policies of service orientation.
- Fundamentals of web services.
- XML, WSDL related to SOA

CO2. Analyze complex business process critically in identifying appropriate service model logic.

CO3. Design service oriented architecture suitable for different environments.

CO4. Use XML, SOAP and service interface design tools for building service oriented architecture.

MCA IV - Semester

(16MC40105) INTERNET OF THINGS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITE: A Course on “Computer Networks”.

COURSE DESCRIPTION: Internet of Things(IoT) Components; Communication models; Prototyping; Hardware; Design models; Development platforms; Analytics for IoT.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on Protocols, Functional blocks and communication models of Internet of things.

CO2. Identify appropriate sensors and communication modes used in IoT based systems.

CO3. Design appropriate solutions for IoT applications using Raspberry Pi and Arduino kits.

CO4. Appropriately synthesize the models and applications for usage in Home automation and cities.

CO5. Apply evolutionary techniques to perform analytics on the data integrated from IoT based systems.

CO6. Use Professional engineering principles to design and develop applications using IoT.

MCA – IV Semester

(16MC40106) COMPUTER FORENSICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on “Computer Networks”.

COURSE DESCRIPTION: Computer forensics technologies and cybercrime; Evidence collection and data seizure; Initial Response and Forensic Duplication; Open source tools for Forensic Process;

Forensic Data Analysis and Validation; Processing crimes and incident scenes; Mobile Device Forensics; Network Forensics; E-mail Investigation; Report writing.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Process Fundamentals and Technologies
- Evidence Capture and Computer Forensic Analysis
- Law Enforcement crime and incident scenes

CO2. Analyze and validate digital evidence found in digital storage device.

CO3. Design and develop solutions for a forensic process based on type of communication standards, electronic device capabilities and specifications.

CO4. Investigate and contribute in groups for the development of new forensics tools- Forensic Card Reader, Cell Seizure and MOBILedit.

CO5. Apply forensic tools- Forensic SIM, WinHex and techniques to acquire and verify the evidence.

CO6. Commit to ethics and follow Law of Enforcement standards for digital Forensics and crime investigations.

MCA – IV Semester **(16MC40107) E-COMMERCE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on “Database Management Systems”, “Computer Networks” and “Web Programming”.

COURSE DESCRIPTION:

Electronic Commerce; E-Commerce applications and web; Process models; Electronic payment systems; EDI; Interorganizational E-Commerce; Digital document types; Online marketing process; M-Commerce; Commerce catalogues; Multimedia.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- E-Commerce applications.
- Mercantile Process Models
- Electronic Payment Systems
- Electronic Data Interchange (EDI)

CO2. Analyze the impact of E-commerce on business models and strategies in the new economy.

CO3. Design and develop an electronic payment system.

CO4. Solve complex security problems in the development of Electronic commerce application using SSL and S-HTTP.

CO5. Apply corporate digital library technique to make the information useful to diverse people at different stages in the work process.

CO6. Follow ethics to adapt security standards - digital signature standards in resolving the issues of E-Commerce.

MCA IV-Semester **(16MC40108) SOFTWARE PROJECT MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
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PREREQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION: Software Models and process improvement ; Principles of software management system and life cycle phases; Workflows and checkpoints of the process; scheduling and work break down structure ; Process automation ; Software metrics ; Future generation software economics.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- Software Economics
- Engineering and Production stages
- Artifacts of the process
- Check points of the process
- Process Automation and Tailoring of the process

CO2. Analyze the resources required for a project and to produce a work plan and resource schedule.

CO3. Design and develop project plans to address real-world management Challenges.

CO4. Synthesize the development of project by assessing quality of project using metrics.

CO5. Apply process methods to manage the software projects at each stage of software development life cycle.

CO6. Commit to ethics to adapt conventional and modern software project management principles for developing the software projects.

IV-Semester

(16MC40109) INFORMATION RETRIEVAL SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Data Warehousing and Data Mining".

COURSE DESCRIPTION: Functional overview; Information Retrieval System capabilities; automatic Indexing; stemming algorithms; automatic term clustering; user search techniques; Information visualization technologies; software text search algorithms; Information system evaluation.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- Theoretical and practical aspects of information retrieval Systems.
- Automatic indexing
- Hardware/ Software text search algorithms and Information visualization

CO2. Analyze the functionality of several searches and browse algorithms.

CO3. Design and develop the probabilistic retrieval methods, algorithms and ranking principles.

CO4. Apply porter stemming and successor stemming algorithms to extract meaningful and relevant patterns.

CO5. Use various search engines effectively by applying optimum searching techniques.

MCA IV-Semester

(16MC40110) WIRELESS NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
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PREREQUISITES: A Course on “Computer Networks”.

COURSE DESCRIPTION: Concepts of Medium access alternatives; Generations of Wireless WANS; Adhoc and Wireless Sensor Networks; Wireless MANS and PANS.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate Knowledge on

- Wireless WANS
- Wireless LANS
- Adhoc and Sensor Networks and
- Wireless MANS and PANS

CO2. Analyze the sensor and Adhoc network models and its classifications.

CO3. Design and develop Network applications for Wireless devices like smart phones and tablets.

CO4. Solve complex connectivity problems - Security, Quality of service and routing optimization at in wireless Networks.

CO5. Select and apply the latest wireless network protocols - LTE, Wi-Fi and Bluetooth in developing and operating wireless networks.

CO6. Provide innovative privacy and security measures for accessing of Wireless Network devices adapting standards-IEEE 802.11, IEEE 802.11b and IEEE 802.11.

MCA – IV Semester

(16MC40111) BUSINESS INTELLIGENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Data Warehousing and Data Mining”.

COURSE DESCRIPTION: Decision support and business intelligence; Framework of computerized decision support and business intelligence; DSS classifications; DSS components; Mathematical models for decision support; BPM methodologies; BPM technologies; BPM applications; Artificial intelligence; Fuzzy logic; Fuzzy inference systems; Natural Language Processing and Artificial Intelligence.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Big data technologies, Data Mining (DM), Knowledge Management, Expert Systems, Natural Language Processing and Artificial Intelligence, banking, finance and insurance.
- Data mining techniques.
- Frameworks of computerized decision support system and Business Intelligence.

CO2. Analyze the scenarios like customer choices and preferences for an organization using predictive analytics.

CO3. Design and develop a DSS with the dimensions like Communications-driven and group, Data-driven, Document-driven, Knowledge-driven, Model-driven.

CO4. Develop solutions for the problems in data warehouse by analyzing a BI maturity model to identify critical attributes and mapping operational data to data warehouse.

CO5. Apply modern techniques like variable identification, predictive analytics of Mathematical models for identification and environmental analysis of the problem.

MCA – IV Semester

(16MC4HS31) SOFT SKILLS LABORATORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on “English Language Lab”.

COURSE DESCRIPTION: Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Acquire knowledge on:

- Goal Setting
- Creative Thinking
- Leadership Skills and
- Team Work

CO2. Analyse the functional knowledge on

- Body Language
- Interpersonal Skills and
- Stress Management

CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.

CO4. Function effectively as an individual and as a member in diverse teams.

CO5. Communicate effectively in public speaking in formal and informal situations.

MCA IV-SEMESTER

(16MC40131) BIG DATA ANALYTICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A Course on “Big Data Analytics”.

COURSE DESCRIPTION: Installation of Hadoop; Perform analytics on Weather sensors application; Analysis of reports in R and HIVE Tool.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Map Reduce Framework
- R programming

CO2. Analyze Structured, unstructured and semi-structured types of data to perform data analytics.

CO3. Design and develop Map Reduce programs on Hadoop platform for weather sensor data.

CO4. Solve complex problems in Big Data by adopting appropriate techniques to provide insights to facebook datasets.

CO5. Apply modern tools such as HIVE and R to perform analytics in a user friendly environment.

CO6. Communicate effectively in implementing social network data sets for analysis using R tool with respect to visualization of hidden patterns.

CO7. Asses the Weather sensors applications with respect to local or global climatic conditions.

CO8. Demonstrate knowledge as an individual to manage OLA dataset on R and HIVE to handle diverse data.

MCA IV-Semester

(16MC40132) LINUX AND WEB PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on “Linux Programming” and “Web Programming”.

COURSE DESCRIPTION: HTML, Java Script, XML and Shell Script; Web Application Development using Servlets, Java Server Pages, PHP and JDBC; Tomcat Server and XAMP Server for Deploying Web Applications.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate Knowledge on:

- Client side scripting
- AJAX programming and Application Servers
- HTML, DHTML, Java Script and XML

CO2. Analyze 2-tier, 3-tier and MVC architectures for web application development.

CO3. Design and develop web Applications using Dynamic HTML with Java Script, XML technology.

CO4. Investigate and solve complex problems using Server-side technologies like servlets, JDBC technologies and adapt Tomcat Server and XAMPP Server for deployment.

CO5. Use JSP and PHP to implement E-Commerce applications that has potential insights.

CO6. Communicate effectively in implementing web application programs using HTML, JAVA script and AJAX.

CO7. Develop societal, environmental and health related applications using Servlets, JSP and PHP.

CO8. Work with diverse teams using web technology frame-works towards developing quality software applications.

MCA – V Semester

(16MC50101) CLOUD COMPUTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PRE-REQUISITES: Courses on “Computer Networks” and “Operating Systems”.

COURSE DESCRIPTION: Virtualization, Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security; Cloud Disaster Recovery; Working with Clouds; and Case Studies.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and Virtualization.

CO2. Analyze the issues in cloud computing Data, Network and Host security.

CO3. Apply API development skills in web applications for Cloud deployment.

CO4. Use research based knowledge to build cloud applications.

CO5. Use advanced programming languages to access cloud services.

CO6. Build cloud environment suitable for societal requirements.

MCA V-Semester

(16MC50102) MOBILE APPLICATION DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Computer Networks", "Web Programming" and "Database Management systems"

COURSE DESCRIPTION:

J2ME concepts; J2ME Architecture and Development Environment; Commands, Items and Event Processing; Low level and High Level Displays; e Applications by using Wireless Tool Kit and Connecting with SQL Data Bases.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on J2ME and Wireless Technology.
- CO2. Analyze the commands, items and event processing in MIDlet Programming.
- CO3. Design and develop the applications for Mobile Devices.
- CO4. Solve the High level and Low level Display problems in Mobiles Screens and Canvas.
- CO5. Select appropriate tool like wireless tool kit-MIDlet programming to develop Mobile Applications.
- CO6. Create security alerts in mobiles for betterment of individual and society.

MCA V-SEMESTER

(16MC50103) SOFTWARE TESTING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on "Software Engineering".

COURSE DESCRIPTION:

Software Testing Basics: Goals, Defects, Terminology, Methodology, STLC in SDLC, Verification and Validation; Software Testing Techniques: White box testing, Black Box Testing, Regression testing; Test Management: Test Planning, Design and Specifications; Test Automation: Tool selection and Guidelines.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Software Testing Life Cycle.
 - Testing Techniques.
 - Test Management and Metrics.
 - Regression Testing
 - Test Automation
- CO2. Analyze testing circumstances and their resultants in software development.
- CO3. Design and develop the appropriate test cases in accordance to the software development model.
- CO4. Use problem solving skills to control and monitor the testing process.
- CO5. Apply testing tools for testing the software quality.
- CO6. Apply contextual knowledge to perform testing on software related to societal applications.

MCA V – Semester

(16MC50104) SOFTWARE QUALITY ASSURANCE

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES: A Course on "Software Engineering".

COURSE DESCRIPTION: Software Quality; Software Quality Assurance; Project Life Cycle components; Software Quality Infrastructure; Development Methodologies; Procedures and Work Instructions; Standards, Certificates and assessments.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on quality, architecture, metrics of software development.
- CO2. Analyze software quality plan for a software project to include sections on change management, configuration management, defect elimination, validation and verification and measurement.
- CO3. Design software quality plans for a software project and asses their capability to adopt quality standards.
- CO4. Assess the quality of software product using software quality metrics.
- CO5. Adapt Procedures and work instructions, Templates, Checklists and 3S development for software quality infrastructure.
- CO6. Commit to ethics to apply ISO and IEEE standards in preparing the quality plan and documents.

MCA – V Semester

(16MC50105) SEMANTIC WEB

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES: Courses on "Web Programming" and "Computer Networks".

COURSE DESCRIPTION: Semantic web fundamentals; Semantic web technology; Ontology web language; Swoogle; Semantic web services.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate knowledge on:
 - Semantic web search
 - RDF and SWOOGLE
 - Semantic web services
 - RDFS and OWL
- CO2. Analyze layers of web architecture for describing web content.
- CO3. Design semantic web search engine for capturing information on the current web

MCA – V Semester

(16MC50106) INFORMATION SECURITY

Int. Marks	Ext. Marks	Total Marks
40	60	100

L	T	P	C
4	-	-	4

PREREQUISITES: A course on "Computer Networks".

COURSE DESCRIPTION: cryptographic algorithms; Classical Encryption Techniques; Public key and Private key encryption; security models; Hash Algorithms; E-mail and IP Security; analysis of security principles in internet and system security; Intrusion Detection.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- Symmetric and Asymmetric Encryption Algorithms
- Key distribution and message Authentication
- Hash algorithms and digital signature techniques
- IP security and Web Security
- Intrusion Detection and Firewall configurations

CO2. Analyze appropriate Symmetric, Asymmetric Encryption algorithms and Hash Algorithms to provide Confidentiality and Authentication.

CO3. Design solutions to problems related to Public-Key Encryption, Digital signatures, Secure Hash Functions.

CO4. Identify efficient ciphers such as Gauss Cipher, Vigenere cipher, Rail Fence Cipher and cryptographic algorithms such as RSA, Diffie-Hellman cryptographic algorithms, Digital Signature standard for Hashing techniques to provide novel solutions for real-time application protocols like PGP, S/MIME, SSL, TLS and SET.

CO5. Use the Cryptographic Techniques - Vigenere cipher, Rail Fence Cipher to provide confidentiality, security Algorithms and hashing techniques to enhance level of protection in area of digital communication.

CO6. Commit to ethics in authentication and access control methods to implement policies and mechanisms on business operations using Digital Signature Standards.

MCA V-SEMESTER

(16MC50107) ENTERPRISE RESOURCE PLANNING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management Systems and Management Information Systems."

COURSE DESCRIPTION: Concepts of ERP; Strategies of ERP Technology; Business models; ERP market.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on systematically planning mechanisms in an enterprise and identify all components in an ERP system and the relationships among the component.

CO2. Analyze ERP Technology Implementations and Modules to develop custom ERP Applications.

CO3. Design and develop an ERP system along with customization using appropriate modeling methods-Entity Relationship Modeling (ERM) and Event-Driven Process Chains (EPC).

CO4. Solve Complex ERP Risks and SAP Business Applications problems.

CO5. Select appropriate tool like SAP AG's ERP used in implementation of ERP system.

MCA – V Semester

(16MC50108) MANAGEMENT INFORMATION SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: Courses on "Database Management System" and "Organizational Behavior and Human Resource Management".

COURSE DESCRIPTION: Methodologies of systems approach to organization; types of information systems; Management issues; Strategic and project planning for MIS; Designing an information system; Implementation of a system; Evaluation and maintenance; Weaknesses in system development; Soft spots in planning.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Meaning and role of MIS
- Types of information systems
- System design processes
- Decision making processes
- Techniques used in developing an information system.

CO2. Analyze the techniques of operations research, management science, mathematical tools, scientific approaches for decision rules.

CO3. Design and develop programmed decision system for Manufacturing Subsystem Inventory System Distribution Logistics System.

CO4. Solve complex problems in strategic and project planning, conceptual and detailed system design by using the techniques like breakdown structure, the network approach to defining task relationships and the integration of performance/cost/time for planning and control.

CO5. Apply tools like spreadsheets, system flowcharts to evaluate solutions for real-world business problems.

CO6. Aware of the ethical, social, and security issues of an information system.

MCA – V Semester

(16MC50109) BIOINFORMATICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: —

COURSE DESCRIPTION: Bioinformatics; Biology and Information; DNA and RNA; biological databases; Sequence alignment and dynamic programming; database mining tools; usages of Bioinformatics.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on

- Biological database.
- Bioinformatics.
- DNA and RNA.
- Modern molecular biology

CO2. Analyze DNA and RNA Structure, Public Databases-NCBI and global and local sequence alignments on biological DBMS.

CO3. Design and implement

- Data retrieval.
- Data annotation.
- Database Connectivity

- CO4. Investigate on sequence alignment function and retrieve structure and Evolutionary information using dynamic programming.
- CO5. Select and apply techniques and data mining tools on biological data to perform Sequence similarity search using tools like BLAST and FASTA.

MCA – V Semester

(16MC50110) ETHICAL HACKING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A Course on “Computer networks”.

COURSE DESCRIPTION: Network and Computer Attacks; Foot Printing and Social Engineering; Port Scanning; Enumeration; Desktop and Server Operating System vulnerabilities; Hacking Web Servers; Cryptography; Network Protection System; Hacking Wireless Network.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate Knowledge on:
- Network and Computer attacks
 - OS Vulnerabilities
 - Hacking web servers, Hacking wireless network
- CO2. Analyze system and network vulnerabilities.
- CO3. Design security solutions for risks that arise from hacking.
- CO4. Use appropriate ethical hacking technique to solve security problems.
- CO5. Apply Contextual Knowledge to assess safety and legal issues in ethical hacking.
- CO6. Inculcate use of ethical hacking practices while maintaining professional ethics.

MCA V-Semester

(16MC50111) MULTIMEDIA AND RICH INTERNET APPLICATION DEVELOPMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	4	-	-	4

PREREQUISITES: A course on “Web Programming”.

COURSE DESCRIPTION: Concepts of Multimedia; Multimedia authoring tools; Data representations; Fundamental concepts in Video and digital audio; Basic video compression techniques; Multimedia communication and retrieval; Development of rich internet applications with adobe flash.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate Knowledge on multimedia, video compression techniques and adobe flash.
- CO2. Analyze a variety of creative techniques like sequential, hierarchical search and MPEG in the visual design of online media.
- CO3. Design and development of Multimedia Animations using Adobe Flash and Flex3
- CO4. Create highly interactive, rich internet applications using multimedia technologies and authoring tools.
- CO5. Evaluate the role and importance of critical experimentation and innovation in the multimedia development process as a professional practice.

MCA – V Semester

(16MC50131) CLOUD COMPUTING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: A Course on “Cloud Computing”.

COURSE DESCRIPTION: Hands-on experience on creating virtual machines on Windows and Linux platforms; Development of service based web applications and their deployment and Mobile app development.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

- CO1. Demonstrate hands-on experience on Virtualization models and Cloud Environment.
- CO2. Analyze the given experiment and relate to existing architectures.
- CO3. Apply API development skills in web applications for cloud deployment.
- CO4. Demonstrate independent problem solving skills in developing dynamic web applications.
- CO5. Use advanced programming languages to access cloud services.
- CO6. Demonstrate communication skills, both oral and written for preparing and presenting reports.
- CO7. Build suitable cloud environment for societal requirements.
- CO8. Work effectively as an individual and as a member in team for mini-project implementation

MCA – V Semester

(16MC50132) MINI PROJECT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	-	2

PREREQUISITES: All the courses of the program from I to IV semesters.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Implementation of the project work; Preparation of mini project reports and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

- CO1. Knowledge on the project topic.
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex computing problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex computing activities with an understanding of limitations in the project work.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
- CO7. Understanding of the impact of the professional computing practices to provide solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the professional computing practice applied in the project work.
- CO9. Ability to function effectively in a team is experienced during the mini project.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO12. Ability to engage in life-long learning as experience during the project work.

MCA – V Semester
(16MC50133) COMPREHENSIVE ASSESSMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to demonstrate:

- CO1. Knowledge in the courses of the program.
- CO2. Analytical ability in the courses of the program.
- CO3. Design skills in the courses of the program.
- CO4. Ability to investigate and solve complex computing problems in the courses of the program.
- CO5. Ability to apply tools and techniques to complex computing activities with an understanding of limitations in the courses of the program.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
- CO7. Understanding of the impact of the professional computing solutions in environmental context and need for sustainable development in the courses of the program.
- CO8. Ability to apply ethics and norms of the professional computing practices in the courses of the program.
- CO9. Ability to function effectively as an individual in the courses of the program.
- CO10. Ability to present views cogently and precisely in the courses of the program.
- CO11. Ability to engage in life-long learning in the courses of the program.

MCA – VI Semester
(16MC60131) SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES: Completion of the seminar work enables a successful student to demonstrate:

- CO1. Knowledge on the seminar topic.
- CO2. Analytical ability exercised during the seminar work.
- CO3. Ability to investigate and solve complex computing problems faced during the seminar work.
- CO4. Ability to apply techniques to complex computing activities with an understanding of limitations as applied in the seminar work.
- CO5. Ability to function effectively as an individual as experienced during the seminar work.
- CO6. Ability to present views cogently and precisely on the seminar topic.
- CO7. Ability to engage in life-long learning as experience during the seminar work.

MCA – VI Semester
(16MC60132) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks
100	100	200

L	T	P	C
-	-	-	12

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: Completion of the project work enables a successful student to demonstrate:

- CO1. Knowledge on the project topic.
- CO2. Analytical ability exercised in the project work.
- CO3. Design skills applied on the project topic.
- CO4. Ability to investigate and solve complex computing problems faced during the project work.
- CO5. Ability to apply tools and techniques to complex computing activities with an understanding of limitations in the project work.
- CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
- CO7. Understanding of the impact of the professional computing practices to provide solutions in environmental context and need for sustainable development experienced during the project work.
- CO8. Ability to apply ethics and norms of the professional computing practice applied in the project work.
- CO9. Ability to function effectively as an individual as experienced during the project work.
- CO10. Ability to present views cogently and precisely on the project work.
- CO11. Project management skills as applied in the project work.
- CO12. Ability to engage in life-long learning as experience during the project work.