



SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)

Sree Sainath Nagar, Tirupati

Department of Mechanical Engineering

Supporting Document for 1.1.3

Courses having focus on
Employability/ Entrepreneurship/ skill Development

Program: B.Tech.- Mechanical Engineering

Regulations : SVEC-14

The Courses (with course outcomes) under SVEC-14 Regulations which focus on ***employability/ entrepreneurship/ skill development*** are highlighted with the following colours.

Skill

Employability

Entrepreneurship

B.Tech. I Year

14BT1HS01: TECHNICAL ENGLISH

(Common to All Branches of Engineering)

Int. Marks: 30; Ext. Marks: 70; Total Marks: 100

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2 - - 4

PRE-REQUISITES: Basic Grammar and Fundamentals of Writing Skills

COURSE DESCRIPTION: The course consists of lessons which include characters, speeches and short stories: 'My Early Days', 'Speech by N. R. Narayana Murthy', 'Dr. C.V. Raman: The Celebrated Genius', 'The Town by the Sea' and 'The Model Millionaire'. The course also covers the principles of Language and Communication Skills (Listening, Speaking, Reading and Writing Skills).

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

- CO1:** Acquire fundamental and functional knowledge of English Language, grammar and communication skills.
- CO2:** Identify and analyze productive skills (speaking and writing) and receptive skills (listening and reading) of English Language proficiency for effective communication and practice.
- CO3:** Design and develop functional skills for professional practice through English.
- CO4:** Communicate effectively with the engineering community and society to comprehend and deliver effective solutions.
- CO5:** Inculcate an attitude to upgrade competence of English knowledge and communication to engage in independent and lifelong learning.

Detailed Syllabus:

UNIT - I:

(10 periods)

My Early Days by **A. P. J. Abdul Kalam** from **All About English** by Cambridge University Press India Pvt Ltd. 2014.

Communication: Importance of Communication – Language as a tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Verbal and Non-Verbal Communication.

UNIT – II: (10 periods)

A Speech by N. R. Narayana Murthy from **All About English** by Cambridge University Press India Pvt Ltd, 2014.

Listening: Meaning and Art of Listening – Importance of Listening – Traits of a Good Listener – Reasons for Poor Listening – Types of Listening– Barriers to Effective Listening

UNIT – III: (10 periods)

The Town by the Sea by Amitav Ghosh from **All About English** by Cambridge University Press India Pvt Ltd, 2014.

Speaking: Achieving Confidence, Clarity, and Fluency – Paralinguistic Features – Types of Speaking – Barriers to Speaking.

UNIT – IV: (10 periods)

Sir. C. V. Raman: The Celebrated Genius from **All About English** by Cambridge University Press India Pvt. Ltd, 2014.

Reading: Reading and Interpretation – Intensive and Extensive Reading– Critical Reading – Reading Comprehension – Techniques for Good Comprehension – SQ3R Reading Technique

UNIT – V: (10 periods)

The Model Millionaire by **Oscar Wilde** from **All About English** by Cambridge University Press India Pvt. Ltd, 2014.

Writing: Characteristics – Language – Elements of Style – Techniques for Good Technical Writing – Avoiding Plagiarism - Referencing and Styling.

Total Periods: 50

TEXT BOOKS:

1. **All About English**, Cambridge University Press India Pvt. Ltd., First Edition, 2014.
2. Meenakshi Raman and Sangeetha Sharma, **Technical Communication**, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. M. Ashraf Rizvi, **Effective Technical Communication**, Tata McGraw–Hill, Publishing Company Limited, First Edition, 2005.
2. Martin Hewings, **Advanced English Grammar: A Self Study Reference and Practice Book for Advanced South Asian Students**, Cambridge University press, First South Asian Edition, New Delhi, 1999.

B.Tech. I Year

14BT1BS01: ENGINEERING PHYSICS

(Common to All Branches of Engineering)

Int. Marks: 30; Ext. Marks: 70 ;Total Marks: 100 **L T P C**
2 1 - 4

PRE-REQUISITES: Intermediate/Senior Secondary Physics

COURSE DESCRIPTION: The course deals with different lasers, optical fibers and holograms, theory of relativity, acoustics of buildings, crystallography, principles of quantum mechanics, band theory of solids, properties of dielectric materials, semiconductors, properties and application of magnetic materials, nanomaterials, and superconductors.

COURSE OUTCOMES :

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

CO1: Acquire basic knowledge of lasers, optical fibers, holography, theory of relativity, acoustics, crystallography, quantum mechanics, dielectrics, magnetic materials, semiconductors, superconductors and nanomaterials.

CO2: Develop skills in designing of lasers, fiber optic cable, holograms, acoustically good hall, semiconductor devices and nanomaterials.

CO3: Develop problem solving skills in engineering context.

Detailed syllabus:

UNIT-I: LASERS, FIBER OPTICS AND HOLOGRAPHY (18 periods)

Lasers: Introduction, characteristics of laser, principles of lasing action, spontaneous and stimulated emission of radiation, Einstein's coefficients, population inversion, Ruby laser, Helium-Neon laser, semiconductor laser, applications of lasers.

Fiber optics: Introduction, construction and working principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, types of optical fibers and refractive index profiles, attenuation and losses in fibers, optical fiber communication system, applications of optical fibers in sensors and medicine.

Holography: Introduction, construction of a hologram, reconstruction of image from hologram, applications.

UNIT-II: SPECIAL THEORY OF RELATIVITY, ACOUSTICS OF BUILDINGS AND CRYSTALLOGRAPHY (16 periods)

Special Theory of Relativity: Introduction, absolute frame of reference, time dilation, length contraction, addition of velocities, mass-energy equivalence, energy-momentum relation.

Acoustics of Buildings: Introduction, basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment), absorption coefficient of sound and its measurement, factors affecting the architectural acoustics and their remedies.

Crystallography: Introduction, crystal planes, crystal directions and Miller indices, separation between successive (hkl) planes, X-ray diffraction by crystal planes, Bragg's law, Laue and powder methods.

UNIT-III: PRINCIPLES OF QUANTUM MECHANICS AND BAND THEORY OF SOLIDS (17 periods)

Principles of Quantum Mechanics: Black body radiation – Wien's law, Rayleigh-Jeans law and Planck's law (qualitative treatment), waves and particles, matter waves, de-Broglie's hypothesis, G.P. Thomson experiment, Heisenberg's uncertainty principle, Schrödinger's one dimensional wave equation (time independent), significance of wave function, particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment), scattering-source of electrical resistance.

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment), origin of energy band formation in solids, effective mass of electron, distinction between metals, semiconductors and insulators based on band theory.

UNIT-IV: DIELECTRIC PROPERTIES OF MATERIALS AND SEMICONDUCTORS (17 periods)

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, Clausius-Mossotti equation, frequency dependence of polarisability (qualitative treatment), ferro and piezo electricity.

Semiconductors: Introduction, intrinsic and extrinsic semiconductors, carrier concentration, electrical conductivity in semiconductors, drift and diffusion currents, Einstein's relation, Hall effect, direct and indirect band gap semiconductors, p-n junction, energy band diagram of p-n diode, diode equation (qualitative), LED, photo diode and solar cell.

UNIT-V: MAGNETIC PROPERTIES OF MATERIALS, SUPERCONDUCTIVITY AND NANOMATERIALS (17 periods)

Magnetic Properties of Materials: Introduction, origin of magnetic moment, classification of magnetic materials into dia, para, ferro, anti-ferro and ferri magnetism, hysteresis, soft and hard magnetic materials.

Superconductivity: General properties, Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory, applications of superconductors.

Nanomaterials: Introduction, surface area to volume ratio, quantum confinement, properties of nanomaterials, synthesis of nanomaterials by ball milling, plasma arcing, pulsed laser deposition and sol-gel methods, carbon nanotubes-properties and applications, applications of nanomaterials. **Total :85 periods**

TEXTBOOKS :

1. S. Mani Naidu, **Engineering Physics**, Pearson Education, 2013.
2. P. K. Palaniswamy, **Engineering Physics**, Scitech Publications

REFERENCE BOOKS:

1. R. K. Gaur and S. L. Gupta, **Engineering Physics**, Dhanpat Rai Publications (P) Ltd., 8th Edition, 2001.
2. M. R. Srinivasan, **Engineering Physics**, New Age International (P) Limited, Publishers, 1st Edition, 2010.

B.Tech. I Year

14BT1BS02 : ENGINEERING CHEMISTRY

(Common to All Branches of Engineering)

Int. Marks:30;Ext. Marks:70;Total Marks: 100

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PRE-REQUISITES: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: This course deals with various engineering materials, electro-chemical cells, corrosion, water technology, fuel technology, lubricants, nano chemistry, and green chemistry.

COURSE OUTCOMES:

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

CO1: Acquire basic knowledge in liquid crystals, conducting Polymers, Composites, Chemical sensors, insulators, Electro chemical cells, corrosion phenomenon, fuels, Nanomaterials and principles of Green Chemistry and Green Engineering.

CO2: Develop analytical skills in:

- Determination of hardness of water.
- Determination of viscosity, flame and fire points, cloud and pour points.
- Determination of calorific value of fuels.

CO3: Develop skills in design of:

- Methods for control of corrosion
- Chemical methods for the synthesis of Nanomaterials.

CO4: Develop skills for providing solutions through:

- Mitigation of hardness of water.
- Control of corrosion
- Newer Nanomaterials for specific applications

CO5: Acquire awareness to societal issues on:

- Chemical materials utility and their impact.
- Quality of water.
- Phenomenon of corrosion.

CO6: Imbibe attitude to practice engineering in compliance to environmentally benign techniques such as:

- Green computing
- Green construction
- Green manufacturing systems

Detailed syllabus:

UNIT – I: CHEMISTRY OF ENGINEERING MATERIALS (18 periods)

Liquid Crystals – Introduction, chemical structure, classification, engineering applications.

Conducting Polymers – Definition, types of conducting polymers and their engineering applications. **Composites** – Introduction, advantages of composites, constituents of composites, types of composites, applications of composites. **Sensors** - Introduction, types of sensors, electrochemical sensors, applications. **Insulators** – Definition, characteristic properties of insulators and classification of insulators.

UNIT–II: WATER TECHNOLOGY (15 periods)

Introduction, types of water, impurities in water and their consequences. Hardness of water, units of hardness, measurement of hardness by EDTA method, disadvantages of hardness. Softening methods – Ion exchange process, Zeolite process-Municipal water treatment. Boiler Troubles. Desalination of brackish water by Electro dialysis and Reverse osmosis. Numerical problems on measurement of hardness of water.

UNIT–III: ELECTROCHEMICAL CELLS AND CORROSION (17 periods)

Electrode potential, Nernst's equation, Electrochemical cells, EMF of an electrochemical cell. Reference electrodes- Standard Hydrogen Electrode (SHE), Calomel electrode.

Batteries: Introduction, types of Batteries. Ni-Cd battery, lithium – ion battery-applications.

Fuel Cells: Definition, $H_2 - O_2$ fuel cell, phosphoric acid fuel cells, proton exchange membrane fuel cells, solid oxide fuel cells. Applications of fuel cells.

Corrosion: Introduction, definition, types of corrosion, galvanic corrosion, concentration cell corrosion, control of corrosion – Electroplating method (Nickel electroplating).

UNIT–IV: LUBRICANTS AND FUEL TECHNOLOGY (18 periods)

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity, flash and fire points, cloud and pour points, aniline points, neutralization number and mechanical strength.

Fuel Technology: Introduction, classification, characteristics of a good fuel, calorific value, liquid fuels, petroleum, refining of petroleum, knocking, octane number, cetane number, power alcohol, synthetic petrol, gaseous fuels, important gaseous fuels.

UNIT–V: NANO CHEMISTRY AND GREEN CHEMISTRY (17 periods)

Nano Chemistry: Introduction, classification of nanomaterials, properties of nanomaterials, methods of synthesis – sol-gel process, Chemical Vapour Deposition (CVD), Plasma Enhanced Chemical Vapour Deposition (PECVD). Applications of nanomaterials.

Green Chemistry: Introduction, tools of Green chemistry, principles of green chemistry, examples of Green chemistry, principles of Green Engineering, Green computing, Green construction, Green manufacturing systems.

Total Periods : 85

TEXT BOOKS:

1. P.C.Jain & Monika Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 17th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy & C. Ramachandraiah **Engineering Chemistry**, Mc. Graw-Hill Higher Education, Hyderabad, 1st edition, 2013.

REFERENCE BOOKS:

1. A.K. Bandyopadhyay, **Hand book of Nanostructured materials and Nanotechnology**, New Age international publishers, 2nd edition, 2010.
2. Paul T. Anastas, John C Warner, **Green Chemistry: Theory and practice**, Oxford University Press, 2000.

B.Tech. I Year

14BT1BS03 : ENGINEERING MATHEMATICS

(Common to All Branches of Engineering)

Int. Marks: 30 ; Ext. Marks: 70 ; Total Marks: 100

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PRE-REQUISITES: Intermediate/ Senior Secondary Mathematics

COURSE DESCRIPTION: Engineering mathematics is an application oriented course for various fields of engineering. In this course, Differential equations, partial differentiation as applied to various engineering problems; Integration and its applications to find lengths, areas and volumes of objects, Laplace transforms and their applications, fundamentals of vector calculus are presented.

COURSE OUTCOMES:

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

CO1: Acquire knowledge in Differential equations, finding maximum and minimum values attained by functions of several variables, evaluating double and triple integrals, Laplace transforms and differentiation and integration of vector functions.

CO2: Develop analytical skills in solving problems involving

- (a) Non homogeneous linear differential equations
- (b) Flux and fluid mechanics by vector methods.
- (c) Complex integrations using Laplace transforms.
- (d) the length of curves, areas, surfaces and volumes of revolutions.

CO3: Develop skills in designing Mathematical models for

- (a) L-C and R-C circuits.
- (b) Newton's Law of cooling and heat transfer.

CO4: Develop skills in providing solutions for

- (a) problems involving L-R-C oscillatory circuits
- (b) linear, surface and volume integrals by vector methods
- (c) work done, flux through vector integrations

Detailed syllabus:

UNIT-I: DIFFERENTIAL EQUATIONS- APPLICATIONS (20 periods)

Ordinary differential equations – Linear and Bernoulli type – exact equations and reducible to exact. Orthogonal trajectories (both cartesian and polar forms). Newton’s Law of cooling, Law of natural growth and decay. Non-homogeneous linear differential equations of second and higher order with constant coefficients. Methods of finding the particular integrals for $Q(x) = e^{ax}, \sin ax, \cos ax, x^n, e^{ax}V(x), xV(x)$. Method of variation of parameters . Applications to L-R-C circuits.

UNIT-II: PARTIAL DIFFERENTIATION & APPLICATIONS OF DERIVATIVES (22 periods)

Functions of two or more variables – Homogeneous functions – total derivatives – derivatives of implicit function – Jacobian – maxima and minima of functions of two variables with and without constraints – Lagrange’s method of undetermined multipliers. Radius ,centre and circle of curvature, tracing of curves in cartesian, parametric and polar forms.

UNIT-III: APPLICATIONS OF INTEGRATION (18 Periods)

Applications of integration to – length of curves, area of surfaces of revolution and volume of solids of revolution – Double integrals – change of variables and change of order of integration. Evaluation of Triple integrals -volume as double integral.

UNIT-IV: LAPLACE TRANSFORMS- APPLICATIONS (20 periods)

Laplace transforms of standard functions – Properties of Laplace transforms–First and second shifting Theorems. Laplace transforms of derivatives and integrals–Laplace transforms of periodic functions – Unit step function – Dirac delta function – Inverse transforms–Convolution theorem. Applications of Laplace transforms to linear differential equations with constant coefficients.

UNIT-V: VECTOR CALCULUS (20 periods)

Vector differentiation – gradient, divergence, curl and vector identities. Laplacian Operator. **Vector integration:** Line integrals independent of path – work done, conservative field and scalar potential functions. Surface integrals, flux and volume integrals. Verifications and applications of vector integral theorems: Greens theorem, Stokes theorem and Gauss divergence theorem (without proof).

Total periods : 100

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, **Engineering Mathematics, Vol. 1**, S. Chand & Company, 12/e ,2013.

REFERENCE BOOKS:

1. B.S., Grewal, **Higher Engineering Mathematics**, Khanna Publishers, 42/e,2012.
2. E., Kreyszig, **Advanced Engineering Mathematics**, John Wiley and Sons, 8/e.2006

B.Tech. I Year

14BT10301: ENGINEERING MECHANICS

(Common to CE and ME)

Int. Marks: 30; Ext. Marks: 70; Total Marks: 100

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PRE-REQUISITES: Intermediate/Senior Secondary Mathematics and Physics

COURSE DESCRIPTION: Engineering Mechanics is a foundation course for all other courses belonging to the broad knowledge area Design Engineering as applied to Civil Engineering and Mechanical Engineering. Basic concepts of statics and dynamics are presented in this course. Several aspects such as resultant of a system of forces, couple, support reactions, moment of inertia, member forces in trusses and preliminaries of friction, virtual work are included in the "statics" part of the course. Similarly characteristics of motion, cylindrical / Cartesian coordinates, centripetal acceleration and Newton's second law are included in the "dynamics" part of the course.

COURSE OUTCOMES:

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

- CO1:** Apply the knowledge of Mathematics, Science, Engineering fundamentals to the solutions of complex engineering problems.
- CO2:** Analyse :
 - (a) multi-body systems under equilibrium and under dynamic conditions.
 - (b) systems involving dry friction and compute the efficiency of the system forces in trusses under suitable assumptions.
- CO3:** Design solutions to complex engineering problems using first principles of engineering mechanics.
- CO4:** Exercise awareness to assess the safety of system and other ethical issues 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.

Detailed Syllabus:**UNIT - I: BASIC CONCEPTS (24 periods)**

Axioms of Mechanics – basic quantities of mechanics and their units, System of forces– Lami’s theorem, Moment of forces and its Application, Couples and Resultant of Force System, concurrent force systems, parallel force systems, non-concurrent force systems. Free body diagrams, Friction as a force – Laws of dry friction – Wedge, screw-jack, and differential screw-jack, Introduction to Virtual work principle – Very simple and elementary problems using virtual work.

UNIT - II: STRUCTURAL ANALYSIS (16 periods)

Types of Supports – Support reactions for beams with different types of loading, concentrated, uniformly distributed and uniformly varying loading Types of frames –perfect frames, Analysis of frames using method of joints and method of sections.

UNIT - III: CENTROID, CENTER OF GRAVITY, MOMENTS OF INERTIA (18 periods)

Centroids of simple figures, Centroids of Composite figures, Centre of Gravity of bodies, Centre of Gravity of Composite figures. Parallel axis and perpendicular axis theorems, Theorems of Pappus and Guldinus, Moments of Inertia of Composite Figures, Mass Moment of Inertia of Simple solids, Moment of Inertia of composite masses.

UNIT - IV: KINEMATICS (14 periods)

Rectilinear and Curvilinear motion – Velocity and Acceleration, motion of a projectile, Normal and tangential accelerations.

UNIT - V: KINETICS (18 periods)

Analysis as particle and Analysis as a Rigid Body in Translation – Newton’s laws, Work Energy Method – Equation for Translation, Work – Energy application to Particle Motion, Impulse-Momentum Equation, Fixed axis Rotation.

Total Periods: 90**TEXT BOOKS:**

1. S.S. Bhavikatti and K.G. Rajashekarappa, **Engineering Mechanics**, New Age International (P) Ltd., 3rd edition, 2008
2. Basudeb Bhattacharya, **Engineering Mechanics**, Second Edition, Oxford University Press, 2nd Edition, 2014.

REFERENCE BOOKS:

1. S. Timoshenko, D.H. Young, and J.V. Rao, **Engineering Mechanics**, Tata McGraw-Hill Publishing Company Limited, Revised 4th Edition, 2007.
2. R.C. Hibbeler, **Engineering Mechanics - Statics and Dynamics**, Prentice Hall, 8th Edition, 1998
3. K. Vijaya Kumar Reddy and J. Suresh Kumar, **Singer’s Engineering Mechanics – Statics and Dynamics**, BS Publications, 3rd Edition.

B.Tech. I Year
**14BT1ES01: PROGRAMMING IN C & DATA
STRUCTURES**

(Common to ECE, EEE, EIE, ME and CE)

Int. Marks: 30; Ext. Marks: 70; Total Marks: 100

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PRE-REQUISITES: Nil

COURSE DESCRIPTION: This course deals with fundamentals of programming in C language such as syntax of C, mechanisms of input and output processing, derived data types like arrays, strings and pointers. Also file in C and data structures are discussed.

COURSE OUTCOMES:

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

- CO1:** Gain knowledge on developing algorithms and programming techniques.
- CO2:** Gain analytical skills on
 - a. Searching and sorting
 - b. File management functions.
 - c. Various Data Structures
- CO3:** Design various applications using basic data structures like linked list, stacks and queues
- CO4:** Gain competence to represent and solve real time problems using tree data structures.

Detailed Syllabus:

UNIT-I: (15 periods)

PROGRAMMING LANGUAGES- Compiler, Interpreter, Loader, and Linker- Program execution- Classification of programming-Algorithms and flowcharts .

Basics of C: Introduction, Standardizations of C language, Developing Programs in C, Structure of C program, Variables, Data Types, Declaration, Token, Operators and expressions, L values and R values, Type Conversion in C.

UNIT-II: (20 periods)

INPUT AND OUTPUT: Basic screen and key board I/O in C , Non formatted input and output , Formatted Input and output. Control Statements: Specifying Test Condition for Selection and Iteration, Writing Test Expressions, Conditional Execution and Selection, Iterative and Repetitive Execution, GOTO Statement, Special Control statements, Nested loops.

UNIT-III: (20 periods)

ARRAYS AND STRINGS: One dimensional Array, Strings: One-Dimensional Character Arrays, Multidimensional Arrays, Arrays of Strings. Functions: Concept of function, Call by Value Mechanism, passing arrays to Functions, Scope and extent, Storage classes, Inline function, Recursion, Searching and sorting.

UNIT-IV: (25 periods)

POINTERS: Introduction, Understanding Memory Address, Address Operators, pointer, Void pointer, Null pointer, use of pointers, arrays and pointers, Pointer and strings, pointer arithmetic, pointers to pointers, pointer to arrays, Pointers to functions, Dynamic memory allocation, Pointer and const Qualifier. User-defined data types and variables: Structures, union, Enumerations types, Bitfields.

Files in C: Working with text files, Binary files, Random Access files, other file management functions, Command line arguments, C preprocessor, Type qualifier.

UNIT-V: (20 periods)

LINKED LISTS: Singly Linked Lists, Circular Linked lists, Doubly Linked list Applications of Linked Lists. Stacks and Applications, Queues, Other Variations of Queues, Applications, Tree-Binary tree, Traversals, Kinds of binary trees, Binary Search tree, Application of tree.

Total periods: 100

TEXT BOOKS:

1. PradipDey and Manas Ghosh, "**Programming in C**,"Second Edition, Oxford University Press, New Delhi, 2007

REFERENCE BOOKS:

1. D. Samanta, "**Classic Data Structures**", Second Edition, PHI Learning, New Delhi, 2004
2. Behrouz A. Forouzan and Richard F. Gilberg, "**A Structured Programming Approach using C**,"Third Edition, Cengage Learning, New Delhi, 2007.

B.Tech. I Year

14BT1ES03: COMPUTER AIDED ENGINEERING DRAWING

(Common to All Branches of Engineering)

Int. Marks: 25; Ext. Marks: 50; Total Marks: 75

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PRE-REQUISITES: Nil

COURSE DESCRIPTION: This course deals with the concepts of computer-aided sketching, and orthographic and isometric projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

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

- CO1:** Produce different views and projection in drawing.
- CO2:** Use modern CAD software for different designs.
- CO3:** Create multi-view drawings suitable for presentation to a general audience.

Detailed Syllabus:

UNIT-I: INTRODUCTION TO COMPUTER AIDED SKETCHING

(20 periods)

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning, Different types of lines, Material conventions and free hand practicing, Definitions of Principle planes and other planes. Computer screen, layout of the software, Creation of 2D/3D environment, Selection of drawing size and scale, Standard tool bar/menus, Coordinate system, and description of most commonly used toolbars, Navigational tools, Commands and creation of Lines, Co-ordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity.

UNIT - II: ORTHOGRAPHIC PROJECTIONS (20 periods)

Introduction, Definitions- Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), Projection of lines inclined to one plane, inclined to both the planes, finding true lengths and true inclinations (No application problems).

UNIT- III: ORTHOGRAPHIC PROJECTIONS OF PLANE SURFACES
(20 periods)

Introduction, Definitions-projections of plane surfaces-triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (Simple problems inclined to any one plane only)

UNIT - IV: PROJECTIONS OF SOLIDS **(20 periods)**

Introduction, Projections of right regular prisms, pyramids, cylinders and cones in different positions. (Simple problems inclined to any one plane only). Isometric projections and isometric views.

UNIT - V: SECTIONS AND DEVELOPMENT OF LATERAL SURFACES OF SOLIDS **(20 periods)**

Introduction, Section planes and sectional views of right regular solids - prisms, cylinder, pyramids and cone resting with base on HP. True shapes of the sections.

Development of Surfaces: Right regular solids – prisms, cylinder, pyramids, cone and their sectional parts.

Total Periods: 100

TEXT BOOKS:

1. D.M. Kulkarni, A.P. Rastogi and A.K. Sarkar, **Engineering Graphics with Auto CAD**, PHI Learning Private Limited, Revised Edition, August 2010.
2. N D Bhat & V M Panchal, **Engineering Drawing**, Charotar Publishing House, Gujarat, 51st edition, 2013.

REFERENCE BOOKS:

1. Sham Tickoo, **AutoCAD 2013 For Engineers And Designers**, Dreamtech Press, 2013
2. T Jeyapoovan, **Engineering Drawing and Graphics Using Autocad**, Vikas Publishing House, 3rd Edition, 2010.
3. Jolhe, **Engineering Drawing**, Tata McGraw Hill Education Private Limited, 1st Edition, 2007.
4. Basant Aggarwal, **Engineering Drawing**, Tata McGraw Hill Education Private Limited, 1st Edition, 2008.

B.Tech. I Year

14BT1BS05: ENGINEERING PHYSICS & ENGINEERING CHEMISTRY LABORATORY

(Common to All Branches of Engineering)

Int. Marks: 25; Ext. Marks: 50; Total Marks: 75

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PRE-REQUISITES: Intermediate Physics & Chemistry

COURSE DESCRIPTION:

Engineering Physics: The course deals with experimental verification of characteristics of p-n junction diode, photodiode, LED, and semiconductor laser diode. It also covers experimental determination of energy gap and carrier concentration of a semiconductor material, wave length of a laser source, rigidity modulus of a material, size of fine particle, dielectric constant, numerical aperture of optical fibre, frequency of electrically vibrating tuning fork and magnetic field along axial line of a current carrying coil. Verification of transverse laws of stretched string is also included.

Engineering Chemistry: This course deals with the estimation of hardness, alkalinity and dissolved oxygen of water samples by volumetric methods. It provides hands-on experience on different instrumental methods such as conductivity meter, potentiometer, pH meter, and colorimeter. This course also deals with the methods of synthesis of nano metal-oxides and novalac resin.

COURSE OUTCOMES:

Engineering Physics:

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

CO1. Acquire analytical skills in the determination of

- Wave length of laser.
- Divergence angle for laser beam.
- Numerical aperture of an optical fibre.
- Hall coefficient for semiconductor material.
- Energy gap of semiconductor material.
- Verifying the laws of stretched string.
- Characteristics of p-n junction diode, and light emitting diode.

Engineering Chemistry:

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

CO1: 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.

CO2: Acquire analytical skills in the determination of P^H of a solution, EMF of a solution, spectrophotometric determination of iron and estimation of iron in cement through instrumental methods of analysis.

CO3: Develop skills in the designing of synthetic methods for the preparation of polymers and Nanomaterials.

List of experiments :

Engineering Physics:

Conduct a minimum of any **Ten** of the following experiments.

1. Determination of wavelength of a laser source using diffraction grating
2. Determination of numerical aperture of an optical fiber
3. I-V Characteristics of a p-n junction diode
4. Characteristics of LED source.
5. Hall effect
6. Photo diode – characteristics
7. Energy gap of a material of a p-n Junction
8. Magnetic field induction along the axis of a current carrying coil-Stewart and Gee's method
9. Melde's experiment - transverse & longitudinal modes
10. Verification of transverse laws of stretched string - Sonometer
11. Determination of dielectric constant
12. Characteristics of laser source.
13. Determination of particle size by using a laser source
14. Determination of the rigidity modulus of the material of wire using torsional pendulum

Engineering Chemistry:

A minimum of any **Ten** experiments are to be conducted among the following:

1. Estimation of Hardness of water by EDTA method.
2. Estimation of alkalinity of Water.
3. Estimation of Dissolved Oxygen in water.
4. Estimation of Ferrous Iron by Dichrometry.
5. Conductometric titration of strong acid Vs strong base
6. Determination of P^H of a given solution by P^H metry.
7. Estimation of Ferrous ion by Potentiometry.
8. Estimation of Ferric iron in cement by Colorimetric method.
9. Preparation of Novalac Resin.
10. Synthesis of Nano metal-oxide using sol- gel process.
11. Determination of the capacity of the given cation-exchange Resin.
12. Measurement of viscosity by Redwood viscometer.

Duration: 3 Periods for each experiment

Total periods: 30

TEXT BOOKS:

1. **Physics Laboratory Manual**
2. K. Mukkanti, **Practical Engineering Chemistry**, BS Publications, 2013.
3. K.N. Jayaveera, K.B. Chandra Sekhar, **Chemistry laboratory manual**, S.M. Enterprises Limited, 2013.

B.Tech. I Year

14BT1ES04: PROGRAMMING IN C & DATA STRUCTURES LAB

(Common to ECE, EEE, EIE, ME and CE)

Int. Marks: 25 Ext. Marks: 50 Total Marks: 75

L	T	P	C
-	-	3	3

PRE-REQUISITES: Nil

COURSE DESCRIPTION: This course provides programming practice in C language specifically syntax of C, input-output processing, derived data types, file processing, and data structures.

COURSE OUTCOMES:

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

- CO1:** Design, code, test, debug and execute programs in C.
- CO2:** Implement and use common features found in C programs – arrays, pointers, strings, stacks and queues.
- CO3:** Select the appropriate data structure and algorithm design method for a specified problem.

Week 1:

- a. Write a C program to print the string "SVEC" at four corners and center of the screen using single printf statement.
- b. Mr. Gupta deposits Rs.1000 in a bank. The bank gives simple interest of 15% per annum. Write a program to determine the amount in Mr. Gupta's account at the end of 5 years. (Use the formula $I = PTR/100$)
- c. Write a program to exchange the values of two variables without using the third variable.

Week 2:

- a. A cashier has currency notes of denominations Rs.10, Rs. 50 and Rs. 100. If the amount to be withdrawn is input in hundreds, find the total number of notes of each denomination the cashier will have to give to the withdrawer.
- b. In a town, the percentage of men is 52. The percentage of total literacy is 48. If total percentage of literate men is 35 of the total population, write a program to find the total number of illiterate men and women if the population of the town is 8000.
- c. Assume that any month is of 30 days. Input total days through keyboard. Find out the exact number of Years, Months & Days.

Week-3

- a. Write a program that reads in a number, then reads in a single digit and determines whether the first number contains the digit. If it does, the program should display how many times the digit occurs in the number.
- b. Write a program to print Pythagoras triplets $a = m^2 - n^2$, $b = (m^2 + n^2)/2$, $c = (m^2 + n^2)/2$ where $m = 1, 3, 5, \dots$; $n = m + 2, m + 4, \dots$
- c. Write a program to produce the following pattern:
a.

```
1 2 3 4 5 6 7 8 9 10
 1 2 3 4 5 6 7 8 9
 1 2 3 4 5 6 7 8
 1 2 3 4 5 6 7
 1 2 3 4 5 6
 1 2 3 4 5
 1 2 3 4
 1 2 3
 1 2
 1
```

b.

```
1 2 3 4 5 6 7 8 9 10
 2 3 4 5 6 7 8 9 10
 3 4 5 6 7 8 9 10
 4 5 6 7 8 9 10
 5 6 7 8 9 10
 6 7 8 9 10
 7 8 9 10
 8 9 10
 9 10
 10
```

Week-4

- a. Write a C program to generate Pascal's triangle.
- b. Write a C program to construct a pyramid of numbers.

Week-5

- a. The formula used to calculate the amount of interest on a bank account that compounds interest daily is
$$i = p(1 + r)^d - p$$
 where:
 i is the total interest earned,
 p is the principal (the amount originally deposited in the account),
 r is the rate of interest as a decimal less than 1 (for example, 15 percent is expressed as 0.15), and
 d is the number of days the money is earning interest.
Write a program that accepts values for p , r and d and calculates the interest earned.
- b. A character is entered through keyboard. Write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol. The following table shows the range of ASCII values for various characters.

<u>Characters</u>	<u>ASCII values</u>
A - Z	65 - 90
a - z	97 - 122
0 - 9	48 - 57
Special Symbols	0 - 47, 58 - 64, 91 - 96, 123 - 127
- c. Write a C program to convert a given decimal number into its equivalent
 - i. Binary Number
 - ii. Octal Number
 - iii. Hexadecimal Number
 - iv. Quinary Number(base 5)

Week-6

- a. Write a program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, %, use switch statement)
- b. Write a program to find the sum of individual digits of a positive integer.
- c. A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first N terms of the sequence.
- d. Write a program to generate all the prime numbers between 1 and N, where N is a value supplied by the user.

Week 7:

- a. Write a program to find the largest and smallest number in a list of integers.
- b. Write a program to perform the following:
 - i) Addition of two matrices.
 - ii) Multiplication of two matrices.

Week-8

- a. Write a C program that uses functions to perform the following operations:
 - i) To insert a sub-string in to given main string from a given position.
 - ii) To delete n Characters from a given position in a given string.
- b. Write a C program to determine if the given string is a palindrome or not
- c. Write a C Program to implement all string operations.
 1. Find the length of string
 2. Reverse the string.
 3. Comparing the two strings.
 4. Copy the string .

Week -9:

- a. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
- b. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 10:

- a. Write a C program to count the lines, words and characters in a given text.
- b. Write a program that simulates a password entry.
- c. Write a program to read a five letter word and generate all possible combinations of two-letter words using those five letters.

Week 11:

- Write a program to perform the following:
- i) Linear search
 - ii) Binary search

Week 12:

- Write a program to perform the following:
- i) Selection sort
 - ii) Insertion sort
 - iii) merge Sort
 - iv) Quick sort

Week 13:

Write programs to perform the following using recursion

- i) To find the factorial of a given integer.
- ii) To solve Towers of Hanoi problem

Week-14

- a. Write a C Program to return a substring from a main string using pointers.
- b. Write a C program to return character frequency count in a text using pointers

Week-15

- a. Write a C program that uses functions to perform the following operations:
 - i) Reading a complex number
 - ii) Writing a complex number
 - iii) Addition of two complex numbers
 - iv) Multiplication of two complex numbers
 (Note: represent complex number using a structure.)
- b. Write a Program to enter records of students display in sorted order according to ID number.
- c. Define a structure to store employee's data with the following specifications:
Employee-Number, Employee-Name, Basic pay, Date of Joining
 - i) Write a function to store 10 employee details.
 - ii) Write a function to implement the following rules while revising the basic pay.
 - If Basic pay \leq Rs.5000 then increase it by 15%.
 - If Basic pay $>$ Rs.5000 and \leq Rs.25000 then it increase by 10%.
 - If Basic pay $>$ Rs.25000 then there is no change in basic pay.
 - iii) Write a function to print the details of employees who have completed 20 years of service from the date of joining.

Week-16

- a. Write a program which copies one text file to another.
- b. Write a program to reverse the first N characters of a given text file.

Note: The file name and N are specified through command line.

- c. Consider the following text file:

Input File:

S.No.	Customer_ID	Item No.	Qty.	Price Per Item (Rs.)
1.	C01	I1	2	10
2.	C02	I2	5	50
3.	C03	I2	5	50
4.	C04	I4	10	10

Write a program to print the output in following format by giving the Customer_ID as an input.

Output:

S.V. PROVISION STORES		
TIRUPATI		
Customer_ID: C01		Date: 12-08-2010
Item	Qty	Price
II	2	20
Total		20

Week - 17:

Write a program to implement the following operations on Singly Linked List

- a. List Creation b. Insertion c. Deletion d. Display

Week -18:

Write a program to implement the following operations on Circular Linked List

- a. List Creation b. Insertion c. Deletion d. Display

Week -19 :

Write a program to implement the following operations on Doubly Linked List

- a. List Creation b. Insertion c. Deletion d. Display

Week- 20:

Write a program to implement stack operations using:

- i) Arrays ii) Pointers

Week -21 :

Write a program to implement linear queue operations using:

- i) Arrays ii) Pointers

Week -22:

- a) Write a program to implement circular queue operations using arrays

- b) Write a program to implement traversals of a Binary tree

- i. Preorder ii. Post order iii. Inorder

Week- 23

Write a program to implement insertion and deletion in a binary search tree.

REFERENCE BOOKS:

1. Behrouz A. Forouzan and Richard F. Gilberg, "A **Structured Programming Approach using C**," Third Edition, Cengage Learning, New Delhi, 2007.
2. PradipDey and Manas Ghosh, "**Programming in C**", Second Edition, Oxford University Press, New Delhi, 2007
3. D. Samanta, "**Classic Data Structures**", Second Edition, PHI Learning, New Delhi, 2004.

B.Tech. I Year

14BT1ES06: ENGINEERING & IT WORKSHOP

(Common to All Branches of Engineering)

Int. Marks: 25; Ext. Marks: 50; Total Marks: 75

L	T	P	C
-	-	3	3

PRE-REQUISITES: Nil

COURSE DESCRIPTION:

Engineering Workshop: The course provides hands-on training in the trades Carpentry, Fitting, House-wiring, Tin Smithy, Foundry. Overview of metal cutting processes, plumbing and welding is provided through live demonstrations.

IT Workshop: This course deals with practice sessions on PC hardware, Internet, World Wide Web, MS-Word, Excel, Power Point and Publisher. 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:

ENGINEERING WORKSHOP:

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

- CO1:** Utilize workshop tools for engineering practice.
- CO2:** Employ skills for the production a component for real time applications.
- CO3:** Appreciate the hard work and intuitive knowledge of the manual workers.

IT WORKSHOP:

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

1. Acquire 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. Gain effective communication skills through IT tools.
5. Update knowledge and skills in PC maintenance and usage of latest Operating Systems and Office automation tools.

**DETAILED SYLLABUS:
ENGINEERING WORKSHOP:**

1. Trades for Exercise:

Any TWO jobs from each trade should be performed.

- a) **Carpentry Shop** : Cross lap joint, mortise and tenon, T-joint, dove tail joint.
- b) **Fitting Shop** : Square fit and V-fit, semi circular fit, dove tail fit.
- c) **Sheet Metal Shop** : Trapezoidal tray, square tin, funnel, cylinder.
- d) **House wiring** : Wiring for two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, tube light connection, godown wiring.
- (e) **Foundry** : Preparation of casting using single piece pattern,
Preparation of casting using split piece pattern

2. Trades for Demonstration:

- a) **Welding**
- b) **Metal Cutting**
- c) **Plumbing**

In addition to the above, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, plastics, steels, meters, gauges, equipment, first-aid and shop safety shall be demonstrated through charts, layouts, figures, circuits, CDs/DVDs.

IT WORKSHOP:

a) PC Hardware

Week 1: Identify the peripherals of a personal computer, components in a Central Processing Unit (CPU) and its functions, block diagram of CPU along with the configuration of each peripheral.

Week 2: Demonstrating assembling and disassembling of the Personal Computer.

Week 3: Introduction to Operating Systems, Components of OS, Installation of Microsoft Windows-XP Operating System.

Week 4: Introduction to LINUX OS, Installation of LINUX OS, Basic DOS commands – mkdir, cd, cls, del, copy, attrib, date, path, type, format, exit. Basic commands in LINUX - cat, ls, pwd, rm, rmdir, cd, cp, mv, who, date, cal, clear, man, wc.

Week 5: Hardware & Software Troubleshooting: Diagnosis of PC malfunction, types of faults, common issues and how to fix them. Basic Hardware & Software Troubleshooting steps, PC diagnostic tools.

b) MS-Office:

MS Word

Week 6: Introduction to MS-Word, Importance of Word as Word Processor, Overview of toolbars, Saving, Accessing files, Using help and resources. Create a word document using the features: Formatting fonts, Drop cap, Applying text effects, Using character spacing, Borders and shading, Inserting headers and footers, Using date and time option.

Week 7: Create a word document in MS-Word using the features: Inserting tables, Bullets and numbering, Changing text direction, Hyperlink, Images from files and Clipart, Drawing toolbar and Word art.

Week 8: Create an invitation using Mail Merge in MS-Word

MS Power Point:

Week 9: Introduction to MS-Power Point, Utilities, Overview of toolbars, PPT orientation, slide layouts, Types of views.

Create a Power Point Presentation using the features: Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows.

Week 10: Create a Power Point Presentation using the features: Auto content wizard, Hyperlinks, Inserting images, Clip art, Audio, Video, Custom animation, Slide hiding, Tables and Charts.

MS Excel:

Week 11: Introduction to MS-Excel as a Spreadsheet tool, Overview of toolbars, accessing, Saving excel files, Using help and resources.

Create a spreadsheet using the features: Gridlines, Format cells, Summation, Auto fill, Formatting text, Formulae in Excel Charts.

Week 12: Create a spreadsheet using the features: Split cells, Sorting, Conditional formatting, Freeze panes, Pivot tables, Data validation.

MS Publisher & World Wide Web

Week 13: Introduction to MS-Publisher, Overview of toolbars, Saving files, Templates, Layouts.

Create a website using the features: Home page, About us, Department, Contact page.

Internet & Computer Security

Week 14: Search Engines and Cyber Hygiene: Introduction to computer networking, Demonstration on network components, Drivers loading and Configuration settings, Mapping of IP addresses, Configuration of Internet and Wi-Fi. Bookmarks, Search toolbars and pop up blockers. Types of search engines and how to use search engines, Awareness of various threats on Internet, Types of attacks and how to overcome. Installation of antivirus software, Configuration of personal firewall and Windows update on Computers.

Total Periods: 48

REFERENCE BOOKS:

ENGINEERING WORKSHOP:

1. V. Ramesh Babu, **Engineering Work shop practice**, VRB Publishers Private Limited, 2009.
2. P.Kannaiah and K.L.Narayana, **Work shop Manual**, SciTech Publishers, 2009.
3. K. Venkata Reddy, **Workshop Practice Manual**, BS Publications, 2008

IT WORKSHOP:

1. Vikas Gupta, "**Comdex Information Technology Course Tool Kit**," 2nd Edition, WILEY Dreamtech, New Delhi, 2006.
2. ITL Education, "**Introduction to Information Technology**," 2nd Edition, Pearson Education, New Delhi, 2005.
3. **IT Workshop Laboratory Manual**, Department of IT, SVEC, 2014.

B.Tech. I Year
14BT1HS02: ENGLISH LANGUAGE
COMMUNICATION SKILLS LABORATORY

(Common to All Branches of Engineering)

Int. Marks: 25; Ext. Marks: 50; Total Marks: 75

L T P C
- - 3 3

PRE-REQUISITES: Basic Speaking and Listening Skills.

COURSE DESCRIPTION: The course contains practice sessions which are classified into software based learning, grammar and activities. English Speech Sounds and Phonemic Transcription, Word Stress and Sentence Stress, Accent, Rhythm and Intonation, Paralinguistic Features, Vocabulary Building, are aided by software. Grammar sessions include Functional Grammar: Tenses, Speech, Voice, Error Correction and Essay Writing. Just a Minute, Impromptu Speech and Elocution, Role Plays, Telephonic Etiquette, Listening Skills, Describing People, Places and Objects, Presentation Skills and Information Transfer are activity oriented.

COURSE OUTCOMES:

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

CO1: Gain practical knowledge in

- English Speech Sounds
- Stress Patterns in word and sentence
- Intonation Patterns
- Paralinguistic Features
- Vocabulary Enrichment

CO2: Analyse the functional part of the grammatical elements for writing grammatically correct English in various academic and personal practices.

CO3: Develop various language functions to fulfil the purpose of speaking and writing in academic, professional and personal contexts.

CO4: Apply the knowledge of the usage of various language software for enhancing the language skills more and more thereby acquiring unconsciously the language functions and elements that are commonly used in various contexts.

CO5: Communicate effectively with engineering community and society in various formal, informal and neutral situations.

6. Demonstrate various language functions by participating in
 - Just A Minute
 - Impromptu Speech
 - Elocution
 - Role Plays
 - Presentations
7. Engage in lifelong learning for the development of the communicative competence for meeting the global challenges.

Detailed list of experiments / Lab practice Sessions:

1. English Speech Sounds and Phonemic Transcription
2. Word Stress and Sentence Stress
3. Accent, Rhythm and Intonation
4. Paralinguistic Features.
5. Vocabulary Building
 - a. Importance of Vocabulary Enrichment in Speaking: Spelling
 - b. Synonyms–Antonyms–Prefix–Suffixes–One Word Substitutes
 - c. Idioms and Phrases–Homophones–Homonyms–Homographs.
6. Functional Grammar
 - a. Parts of Speech
 - b. Tenses
 - c. Change of Speech
 - d. Change of Voice
 - e. Word Order and Error Correction
 - f. Essay Writing
7. Just a Minute, Impromptu Speech and Elocution
8. Role Plays
9. Telephonic Etiquette
10. Listening Skills
11. Describing People, Places and Objects
12. Presentation Skills
13. Information Transfer

REFERENCES:

1. Departmental Lab Manual

SUGGESTED SOFTWARE:

1. Mastering English: Vocabulary, Grammar, Punctuation and Composition.
2. Dorling Kindersley Series of Grammar, Punctuation, Composition etc.
3. Language in Use 1, 2 and 3
4. Learning to Speak English 8.1, the Learning Company – 4 CDs.
5. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
6. English Pronunciation Dictionary by Daniel Jones
7. Speech Solutions
8. Cambridge Advanced Learner’s Dictionary - 3rd Edition
9. Centronix - Phonetics
10. Rosetta Stone
11. Let’s Talk English, Regional Institute of English South India.

II B.Tech - I Semester
14BT3BS01: MATRICES AND NUMERICAL
METHODS

(Common to CE & ME)

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

PRE-REQUISITES:

Engineering Mathematics of I year B.Tech

COURSE DESCRIPTION:

Matrices, systems of equations; eigen values, eigen vectors; solutions of algebraic and transcendental equations, curve fitting, interpolation, Numerical differentiation and integration, numerical solutions of ordinary differential equations, Fourier series and integrals, partial differential equations.

COURSE OUTCOMES:

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

CO1 : Acquire knowledge in

- (a) Estimating ranks and solutions of linear equations through matrices.
- (b) Solutions of algebraic and transcendental equations
- (c) Fitting of different curves to discrete data.
- (d) Estimating the unknown values of different parameters through interpolation.
- (e) Estimating values of derivatives from the given data
- (f) Numerical differentiation and integration
- (g) Numerical solutions of differential equations
- (h) Fourier series, Fourier transforms and partial differential equations.

CO2 : (i) Develop analytical skills for the problems involving

- (a) differential equations through numerical methods
- (b) partial differential equations.

(ii) Develop skills in analyzing

- (a) Properties of functions through Fourier series.
- (b) Numerical techniques in differentiation and integration of higher complexity.

CO3: Develop skills in the design of mathematical equations and arrive at numerical solutions involving

- (a) Curves that best fits the given data.
- (b) Integrations of higher complexity.
- (c) Ordinary differential equations.
- (d) Oscillatory motion and heat transformations.

Detailed syllabus :

UNIT - I: MATRIX THEORY & APPLICATIONS (10 periods)

Matrices: Rank of a matrix, echelon form, normal form, inverse of a matrix by row operation; Homogenous and non-homogenous linear systems, consistency and solutions of linear system of equations, solutions of equations by Gauss elimination method; Eigen values, eigen vectors - properties; Cayley - Hamilton theorem (without proof); Inverse and powers of a matrix using Cayley- Hamilton theorem.

UNIT -II: NUMERICAL SOLUTIONS, CURVE FITTING AND INTERPOLATION (9 periods)

Solutions of algebraic and transcendental equations by bisection method, Regula-falsi method, Newton-Raphson method. Curve fitting by the principle of least squares - fitting of a straight line, parabola, exponential curves. Interpolation: Newton's forward formula, Newton's backward formula, Lagrange's interpolation formula.

UNIT- III: NUMERICAL DIFFERENTIATION, INTEGRATION AND SOLUTIONS OF O D E (8 periods)

Numerical differentiation using Newton's forward formula, Newton's backward formula; Numerical integration using trapezoidal rule, Simpsons 1/3rd Rule; Simpsons 3/8th Rule. Numerical solutions of first order ordinary differential equations by Euler's method, Euler's modified method, Runge - Kutta method (4th order only).

UNIT-IV: FOURIER SERIES AND FOURIER INTEGRALS (9 periods)

Fourier series of functions in $(0, 2\pi)$, $(-\pi, \pi)$, $(0, \pi)$, $(-\pi/2, \pi/2)$; Determination of Fourier coefficients by Euler's formulae. Even and odd functions, Fourier series for periodic functions; Half - range Fourier sine and cosine expansions. Fourier integral theorem (statement only); Fourier sine and cosine integrals, Fourier sine and cosine transforms.

UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS (9 periods)

Formation of partial differential equations, method of separation of variables for second order partial differential equations, solutions of one dimensional wave equation- heat equation.

Total periods: 45

TEXTBOOKS:

1. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N Prasad, Mathematical Methods, S.Chand and Company, 8th edition, 2013.

REFERENCE BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42/e, 2012.
2. S.S.Sastry, Introductory methods of Numerical Analysis, Prentice Hall of India, 4th edition, 2005.

II B. Tech - I Semester
14BT30234: BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

PRE-REQUISITES:

Engineering Mathematics and Engineering Physics.

COURSE DESCRIPTION:

Basics of electrical DC and AC circuits; principle of operation and applications of DC machines, transformers, and induction motors; Electrical and electronic measuring instruments construction and operation; Rectifier devices; bipolar transistors and its characteristics.

COURSE OUTCOMES:

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

- CO1:** Demonstrate knowledge on
- i. Electrical and electronic circuits.
 - ii. Construction and operation of electrical machines, electrical and electronic instruments.

CO2: Analyze various electrical and electronic circuits.

CO3: Evaluate the electrical and electronic circuit parameters and performance of electrical machines.

Detailed Syllabus:

UNIT- I BASICS OF ELECTRICAL ENGINEERING (9 Periods)

Sources of electricity, basic circuit components, electric field, electric current, potential and potential difference, EMF, electric power, Ohm's law, node, path, loop, branch, resistive networks, inductive networks, capacitive networks, Kirchhoff's laws, series-parallel circuits, nodal analysis, mesh analysis, star-delta and delta-star transformations; problems.

UNIT - II AC FUNDAMENTALS (9 Periods)

Production of alternating voltage, phase and phase difference, phasor representation of alternating quantities, behavior of AC series, parallel and series-parallel circuits, power factor, power in AC circuit - problems.

UNIT - III DC AND AC MACHINES (10 Periods)

DC Machines :Construction and working of a DC Generator and DC motor and their types, EMF equation of a DC generator, torque equation of a DC motor, applications of DC generators and DC motors - problems.

Transformers: Construction and working of a single phase transformer, EMF Equation.

AC Machines : Construction and working of a three phase induction motor, applications of three phase induction motors, problems.

UNIT-IV: ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENT (9 Periods)

Electrical Measuring instruments: Construction, working principle, torque equation and applications of PMMC and moving iron (repulsion type and attraction type) instruments; Dynamometer type wattmeter: construction and working principle.

Electronic Measuring instruments : Electronic voltmeters and ammeters, rectifier type voltmeter and ammeter, advantages and disadvantages, digital voltmeters, digital multi-meters (elementary concepts only).

UNIT-V: RECTIFIER CIRCUITS AND BIPOLAR JUNCTION TRANSISTORS (8 Periods)

Rectifier circuits : DC voltage and current, Peak Inverse Voltage (PIV), ripple factor, efficiency and regulation of half wave and full wave rectifiers.

Bipolar Junction Transistors : Formation of PNP / NPN junctions, transistor as an amplifier, need for biasing, single stage CE amplifier, frequency response of CE amplifier, necessary conditions for oscillators, RC phase shift oscillator and Crystal oscillator.

Total Periods: 45 periods

TEXT BOOKS:

1. V.K. Mehta and Rohit Mehta, Principles of Electrical and Electronics Engineering, 2nd edition, S.Chand, New Delhi, 2007.
2. M.S. Naidu and S. Kamakshaiah, Introduction to Electrical Engineering, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

REFERENCE BOOKS:

1. Theraja B.L & Theraja A.K, A text book of electrical technology, Vol-I, S.Chand, New Delhi, 2009.
2. T. K. Nagsarkar, M. S. Sukhija, Basic Electrical Engineering, Oxford University Press, New Delhi, 2011.
3. K. Lal Kishore, Electronic Devices and Circuits, 3rd Edition, BS Publications, Hyderabad, 2008.

II B.Tech - I Semester

14BT30301: STRENGTH OF MATERIALS

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

PRE-REQUISITES:

Engineering Mechanics

COURSE DESCRIPTION:

Analysis of stresses and strains of mechanical and structural components; Action of shear; Bending and torsional stresses; deflection of springs and beams due to axial and transverse loadings; Thin and thick walled pressure vessels.

COURSE OUTCOMES:

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

- CO1:** Utilize knowledge of computing the stresses and strains to provide information required for further design.
- CO2:** Analyze the requirements and arrive at estimates of loading on machine elements.
- CO3:** Analyze components under complex loading conditions by simplifying under suitable assumptions.
- CO4:** Show loading diagrams pictorially and represent principal stresses.

Detailed Syllabus:

UNIT - I: SIMPLE STRESSES AND STRAINS (10 periods)

Types of Stresses, small strains; Hooke's law, stress-strain diagram, working stress, factor of safety, lateral strain, poisson's ratio, volumetric strain, elastic moduli and relationship between them, bars of varying section, composite bars, temperature stresses, strain energy, principal stresses (elementary treatment should be given), Mohr's circle.

UNIT - II: SHEAR FORCE AND BENDING MOMENT (8 periods)

Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, simply supported beams subjected to point loads, uniformly distributed loads, uniformly varying loads and combination of these loads, point of contraflexure.

UNIT - III: BENDING, SHEAR AND TORSIONAL SHEAR STRESSES (13 periods)

Theory of simple bending, bending equation, determination of flexural stresses for simple cases, section modulus, shear stress formula, Shear stress distribution across various beams & sections like rectangular, circular, triangular, I, T-sections; Theory of pure torsion, torsion equation, Assumptions made in the theory of pure torsion, Torsional moment of resistance, Polar section modulus.

UNIT - IV DEFLECTION OF BEAMS (7 periods)

Relationship between curvature, slope and deflection, slope and deflection of cantilever and simply supported beams by double Integration method & Macaulay's method, moment area method.

UNIT - V PRESSURE VESSELS (7 periods)

Thin seamless cylindrical shells, derivation of formula for longitudinal and circumferential stresses, volumetric strain; Thin spherical shells; Thick cylinders under internal and external pressure.

Total Periods:45

TEXT BOOKS:

1. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Mechanics of Materials, Laxmi Publications, 1st edition, 2009.
2. S. Ramamrutham, R. Narayanan, Strength of Materials, Dhanpat Rai Publications, 14th edition, 2011.

REFERENCE BOOKS:

1. James M. Gere, Stephen Timoshenko, Mechanics of Materials, CBS Publications, 2nd edition, 2004.
2. Beer, Johnston & Dewolf, Mechanics of Materials, Tata McGraw-Hill Education, 3rd edition, 2004.
3. S.S Rattan, Strength of materials, Tata McGraw Hill Publications, 2nd edition, 2011.

II B.Tech - I Semester
14BT30302: MATERIALS SCIENCE AND METALLURGY

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

PRE-REQUISITES:

Engineering Physics and Chemistry.

COURSE DESCRIPTION:

Atomic and crystal structure of metal; Types of metals and their application; formation of alloys; Equilibrium diagrams; Heat treatment procedures and their influence on mechanical properties; Structure and properties of ferrous materials and Non-Ferrous materials; Production of metal powders and study of composite materials.

COURSE OUTCOMES:

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

- CO1:** Explain how materials are formed and are classified on the basis of atomic arrangement.
- CO2:** Apply the Iron-iron-carbide diagram in ferrous material selection problems.
- CO3:** Suggest suitable heat treatment to endow required mechanical behavior as per industrial requirements.
- CO4:** Identify different materials by their microstructure and their applications.

Detailed Syllabus:

UNIT - I: STRUCTURE OF METALS (9 periods)

Introduction to engineering materials, classification, Primary and secondary bonding in materials, space lattice, unit cell; mechanical properties of materials; Structure of materials: SC, BCC, FCC, HCP; crystal defects: point, line, planar, and volume, grain and grain boundaries; Effect of grain boundaries on properties of metal/alloys, determination of grain size.

UNIT - II: PHASE DIAGRAMS (9 periods)

Cooling curve of pure metal and alloy, phase, Phase diagram, Gibbs's phase rule, Hume Rothery rules, binary isomorphous system, binary eutectic alloy system (Lead-Tin System), invariant Reactions: Eutectic, eutectoid, Peritectic, Peritectoid, Iron-Iron Carbide phase diagram, Effect of alloying elements on Iron-Iron carbon system.

UNIT - III: HEAT TREATMENT (9 periods)

Introduction, Annealing and its types, Normalizing, Hardening, Tempering, TTT diagrams, surface heat treatment processes: Carburizing, Nitriding, Cyaniding, Carbonitriding, Flame and Induction hardening, Cryogenic treatment of alloys.

**UNIT -IV FERROUS, NON FERROUS MATERIALS AND THEIR ALLOYS
(9 periods)**

Ferrous materials and its alloys: Structure and properties of Cast Iron: White cast iron, Malleable cast iron, Grey cast iron, Spheroidal cast iron, Alloy cast iron, classification of steels, structure and properties of steels, Plain carbon steel, Low alloy steels, Hadfield manganese steels, stainless steel, and Tool steels.

Non-ferrous materials and its alloys: Properties and applications of copper and its alloys, Aluminium and its alloys, Titanium and its alloys, and super alloys.

**UNIT-V: POWDER METALLURGY AND COMPOSITE MATERIALS
(9 periods)**

Powder Metallurgy: Introduction, methods of production of metal powders, mixing, Blending, Compacting, Sintering, applications and limitations of powder metallurgy.

Composite Materials: Introduction, types of matrices and reinforcement, polymer Matrix Composites: GFRP, CFRP, Metal Matrix Composites(MMC).

Total Periods: 45

TEXT BOOKS:

1. Sidney H. Avner, Introduction to Physical Metallurgy, Tata Mc Graw Hill, 2nd edition, 1997.
2. Kodigre V D, Material Science and Metallurgy, Everest Publishing House, 31st edition, 2011.

REFERENCE BOOKS:

1. V. Raghavan, Physical Metallurgy: Principles and Practices, PHI, 2nd edition, 2006.
2. William. D. Callister, Materials Science & Engineering-An Introduction, John Wiley and sons, 2nd edition, 2014.
3. Donald R. Askeland, Pradeep P.Fulay, D.K.Bhattacharya, Materials Science and Engineering, Cengage Learning, 1st edition, 2010.
4. R.K.Rajput, Engineering Materials and Metallurgy, S. Chand, 1st edition, 2006.

II B.Tech - I Semester
14BT30303: THERMODYNAMICS

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

PRE-REQUISITES:

Engineering Physics, Engineering Chemistry & Engineering Mathematics

COURSE DESCRIPTION:

Thermodynamic system; Energy interactions; Work transfer and Heat Transfer in flow and non- flow systems; Kinetic theory of gases; Equation of state; Laws of thermodynamics; Reversible and irreversible processes; Entropy; Pure substance and Gas power cycles.

COURSE OUTCOMES:

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

- CO1:** Employ the basic concepts such as conservation of mass and energy, work interaction, heat transfer and first law of thermodynamics.
- CO2:** Apply the concept of second law and entropy to design simple systems.
- CO3:** Analyze the gas power cycles and identify methods to improve the cycle efficiency.

Detailed Syllabus:

UNIT - I: BASIC CONCEPTS

(7 Periods)

System, control volume, surrounding, boundaries, Universe, types of systems, Thermodynamic equilibrium, state, property, process, cycle; reversibility, Quasi - static process, point and path function, irreversible process, work transfer and heat transfer, Zeroth law of thermodynamics.

UNIT-II: FIRST LAW OF THERMODYNAMICS AND SECOND LAW OF THERMODYNAMICS

(9 Periods)

First Law of Thermodynamics: Perpetual Motion Machine (PMM) of first kind, limitations of first law, first law for a closed system, Energy-A property of system; First law applied to a flow process: steady flow energy equation.

Kelvin-Planck and Clausius statements of second law and their equivalence; Thermal reservoir, heat engine, refrigerator, heat pump; PMM of second kind, Carnot cycle, Carnot's theorem.

UNIT - III: ENTROPY AND AVAILABILITY

(7 Periods)

Clausius theorem and Clausius inequality, entropy as a property, Principle of entropy, Third law of Thermodynamics; Availability and irreversibility; Available energy: Maximum work in a Reversible process; Availability in Non - flow and flow Processes.

UNIT - IV: PURE SUBSTANCES AND PROPERTIES OF GASES AND GAS MIXTURES (11 Periods)

Introduction: P-V, P-T and T-S diagrams for pure substances, Mollier diagram, quality and dryness fraction, use of steam tables for thermodynamic properties.

Thermodynamic relations: Gibbs and Helmholtz functions, Maxwell's relation and TDS equations.

Ideal gas: equation of state, mole fraction, mass fraction gravimetric and volumetric analysis, Dalton's law of partial pressure, Mole fraction, volume fraction and partial pressure, equivalent gas constant molecular internal energy, enthalpy, specific heats and entropy of mixture of perfect gases and vapour.

UNIT-V: GAS POWER CYCLES (11 Periods)

Air standard cycles: Stirling cycle, Ericsson cycle, Joule cycle, Atkinson cycle, Lenoir cycle, Otto cycle, Diesel cycle, Dual cycle, comparison of Otto, Diesel and Dual cycles.

Total Periods: 45

TEXT BOOKS:

1. P. K. Nag, Engineering Thermodynamics, TMH, 5th Edition, 2013.
2. Chattopadhyay, Engineering Thermodynamics, Oxford Publisher, 1st revised edition, 2011.

REFERENCE BOOKS:

1. Yunus Cengel & Boles, Thermodynamics-An Engineering Approach, TMH, 8th Edition, 2015
2. J.P.Holman, Thermodynamics, Mc GrawHill, 2nd Edition 2004.
3. R.S.Khurmi, Thermal engineering, S.Chand publications, 15th Edition, 2015.

Note: Steam Tables with Mollier diagram should be supplied during the examination.

II B.Tech - I Semester

14BT30304: MANUFACTURING TECHNOLOGY-I

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

PRE-REQUISITES:

Engineering Workshop.

COURSE DESCRIPTION:

Introduction to manufacturing processes; metal casting and melting procedures, introduction to joining processes, gas welding, electric arc welding, resistance welding, advanced fabrication processes.

COURSE OUTCOMES:

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

- CO1:** Specify a manufacturing method suitable for fabricating a given product.
- CO2:** Investigate, analyze and synthesize complex information, problems, concepts and theories from manufacturing practices.
- CO3:** Use workshop tools to enhance productivity.
- CO4:** Propose eco friendly manufacturing methods for development of new products.

Detailed Syllabus:

UNIT - I: METAL CASTING PROCESSES (9 periods)

Classification of manufacturing processes, introduction to casting process, sand moulding procedures, patterns, pattern allowances, pattern materials, types of patterns, moulding materials, Types of moulding sands, testing sand properties, types of sand moulds, moulding machines, types of cores, casting defects, design of gating systems.

UNIT-II: MELTING AND SPECIAL CASTING PROCESSES

(9 periods)

Crucible, cupola, electric arc furnaces, shell moulding, precision investment casting, permanent mould casting, die casting, low pressure die casting, centrifugal casting, continuous casting and squeeze casting.

UNIT - III: INTRODUCTION TO JOINING PROCESSES (9 periods)

Introduction, adhesive bonding, mechanical fastening, classification of welding processes, types of welds and welded joints and their characteristics, design of welded joints, welding fluxes and filler rods, soldering, brazing and braze welding.

Gas welding processes: Introduction, Oxy-fuel welding processes, Oxy-fuel gas cutting.

UNIT - IV ELECTRIC ARC AND RESISTANCE WELDING (9 periods)

Electric arc welding: Principle of arc, arc-welding equipment, electrodes, manual metal arc welding, arc blow, carbon arc welding.

Inert-Gas shielded Arc Welding: TIG and MIG welding, shielding gases, submerged arc welding (SAW).

Resistance welding: spot welding, seam welding, projection welding, upset welding and flash welding and plasma arc welding.

UNIT - V: ADVANCED FABRICATION PROCESSES (9 periods)

Thermit welding, Electro slag welding, Electron beam welding, laser beam welding, forge welding, friction welding, diffusion welding, explosion welding, ultrasonic metal welding, destructive & non-destructive testing of welds.

Total Periods: 45

TEXT BOOKS:

1. P.N. Rao, Manufacturing Technology, Vol:1, TMH, 4th edition, 2013.
2. Kalpakjian, Serope, Manufacturing Engineering and Technology, Pearson education, 7th edition, 2014.

REFERENCE BOOKS:

1. R.K. Jain, Production Technology, Khanna Publishers, 17th edition, 2010.
2. Rosenthal, Principles of Metal Castings, McGraw-Hill Professional Publishing, 3rd edition, 2013.
3. R.S. Parmar, Welding Engineering and Technology, Khanna Publishers, 1st edition, 2014

II B.Tech - I Semester
14BT30321: COMPUTER AIDED MACHINE
DRAWING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	1	3	2

PRE-REQUISITE:

Computer Aided Engineering Drawing.

COURSE DESCRIPTION:

Principles and requirements of Machine drawings; Assembling and Disassembling important parts used in major mechanical engineering applications by using AUTOCAD software; CAD Drawings of mechanical components and their assemblies such as bolts and nuts, cotter and pin joints, couplings along with their utility for design of components.

COURSE OUTCOMES:

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

- CO1:** Read and interpret a given CAD drawing.
- CO2:** Analyze features on a part and develop 2-D & 3-D models using AutoCAD.
- CO3:** Present suitable drawing views to represent assembly and part drawings of different machine parts in AutoCAD.
- CO4:** Interpret the implications of drawings of machine components.

List of Exercises:

1.Experiments on machine drawing conventions using drafting software.

- a) Conventional representation of materials.
- b) Conventional representation of sectional views.
- c) Conventional representation of limits, fits and tolerances-form and positional tolerances and machining symbols.
- d) Conventional representation of dimensioning on the drawings.

2.Experiments on drawing of machine elements and simple parts using drafting software.

- a) Types of thread profile:-square, metric, ACME, Worm.
- b) Bolted joints: Hexagonal bolt and nut, square bolt and nut.
- c) Locking arrangements for nuts, locking by split pin, castle nut.
- d) Foundation bolts: Eye, bent, rag foundation bolts.

3.Assembly Drawings.

Drawing of assembled views for the part drawings of the following, using conventions and easy drawing proportions. (Below mentioned assembly drawings ONLY)

- a) Stuffing box
- b) Pipe vice
- c) Eccentric
- d) Screw jack

4.Part Drawings.

Preparation of part drawing representing limits, fits and tolerances and surface finish indications (Below mentioned part drawings ONLY).

- a)Petrol Engine connecting rod
- b)Oneway(Single) tool post
- c)Plummer block

NOTE: First angle projection to be adopted.

TEXT BOOKS:

1. S. Trymbaka Murthy, A Text Book of Computer Aided Machine Drawing, CBS Publishers, New Delhi, 2007.
2. K.L Narayana, P. Kannaiah & K. Venkata Reddy, Machine Drawing, New Age Publisher.
3. Goutam Pohit & Goutham Ghosh, Machine Drawing with AutoCAD, Pearson Education.

REFERENCE BOOKS:

1. K.C.John, Text book of Machine Drawing, PHI learning, 2009.
2. Sidheshwar, Machine Drawing, TMH
3. N.D.Bhatt, V. M. Panchal, Machine Drawing, Charotar Publishing House Pvt.
4. Sham Tickoo, AutoCAD 2006 For Engineers and Designers, Dream tech publishers, 2005.

II B.Tech - I Semester

14BT30322: STRENGTH OF MATERIALS AND MATERIALS SCIENCE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Engineering Mechanics, Engineering Chemistry, Strength of Materials, Materials Science and knowledge on measuring instruments.

COURSE DESCRIPTION:

Experiments to find yield strength and ultimate strength in tension, compression, shear, torsion, bending; strain gauges, Dial gauges and data acquisition systems, Types of Metals, Steels, Cast irons and their Microstructures; Heat Treatment procedures; Data acquisition and recording; Grain size analysis; Phase segmentation.

COURSE OUTCOMES:

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

- CO1:** Perform tensile, shear, and torsion tests on test specimens in a real life situation.
- CO2:** Analyze the experimental results and compute Young's modulus for a materials using appropriate test procedure.
- CO3:** Report experimental results and provide systematic documentation for various experimentation efforts.
- CO4:** Prepare metallographic samples for microscopic examinations.
- CO5:** Analyze the microstructure and estimate the amount of porosity and grain size of the casted specimen.
- CO6:** Apply the knowledge of phase diagrams and testing methods to suit design specification in related areas.
- CO7:** Use the software for various analysis of microstructures.

STRENGTH OF MATERIALS LAB

LIST OF EXPERIMENTS

1. Tensile test on mild steel rod
2. Bending test on simply supported beam
3. Bending test on cantilever beam
4. Torsion test
5. Shear test
6. Test on springs - tension and compression
7. Compression test
8. Impact test

MATERIALS SCIENCE LAB

LIST OF EXPERIMENTS:

1. Study of metallurgical instruments & microscope.
2. (a) Preparation of mounted specimen using cold setting die.
(b) Preparation of mounted specimen using hydraulic specimen mounting press.
3. Preparation and study of the microstructure of cast irons.
4. Preparation and study of the microstructure of carbon steels.
5. Preparation and study of the microstructure of Non-Ferrous alloys.
6. (a) Study of the microstructures of heat treated steels.
(b) Measurement of hardness of heat treated and untreated steels.
7. Determination of hardenability of steel by Jominy End Quench Test.
8. Determination of grain size, porosity and phase distribution of any 4 selected specimens by Material Plus software.

II B.Tech - II Semester

14BT3BS03: PROBABILITY AND STATISTICS

(Common to CE & ME)

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

PRE REQUISITES:

Engineering Mathematics.

COURSE OUTCOMES:

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

CO1: Acquire basic knowledge in

- (a) probability distributions, correlation and regressions.
- (b) statistical quality control and testing of hypotheses.
- (c) finding regression coefficients, elucidating relationships in bi variate data.
- (d) Tests of significance for small and large samples.

CO2: (i) Develop analytical skills for the problems involving

(a) Means, probability distributions and standard deviations.

(b) Sampling techniques for decision making in uncertain environments.

(ii) Develop skills for analyzing the data with

(a) Suitable tests of significance for practical situations.

(b) Through probability distributions for practical situations.

CO 3: Develop skills in applying

(a) Statistical techniques employed for quality control and maintenance of uniform quality in the manufacturing processes.

Detailed syllabus :

UNIT - I: PROBABILITY & MATHEMATICAL EXPECTATIONS

(9 periods)

Probability-Conditional probability, Bayes theorem. Random Variables: Discrete and continuous random variables, distribution function of random variable, properties, probability mass function, probability density function, mathematical expectation, properties of mathematical expectations, mean and variance.

UNIT - II: PROBABILITY DISTRIBUTIONS

(9 periods)

Discrete Distributions: Binomial distribution, mean and standard deviations of Binomial distribution, Poisson distribution, mean and standard deviations of Poisson distribution.

Continuous Distributions: Normal distribution, mean, variance and area properties.

UNIT-III: STATISTICAL QUALITY CONTROL AND CORRELATION-REGRESSION (9 periods)

Introduction, advantages and limitations of statistical quality control, control charts, specification limits, \bar{X} , R, p, np and c charts, definition of correlation, correlation coefficient, rank correlation. simple linear regression, regression lines and properties.

UNIT-IV: SAMPLING DISTRIBUTIONS AND TESTS OF SIGNIFICANCE FOR LARGE SAMPLES (9 periods)

Population and sample, parameter and statistic, statistic, standard Error of statistic sampling distribution, null and alternative hypothesis, type I and II errors, level of significance, critical region, degrees of freedom. Test of significance for single proportion, difference of proportions, single mean, difference of means.

UNIT-V: TESTS OF SIGNIFICANCE FOR SMALL SAMPLES (9 periods)

Student's t-test: single mean, difference of means, F-test for equality of population variance, Chi-Square Test for goodness of fit, contingency table, Chi-Square Test for independence of attributes.

Total Periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi et al, Probability and Statistics, S. Chand & Company, 3rd edition, 2011.
2. S.P.Gupta, Statistical Methods, Sultan and Chand, New Delhi, 34th edition, 2005.

REFERENCE BOOKS:

1. Shahnaz Bathul, A text book of Probability and Statistics, Ridge Publications, 2nd edition.
2. S.C.Gupta and V.K.Kapoor, Fundamentals of Applied Statistics, Sultan and Chand, New Delhi, 1998.

II B.Tech - II Semester

14BT3HS01: ENVIRONMENTAL SCIENCES

(Common to CSE,CSSE, IT, CE & ME)

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

PRE-REQUISITES:

Engineering Physics; Engineering Chemistry.

COURSE DESCRIPTION:

Introduction to environment, need for public awareness; Natural resources, conservation and management; Ecology and ecosystems; Biodiversity, conservation and management; Environment pollution and control; Social issues and environment; Human population and environment; field study and analysis.

COURSE OUTCOMES:

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

CO1: Acquire knowledge in

- a) diverse components of environment and natural resources
- b) ecosystem and biodiversity & its conservation methods
- c) population growth and human health
- d) green technology.

CO2: Identify and resolve the issues related to sources of different types of pollutions.

CO3: Provide solutions to individuals, industries and government for sustainable development of natural resources.

CO4: Create awareness on environmental degradation and to bring best management practices to protect environment.

CO5: Develop skills in analyzing reports on environment for sustainable development.

CO6: Apply environmental ethics in protection of diversified ecosystems.

Detailed Syllabus:

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENT AND NATURAL RESOURCES (11 periods)

Multidisciplinary nature of environment: Definition, scope and importance of multidisciplinary nature of environment, segments of environment-lithosphere, hydrosphere, atmosphere and biosphere, need for public awareness.

Natural Resources: Renewable and Non-renewable resources and associated problems- (a) forest resources: use and over exploitation, deforestation-causes, effects and remedies, case studies(b) water resources-use and over utilization of surface & ground water, conflicts over water-benefits and problems of large dams, case studies.

(c) mineral resources- mining, adverse effects, case studies, (d) food resources-world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problem, water logging and salinity, case studies, (e) energy resources-growing needs, renewable energy resources-solar, wind, hydropower, hydrogen fuel and non-renewable energy resources-coal, natural gas, nuclear energy, role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

UNIT-II: ECOSYSTEMS AND BIODIVERSITY (10 periods)

Ecosystems: Definition and concept of an ecosystem, structure and function of an ecosystem-producers, consumers and decomposers, food chains, food webs and ecological pyramids-introduction, types, characteristic features, structure and functions of forest ecosystem, desert ecosystem, aquatic ecosystem-ponds, lakes & oceans, energy flow in the ecosystem, ecological succession. Biodiversity: Definition, concept and value of biodiversity, role of biodiversity in addressing new millennium challenges, hot spots of biodiversity, threats to biodiversity-habitat loss, poaching of wildlife, man-wild life conflicts, endemic, endangered and extinct species of India, conservation of biodiversity-in-situ and ex-situ.

UNIT-III: ENVIRONMENTAL POLLUTION AND CONTROL (8 periods)

Definition, causes, adverse effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) noise pollution (e) thermal pollution (f) nuclear pollution, solid waste management-causes, effects and control measures of urban and industrial wastes, hazards and disaster management-floods, earthquakes, tsunamis, case studies.

UNIT-IV: SOCIAL ISSUES AND THE ENVIRONMENT (8 periods)

From unsustainable to sustainable development, urban problems related to energy, environmental ethics-issues and possible solutions, global warming, acid rain, ozone layer depletion, nuclear accidents and case studies, wasteland reclamation, consumerism and waste products, environment protection act, air (prevention and control of pollution) act, water (prevention and control of pollution) act, wildlife protection act, forest conservation act, issues involved in enforcement of environmental legislation, public environmental awareness.

UNIT-V: HUMAN POPULATION AND THE ENVIRONMENT(8 periods)

Population growth, population characteristics and variation among nations, population explosion, family welfare programme, environment and human health, human rights, value education, HIV/AIDS, women and child welfare, role of information technology in environment and human health, case studies. Field work: visit to a local area to document environmental assets-pond/forest/grassland/hill/mountain/Environment Impact Assessment procedures for local environmental issues or assignment/seminar.

Total periods: 45

TEXT BOOKS:

1. A. Kaushik and C.P. Kaushik, Environmental Studies, New Age International (P) Ltd Publications, 4th Edition, 2014
2. Erach Barucha, Environmental Studies, Orient Blackswan, 2nd Edition, 2013.

REFERENCE BOOKS:

1. R. Rajagopalan, Environmental Studies, Oxford University Press, 2nd Edition, 2011.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2nd Edition, 2009.
3. Dr. B S Chauhan, Environmental Studies, University Science Press, 1st Edition, 2008.
4. M. Anji Reddy, Textbook of Environmental Sciences and Technology, BS Publications, 2007.
5. Larry W Canter, Environmental Impact Assessment, McGraw Hill Education, 2nd edition, 1996.

II B.Tech - II Semester

14BT4HS01: BUSINESS COMMUNICATION AND PRESENTATION SKILLS

(Common to CSE, IT, CSSE, CE & ME)

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

PRE REQUISITES:

Basic grammar and fundamentals of listening, speaking, reading and writing skills.

COURSE DESCRIPTION:

Nature and scope of communication; non-verbal communication; writing business documents; business presentations and public speaking; careers and résumé.

COURSE OUTCOMES:

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

CO1: Acquire knowledge in

- Managerial Communication.
- Corporate Communication.
- Business Writing.
- Presentation Skills.
- Career Building.

CO2: Analyze and judge the situation through non-verbal communication for effective organizational communication.

CO3: Achieve personal excellence and ability to work in groups.

CO4: Develop effective communication to meet professional needs.

Detailed Syllabus :

UNIT - I : NATURE AND SCOPE OF COMMUNICATION (9 periods)

Introduction ,functions of communication, roles of a manager, communication Basics, communication networks, informal communication, tips for effective internal communications , interpersonal communication, communication barriers, effective managerial communication, strategies for improving organizational communication.

UNIT - II : NON-VERBAL COMMUNICATION (9 periods)

Introduction ,significance of non-verbal communication in organizations forms of non-verbal communication, types of non-verbal communication. Cross Cultural Communication: Introduction concept of cross cultural communication , different communication styles, cross-cultural communication strategies, corporate communication: introduction, crisis management / communication, case study.

UNIT - III : WRITING BUSINESS DOCUMENTS (10 periods)

Business Writing: Introduction, importance of written business communication, five main stages of writing business messages. Business letter writing; common components of business letters, strategies for writing the body of a letter, kinds of business letters. Business reports: Kinds of reports, characteristics of business reports, steps in writing a routine business report, corporate reports.

UNIT - IV : BUSINESS PRESENTATIONS AND PUBLIC SPEAKING (10 periods)

Introduction, business presentations speeches, introduction to a presentation, main body, conclusion, effective sales presentations, case Study; Group Discussions: Introduction, work place GD guideline, functional and non-functional roles in Group Discussions, team presentations, benefits of team presentations, purpose of team, presentations, case studies.

UNIT - V: CAREERS AND RESUME (7 periods)

Introduction; Career Building: Understanding yourself, setting a career goal ; Résumé Writing: Résumé formats; Interviews: Introduction, fundamental principles of interviewing, general preparation for an interview, success in an interview, types of interviewing questions, important non-verbal aspects, types of interviews, styles of interviewing, case Interviews.

Total periods: 45

TEXT BOOKS:

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford University Press, New Delhi, Second Edition, 2012.

REFERENCE BOOKS:

1. M K Sehgal and Vandana Khetarpal, Business Communication, Excel Books, New Delhi, 2011.
2. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill, 2009.

II B.Tech - II Semester

14BT40301: KINEMATICS OF MACHINERY

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

PRE-REQUISITES:

Engineering Mathematics; Engineering Mechanics; Computer Aided Engineering Drawing.

COURSE DESCRIPTION:

Basic concepts of static and motion applications; design of mechanical sub-assemblies and assemblies such as simple machines; various components ranging from basic machine elements such as four bar mechanisms, steering mechanisms, Hooke's joint, cams, gear and gear trains; calculation and analysis of velocities and accelerations. Application of kinematic theories to real world machines.

COURSE OUTCOMES:

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

- CO1:** Identify various mechanisms and choose one best suited for a given situation.
- CO2:** Analyze a given mechanism and find motion characteristics using mathematical models.
- CO3:** Specify kinematic design to suit given requirements in select situations.
- CO4:** Trouble-shoot problems associated with simple machine components such as cams, gears, gear trains.

Detailed syllabus:

UNIT - I: MECHANISMS AND MACHINES (8 Periods)

Elements or links; Classification: Rigid, Flexible and Fluid link; Types of Kinematic Pairs: Sliding, turning, rolling, screw and spherical pairs; Lower and Higher pairs; Closed and Open pairs; Constrained Motions: Completely, partially or successfully and incompletely constrained motions; Classification of machines; Kinematic chain; Types of joints: Binary, Ternary and Quaternary joints; Number of degree of freedom for plane mechanisms and its applications: Kutzbach and Grubler's criterions; Inversion of mechanisms: Quadric cycle, Single slider and Double slider crank chains.

UNIT - II: VELOCITY AND ACCELERATION ANALYSIS (8 Periods)

Instantaneous center of rotation, centroids and axodes, relative motion between two bodies, Aronhold Kennedy (three center in line) theorem, method for determination of Instantaneous Centre, diagrams for simple mechanisms and determination of angular Velocity of links and linear

velocities of point, velocity and acceleration diagrams, relative velocity method for four bar mechanism with revolute joint, slider-crank mechanism, and its inversions.

UNIT - III: MECHANISMS WITH LOWER PAIRS (10 Periods)

Pantograph; Exact Straight Line Motion Mechanisms: Peaucellier, Hart and Scott Russell's mechanism; Approximate Straight Line Motion Mechanisms: Watt's, Grasshopper, Tchebicheff's and Robert mechanisms; Steering Mechanisms: Conditions for correct steering, Davis Steering gear and Ackerman steering gear mechanisms, Hooke's joint, single and double Hooke's joint.

UNIT - IV: CONSTRUCTION OF CAM PROFILE (8 Periods)

Introduction to cams and followers, their uses, types of followers and cams, terminology, types of follower motion for translating follower, uniform velocity, simple harmonic motion and uniform acceleration, maximum velocity and maximum acceleration during outward and return stroke in the case of uniform velocity, SHM, and uniform acceleration and retardation, knife edge, roller and flat followers (axis of follower passes through the axis of cam shaft, and offset).

UNIT - V: MECHANISMS WITH HIGHER PAIRS: (11 Periods)

Friction wheels and toothed gears: Types, Law of gearing, velocity of sliding of teeth; Forms of teeth: Cycloidal and involute profiles; expressions for arc of contact and path of contact, contact ratio, phenomena of interference, condition for minimum number of teeth to avoid interference (pinion and wheel); Gear trains: Simple, compound, reverted and epicyclic gear train, velocity ratio (analysis) of epicyclic gear train, compound epicyclic gear train (sun and planet wheel).

Total Periods: 45

TEXT BOOKS:

1. S. S. Rattan, Theory of Machines and Mechanisms, Tata McGraw Hill Education, Third Edition, 2009
2. R.S. Khurmi, Theory of Machines, S.Chand Publications, Fourteenth Revised Edition, 2012

REFERENCE BOOKS:

1. Dr. R. K. Bansal, Dr. J. S. Brar, Theory of Machines, Laxmi Publications, Fourth Edition, 2013
2. Ballaney. P. L., Theory of Machines and Mechanisms, Khanna Publishers, 2005
3. Joseph Edward Shigley and John Joseph Uicker, Jr., Theory of Machines and Mechanisms, MGH, Fourth Edition, New York, August 2013.
4. Bevan T, Theory of Machines, CBS Publishers and Distributors, New Delhi, 2002.

II B.Tech - II Semester

14BT40302: FLUID MECHANICS AND HYDRAULIC MACHINERY

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

PRE-REQUISITES:

Engineering Physics; Engineering Mathematics; Engineering Mechanics.

COURSE DESCRIPTION:

Properties of fluids; pressure measurements; types of flow; Onedimensional 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:

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

- CO1:** Employ the basic knowledge of hydraulics in finding fluid properties, performance parameters of hydraulic turbines and pumps.
- CO2:** Analyze hydraulic machines by developing mathematical models to study characteristics of various steady flow and performance parameters of hydraulic machinery.
- CO3:** Present feasible design solutions to the construction of efficient hydraulic turbines and pumps.
- CO4:** Identify the manageable areas in hydraulic machinery to reduce the mechanical losses.

Detailed Syllabus:

UNIT - I: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENT (9 Periods)

PROPERTIES OF FLUIDS: Dimensions and units; Physical properties of fluids: Mass density, specific weight, specific volume, specific gravity, viscosity, surface tension, capillarity, vapor pressure and its influence on fluid motion, bulk modulus, compressibility; Types of fluids: ideal and real fluids, Newtonian and Non-Newtonian fluids.

PRESSURE MEASUREMENT: Absolute, gauge, atmospheric and vacuum pressure; Manometers: Piezometer, U-tube, single column manometer and differential manometers.

UNIT - II: FLUID KINEMATICS AND DYNAMICS (9 Periods) FLUID KINEMATICS:

Classification of fluid flows: Steady, unsteady, uniform, Non-uniform, laminar, turbulent, rotational and irrotational flows, compressible and incompressible flows; Types of flow lines: Path line,

stream line, streak line and stream tube, equation of continuity for one dimensional flow.

FLUID DYNAMICS:

Surface and body forces, different types of heads, Euler's and Bernoulli's equations for flow along a stream line, Momentum equation and its application on force on pipe bend.

MEASUREMENT OF FLOW: Pitot tube, Venturimeter, and Orifice meter.

UNIT - III: FLOW THROUGH PIPES AND IMPACT OF JETS

(10 Periods)

FLOW THROUGH PIPES: Reynold's experiment, Darcy Weisbach equation, Chezy's equation, minor losses in pipes, equivalent pipe, pipes in series and pipes in parallel, total energy line and hydraulic gradient line.

IMPACT OF JETS: Hydrodynamic force of jets on stationary, moving flat, inclined, curved vanes, jet striking centrally and at tip, Velocity diagrams, Work done and efficiency.

UNIT - IV: HYDRAULIC TURBINES AND THEIR PERFORMANCE

(9 Periods)

HYDRAULIC TURBINES: Classification of turbines: Impulse, Reaction turbines, construction and working of Pelton wheel, Francis turbine, and Kaplan turbine: Working proportions, work done, efficiencies, draft tube theory: functions and efficiency.

PERFORMANCE OF HYDRAULIC TURBINES: Geometric similarity, specific speed, unit quantities, characteristic curves, governing of turbines, selection of type of turbine, water hammer, cavitation, surge tank.

UNIT - V: PUMPS AND HYDROELECTRIC POWER STATIONS

(8 Periods)

PUMPS: Classification; Single Stage Centrifugal Pump; Working Principle, work done, heads, losses and efficiencies; Multi Stage Centrifugal Pump; pumps in series, parallel, characteristic curves, specific speed, net positive suction head; Reciprocating pumps; Working Principle, discharge, slip, indicator diagrams.

HYDROELECTRIC POWER STATIONS: Elements of hydro electric power station: Types, heads, and efficiencies; Concept of pumped storage plants and storage requirements.

Total Periods: 45

TEXT BOOKS:

- 1: R.K. Rajput, Fluid Mechanics and Hydraulic Machines, S. Chand, 4th Edition, 2008.
- 2: Modi and Seth, Fluid Mechanics and Hydraulic Machinery, Standard book house, 17th Edition, 2011.

REFERENCE BOOKS:

- 1: R.K. Bansal, Fluid Mechanics and Hydraulic Machinery, Laxmi publications, 9th Edition 2005.
- 2: D.S. Kumar, Fluid Mechanics and Fluid Power Engineering, Kotaria & Sons, 7th Edition 2009.

II B.Tech - II Semester

14BT40303: THERMAL ENGINEERING-I

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

PRE-REQUISITES:

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:

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

- CO1:** Employ the basic knowledge of an engine and compressor in developing the analytical models.
- CO2:** Analyze the parameters useful to increase the performance and reducing the knock in spark ignition and compression ignition engines.
- CO3:** Identify and implement the fuel requirements and fuel rating.
- CO4:** List design considerations favorable for minimizing harmful emissions and maximum power Output.
- CO5:** Present feasible design of compressors for simple domestic industrial applications.

Detailed Syllabus:

UNIT - I: I.C. ENGINES (9 Periods)

Basic engine components, Classification of I.C. Engines, working of two stroke and four stroke engines, comparison of two stroke and four stroke engines, comparison of SI and CI engines, valve and port timing diagrams, application of I.C. engines, fuel-air cycles: Composition of cylinder gases, variable specific heats, dissociation, number of moles, Actual cycle: heat loss, time loss, exhaust blow down factors and loss due to rubbing friction.

UNIT - II: COMBUSTION IN S.I. AND C.I. ENGINES (9 Periods)

Normal combustion and abnormal combustion in S.I. engines, flame propagation and effect of engine variables, stages of combustion, pre-ignition and knocking, types of combustion chambers in S.I engines, fuel Requirements and fuel rating.

Stages of combustion in C.I. Engines, factors affecting delay period, phenomenon of knock in C.I. Engine, comparison of knock in S.I. and C.I engines, types of combustion chambers in C.I. Engines, Fuel requirements and fuel rating.

UNIT - III: ENGINE PERFORMANCE PARAMETERS, MEASUREMENTS AND TESTING (11 Periods)

Brake power, indicated power, friction power, mean effective pressure, engine efficiencies, performance calculations and heat balance.

Measurement of Brake power: Rope brake, Hydraulic, Eddy current and Swinging field DC Dynamometers; Measurement of Friction Power: William's line method, Morse test, Motoring Test and Retardation Test, air and fuel measurement.

UNIT -IV: NON-CONVENTIONAL ENGINES (7 Periods)

Working principles of CRDI engine, Dual fuel and Multifuel engines, GDI engine, HCCI engine, Lean burn engines, Stirling Engine, stratified charge engines, VCR engine and Wankel engines.

UNIT -V: AIR COMPRESSORS (9 Periods)

Air Compressors: Reciprocating Compressors, effect of Clearance volume in compressors, volumetric Efficiency, single stage and multi stage compressors, effect of inter cooling and pressure drop in multi stage compressors, working principles of Roots , Vane type Compressor, Centrifugal Compressor; Axial Flow Compressors.

Total Periods: 45

TEXT BOOKS:

1. V. Ganesan, I.C. Engines, TMH, 3rd Edition, 2008.
2. R.K.Rajput, Thermal Engineering, Laxmi Publications, 8th Edition, 2010

REFERENCE BOOKS:

1. M.L Mathur & R.P.Sharma, Internal Combustion Engines, Dhanpat Rai & Sons, 8th Edition, 2014.
2. Heywood, I.C. Engines, McGrawHill. 1st Edition, 2013.
3. Pulkrabek, Engineering Fundamentals of IC Engines, Pearson, 2nd Edition, 2004.
4. R.S.Khurmi & J.K. Guptha, Thermal Engineering, S.Chand , 16th Edition, 2008.

II B.Tech - II Semester

14BT40304: MANUFACTURING TECHNOLOGY-II

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

PRE-REQUISITES:

Engineering Workshop; Manufacturing Technology-I.

COURSE DESCRIPTION:

Metal forming processes, sheet metal operations, plastic processing, introduction to various machining operations and study of various process parameters in Non-Traditional machining process; Various cutting tools, cutting forces, and surface finish and tool wear mechanisms during machining of metals and non-metals; ultrasonic machining, abrasive jet machining & water jet machining, electro-chemical processes, electron beam machining, plasma arc machining.

COURSE OUTCOMES:

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

- CO1:** Choose a metal forming processes to fabricate a metallic and plastic processing methods on plastics for material removal with a given accuracy.
- CO2:** Estimate the effects of mechanical and thermal loading when machining metal and Non-metal cutting using a non-traditional machining process.
- CO3:** Estimate the material removal rate and cutting force and the surface finish attainable using a non-traditional machining process and suggest a suitable process for a given application.
- CO4:** Propose, where possible, environment-friendly and sustainable solutions to suit non-traditional machining processes.

Detailed Syllabus:

UNIT -I: METAL FORMING PROCESSES (9 Periods)

Nature of plastic deformation, rolling, forging, extrusion, wire drawing, rod and tube drawing, swaging, tube making, explosive forming and thread rolling.

UNIT -II: SHEET METAL OPERATIONS (9 Periods)

Press tool operations, shearing action, shearing operations, drawing, draw die design, spinning, bending, stretch forming, embossing and coining.

UNIT - III: PLASTIC PROCESSING (6 Periods)

Introduction, properties of plastics, additives in plastics, extrusion of plastics, injection moulding, blow moulding, thermoforming,thermosetting materials.

UNIT - IV: NON-TRADITIONAL MACHINING METHODS (8 Periods)

Need for non-traditional machining methods, classification of modern machining processes, comparative study of different processes, considerations in process selection, materials and its applications.

Ultrasonic machining process: Mechanics of metal removal, process variables, applications and limitations.

Abrasive and Water Jet Machining: Types of abrasives, mechanics of metal removal, process variables, applications and limitations.

**UNIT-V: ELECTRO-CHEMICAL & THERMAL REMOVAL PROCESSES
(13 Periods)**

Chemical machining, electro chemical machining, electro chemical grinding, electro chemical honing, deburring process, electric discharge machining, electric discharge grinding, electric discharge wire cutting processes: mechanics of metal removal, process variables, applications and limitations.

Total Periods: 45

TEXT BOOKS:

1. P.N. Rao, Manufacturing Technology, Vol.1, TMH, 4th Edition, 2013
2. Kalpakjian, Serope, Manufacturing Engineering and Technology, Pearson education, 7th Edition, 2014.

REFERENCE BOOKS:

1. Pandey, P.C. and Shah H.S., Modern Machining Process, TMH, 1980.
2. V.K. Jain, Advanced Machining Processes, Allied Publishers, 2009.

II B.Tech - II Semester

14BT40321: FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Engineering Physics, Engineering Mathematics, Engineering Mechanics

COURSE DESCRIPTION:

Study and calibration of gauges; Orifice meter, Venturi meter; Determination of Darcy's coefficient; the Performance test on hydraulic machines; 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:

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

- CO1:** Use various flow measurement instruments.
- CO2:** Calculate the losses and discharge in pipes and conduct performance tests on pumps and turbines to find the efficiency.
- CO3:** Demonstrate systematic approach in conducting experiments.

LIST OF EXPERIMENTS

Any twelve experiments are to be conducted.

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of coefficient of discharge for a small Orifice by a constant head method
4. Calibration of Rectangular notch
5. Determination of loss of head due to sudden contraction
6. Determination of friction factor for pipes
7. Verification of Bernoulli's equation
8. Impact of jet on vanes
9. Study of hydraulic pumps
10. Performance test on Pelton wheel turbine
11. Performance test on Francis turbine
12. Performance test on Kaplan turbine
13. Performance test on single stage centrifugal pump
14. Performance test on multi stage centrifugal pump
15. Performance test on reciprocating pump

II B.Tech - II Semester

14BT40322: MANUFACTURING TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITE:

Engineering Workshop

COURSE DESCRIPTION:

Integrated approach to Manufacturing Science and Engineering practices; techniques for fabricating parts; pattern making and mould preparation and metal casting; wood working; exposure to mechanical press working, welding, sheet bending, casting and processing of plastic; cold, hot and wood working.

COURSE OUTCOMES:

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

- CO1:** Specify and identify a method suitable for fabricating simple parts.
- CO2:** Analyze the part to be fabricated and manufacture simple parts using a combination of the manufacturing techniques.
- CO3:** Communicate effectively with industry personnel by developing a manufacturing-centric vocabulary.
- CO4:** Demonstrate work habits that are ethical and safe in a laboratory, independently and in teams.

Any TWELVE experiments to be conducted.

I. PATTERN & MOULD PREPARATION AND METAL CASTING

1. Preparation of pattern on a wood turning lathe
2. Preparation of a casting by using single piece and multi piece patterns
3. Preparation of a casting of a hollow pipe/T-Bend with core

II. SAND TESTING

4. (a) Determination of Grain fineness number for sand sample using sieve shaker
(b) Estimation of moisture content in a given sand sample
5. Determination of of clay content in a given sand sample
6. Determination of permeability of the given sand sample
7. Determination of compression, Shear strength of a given sand specimen using universal sand strength testing machine

III. WELDING LAB

8. Preparation of Lap and Butt joint using Arc & Gas welding
9. Exercise on a TIG & MIG welding equipment
10. Exercise on spot welding machine

IV. MECHANICAL PRESS WORKING

11. Exercise on fly press machine(Blanking & Piercing)
12. Exercise on hydraulic Press(Deep drawing & Extrusion)
13. Exercise on bending machine

V. PROCESSING OF PLASTICS

14. Preparation of a specimen on injection moulding machine
15. Preparation of a specimen on a blow moulding machine

III B.Tech - I Semester

14BT4HS02: PROFESSIONAL ETHICS

(Common to: CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

COURSE DESCRIPTION:

Engineering ethics, moral autonomy and moral dilemmas - professional and ideal virtues, professional responsibility and moral leadership ; Engineering as social experimentation, conscientiousness and law of Engineering- Responsibilities and Rights, Whistle blowing; Global issues and managerial ethics.

COURSE OUTCOMES:

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

- CO1:** Apply the principles of ethics to solve engineering problems
- CO2:** Analyze the problems in the implementation of moral autonomy and resolve through consensus
- CO3:** Responsible to follow the codes of ethics.
- CO4:** Practice professionalism in Engineering and assess the issues pertaining to moral dilemmas.
- CO5:** Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams
- CO6:** Write reports without bias and give instructions to follow ethics

Detailed Syllabus:

UNIT I: ENGINEERING ETHICS (8 Periods)

Scope and aim of engineering ethics-senses of engineering ethics, variety of moral issues, types of inquiry, moral dilemmas, moral Autonomy- Kohlberg's Theory, Gilligan's theory, consensus and controversy.

UNIT II: PROFESSIONAL IDEALS AND VIRTUES (10 Periods)

Theories about virtues, professions, professionalism, characteristics, expectations, professional responsibility, integrity, self-respect, sense of Responsibility. self-interest, customs and religion- self-interest and ethical egosm, customs and ethical relativism, religion and divine command ethics. use of ethical theories- resolving moral dilemmas and moral leadership.

UNIT III: ENGINEERING AS SOCIAL EXPERIMENTATION (9 Periods)

Engineering as experimentation, similarities to standard experiments, learning from the past and knowledge gained, engineers as Responsible Experimenters-Conscientiousness, moral autonomy and accountability.

The challenger case, codes of ethics and limitations, industrial standards, problems with the law of Engineering.

UNIT-IV: RESPONSIBILITIES AND RIGHTS (9 Periods)

Collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflict of interests, occupational crime, rights of Engineers, professional rights, whistle-blowing, the bart case, employee rights and discrimination.

UNIT-V: GLOBAL ISSUES (9 Periods)

Multinational corporations, professional ethics, environmental ethics, computer ethics, engineers as consultants, witnesses, advisors and leaders, Engineers as Managers; Managerial ethics applied to engineering profession, moral leadership.

Total Periods: 45

TEXT BOOKS:

1. Mike W. Martin, Roland Schinzinger, Ethics in Engineering, 3rd Edition, Tata McGraw-Hill, 2007.
2. Govindarajan M, Nata Govindarajan. M, Natarajan. S, Senthilkumar. V.S., Engineering Ethics, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. Dr. S. Kannan, K. Srilakshmi, Human Values and Professional Ethics, Taxmann Allied Services Pvt. Ltd., 2009.
2. Scientists and Engineers, 1st Edition, Oxford University Press, 2001.
3. Charles F. Fledderman, Engineering Ethics, Pearson Education, 2004.
4. R. Subramanian, Professional Ethics, Oxford Higher Education, 2013.

III B.Tech - I Semester

14BT50301: DYNAMICS OF MACHINERY

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

PRE-REQUISITES:

Engineering Mathematics, Engineering Mechanics, Kinematics of Machinery

COURSE DESCRIPTION:

Static force analysis, dynamic analysis; Principles of linear and angular momentum and the work-energy relationships, graphical and analytical methods; Analysis and balancing of shaking forces in machines, governors; Vibrations, single degree, multi degree of freedom vibrations, spring mass systems; transmissibility of forces, Dunkerley's method, Rayleigh's method; Whirling of shafts, isolation of system, vibration instrumentation and standards.

COURSE OUTCOMES:

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

- CO1:** Identify situations where dynamics of machinery needs to be studied.
- CO2:** Use analysis methods to provide preliminary and case specific information for design of mechanical dynamic systems involving imbalance, flywheel and gyroscopic effects.
- CO3:** Detect possible sources of imbalance and suggest means of rectification.
- CO4:** Analyze complex dynamic systems through systematic approach by identifying suitable subsystems.
- CO5:** Address the issues of safety in dynamic systems involving moving parts.

Detailed Syllabus:

UNIT - I: STATIC AND DYNAMIC ANALYSIS (8 Periods)

Static force analysis of four bar mechanism and slider crank mechanism by principle of superposition and Virtual work; Dynamic force analysis: Four-bar mechanism; velocity and acceleration of the reciprocating parts in engines by Klien's construction; Forces on the reciprocating parts of an engine neglecting and considering weight of the connecting rod; Graphical and Analytical methods.

UNIT -II: FLYWHEEL AND GYROSCOPIC MOTION (12 Periods)

Turning moment diagrams and fly wheels, single cylinder double acting engines, four stroke IC engines, multi-cylinder engines, fly wheels and

their design, Gyroscopes: Precessional angular motion: Gyroscopic forces and couple; applications: spinning disc, Aeroplane (Right and Left turn), ships (steering, pitching and rolling), stability of four and two wheel vehicles moving on curved paths.

UNIT - III: BRAKES AND CLUTCHES (7 Periods)

Types of Brakes: Simple block brakes, Single block, pivoted block, double block, simple band brake, differential band brake, band and block brake, internal expanding brake.

Friction clutches: Single disc or Plate clutch, multi disc clutch, cone clutch and centrifugal clutch.

UNIT - IV: GOVERNORS AND BALANCING OF MASSES (12 Periods)

Watt, Porter and Proell governors, spring loaded governors, Hartnell and Hartung governors with auxiliary springs.

Balancing of rotating masses: Single and multiple, single and different planes; **Balancing of reciprocating masses:** shaking force and shaking couple, primary and secondary unbalanced forces of reciprocating parts; balancing of single cylinder engine (partial balancing of primary unbalanced force); balancing of two cylinder engines (partial balancing, balancing of locomotives), variation of tractive force, swaying couple, hammer blow.

UNIT-V: VIBRATIONS (6 Periods)

Basic features of vibratory systems, degrees of freedom, single degree of freedom system, free vibration of mass attached to vertical spring, transverse loads, vibrations of beams with concentrated and distributed loads, Dunkerley's method, Rayleigh's method, whirling of shafts, critical speeds and torsional vibrations, simple problems on forced, damped vibration, vibration isolation & transmissibility.

Total Periods: 45

TEXT BOOKS:

1. S.S.Rattan, Theory of Machines and Mechanisms, Tata McGraw Hill Publishers, Fourth Edition, 2014.
2. R.S Khurmi, Theory of Machines, S.Chand Publications, Fourteenth Revised Edition, 2012.
3. S. Balaguru, Dynamics of Machinery, Scitech Publications, Second Edition, 2009.

REFERENCE BOOKS:

1. Joseph Edward Shigley and John Joseph Uicker, Jr. Theory of Machines and Mechanisms, Second Edition, MGH, New York.
2. Ballaney P L, Theory of Machines and Mechanisms, Khanna Publishers, New Delhi.
3. Bevan T, Theory of Machines, Third Edition, CBS Publishers and Distributors, New Delhi, 2002.
4. J.S. Rao and R.V. Dukkipati, Mechanism and Machine Theory, New age International, Second Edition, 2007.

III B.Tech - I Semester
14BT50302: INDUSTRIAL ENGINEERING AND
MANAGEMENT

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

PRE-REQUISITES: Nil

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:

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

- CO1:** Use industrial engineering and management concepts for solving routine management related problems in an industrial scenario.
- CO2:** Analyze an industrial problem and identify probable causes and to suggest suitable remedies to increase the productivity and reduce the cost/wastages.
- CO3:** Exercise discernment in following ethical code of conduct in professional activities.
- CO4:** Motivate people towards greater productivity and synergy.

Detailed Syllabus:

UNIT - I: PRINCIPLES OF MANAGEMENT (9 Periods)

Concepts of management and Organization: Evolution of management thought, Taylor's scientific management, Fayol's principles of management, systems approach to management.

Functions of management: planning, organizing, staffing, controlling and directing, corporate planning process, ethics and social responsibilities of an engineers.

UNIT- II: FACILITIES PLANNING AND MAINTENANCE (10Periods)

Plant location, definition, factors affecting the plant location, comparison of rural and urban sites, plant layout, definition, objectives, types of production, types of plant layout, plant maintenance: objectives of plant maintenance, importance of plant maintenance, functions and responsibilities of plant maintenance, types of maintenance, concepts of reliability: definition, MTBF, series, parallel and series-parallel device configurations; Redundancy; Industrial safety, factory Act, workmen compensation Act; Industrial disputes Act.

UNIT - III: WORK STUDY (7 Periods)

Productivity ;Definition; Objectives of Workstudy; Method study: Definition, Objectives; Steps involved; work measurement: definition;

Time study: Steps involved, equipment, different methods of performance rating, allowances, standard time calculation, work sampling: definition, steps involved, standard time calculations.

UNIT - IV: MATERIALS MANAGEMENT (10 Periods)

Objectives of Materials Management; Inventory: Functions, types, associated costs, inventory classification techniques, stores management and stores records, purchase management, Value Analysis; Factors involved in inventory problem analysis, inventory costs and deterministic inventory control models, single item inventory control models: without shortages, with shortages, with quantity discounts.

UNIT - V: QUALITY CONTROL (9 Periods)

Introduction and meaning of Quality, quality control, process control, control charts: types of control charts, objectives X-bar, R-chart, process capability, theory underlying attribute control charts, comparison between attribute charts and variable charts, Acceptance sampling: OC Curve, sampling plan; Total Quality Management (TQM): Total Quality Control; Concepts of TQM, elements of TQM, benefits of TQM, benchmarking.

Total Periods: 45

TEXT BOOKS:

1. O.P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publications, 17th Edition, 2014.
2. Martand T.Telsang, Industrial Engineering and Production Management, S.Chand, 2nd Edition, 2006.

REFERENCE BOOKS:

1. Stoner, Freeman, Gilbert, Management, Pearson Education, 6th Edition, 2003.
2. M.Mahajan. Industrial Engineering and Production Management, Dhanpat Rai Publications.
3. Besterfield et al., Total Quality Management, Pearson Education, 3rd Edition, 2011.
4. Pannervselvam, Production and Operations Management, PHI, 3rd Edition, 2012.
5. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 7th Edition, 2002.
6. Amrine, Ritchey, Moodie, Kmec, Manufacturing Organization and Management, Pearson, 6th Edition, 2004.

III B.Tech - I Semester

14BT50303: THERMAL ENGINEERING-II

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

PRE-REQUISITES:

Thermodynamics, Thermal Engineering - I.

COURSE DESCRIPTION:

Concepts of Rankine cycle; Several aspects such as steam and its properties; Various boiler mountings and accessories; Draught and performance criteria of boilers; Characteristics of flow through nozzle; Steam turbines; Condensers; Introduction to gas turbines and jet propulsion.

COURSE OUTCOMES:

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

CO1: Apply the knowledge of Thermal Science, and Engineering fundamentals to the solution of Thermal Power Engineering problems.

CO2: Conduct an elementary energy audit and develop heat balance sheet for boilers, turbines and such thermal engineering equipment.

CO3: Identify various components in select thermal engineering setups and troubleshoot a problem.

CO4: Report calculations and diagrams in systematic manner

Detailed Syllabus:

UNIT - I: STEAM GENERATORS (9 periods)

Classification of boilers, functions of mountings and accessories, Green's economiser, Sugden's super heater, air Preheater; Working of fire tube boilers: Cochran, Lancashire and Locomotive boilers; Water tube boilers: Lamont, Babcock and Wilcox, Benson boilers; Boiler horse power, equivalent evaporation and efficiency of boiler, heat balance sheet.

UNIT-II: DRAUGHT AND VAPOUR POWER GENERATION(9 periods)

Draught: Classification of draught, height of chimney, condition for maximum discharge, efficiency of chimney.

Vapour Power Generation: Rankine cycle, Modified Rankine Cycle, Rankine Cycle with reheating and regeneration.

UNIT-III: STEAM NOZZLES AND STEAM CONDENSERS (9 periods)

Steam Nozzles: Function and types of nozzles, flow through nozzles, steady flow assumptions, velocity at nozzle exit, ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, Wilson line.

Steam Condensers: Classification of condensers, working of jet and surface condensers, vacuum efficiency and condenser efficiency, cooling water requirement, Edward's air pump.

UNIT - IV: STEAM TURBINES (9 periods)

Impulse Turbine: Working of single stage impulse turbine, De-laval Turbine, velocity diagrams and combined velocity diagrams, effect of friction, axial, tangential and resultant thrust, power developed, diagram efficiency, condition for maximum efficiency, compounding, governing.

Reaction Turbines: Working of Parson's reaction turbine, degree of reaction, stage velocity diagram and combined velocity diagram, condition for maximum efficiency, governing.

UNIT - V: GAS TURBINES AND JET PROPULSION (9 periods)

Gas Turbines: Components of simple gas turbine plant, ideal gas turbine cycle, specific work and efficiency of simple gas turbine cycle; methods to increase specific work: Inter cooling and reheating, methods to increase efficiency : Regeneration; Brief concepts about gas turbine combustion, thrust augmentation techniques.

Jet Propulsion: Introduction, classification of jet propulsion devices; Working of air breath engines: Ramjet, Pulsejet, Turbojet and Turbopropeller engines; Thrust power and propulsive efficiency, Thermodynamic cycle of turbojet engine, introduction to rocket propulsion.

Total Periods:45

TEXT BOOKS:

1. R.K. Rajput, Thermal Engineering, Laxmi Publication, 9th Edition, 2013.
2. R.S. Khurmi & J.S Gupta, Thermal Engineering, S.Chand, 15th Edition, 2015.

REFERENCE BOOKS:

1. V. Ganesan, Gas Turbines , TMH, 3rd edition, 2010.
2. B. Srinivasulu Reddy and K.Hema Chandra Reddy, Thermal Engineering Data Book, I.K. International, 2007.
3. R. Yadav, Thermodynamics and Heat Engines, Pearson, 7th edition 2007.

Note: Steam tables with Mollier diagram should be supplied during examination.

III B.Tech - I Semester
14BT50304: MACHINE TOOLS

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

PRE-REQUISITES:

Manufacturing Technology.

COURSE DESCRIPTION:

Theory of Metal Cutting: Geometry of Cutting Tools; Merchant's force diagram; Lathe machine, principle of operation, tools, multispindle lathes; Shaping; Slotting and Planing machines; Drilling; Boring; Jig boring; Milling machine, specifications; Grinding; Lapping; Honing, principles of design of jigs and fixtures.

COURSE OUTCOMES:

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

- CO1.** Identify and explain the functions of the basic components of a machine tool.
- CO2.** Apply merchant circle diagram to estimate geometry of tool from estimated forces.
- CO3.** Specify required machining operation to achieve the specified geometry, and estimate machining time and metal removal rate.

Detailed Syllabus:

UNIT - I : THEORY OF METAL CUTTING (11 Periods)

Introduction: Basic elements of machining, sources of heat in metal cutting, basic definitions: cutting speed, feed and depth of cut, orthogonal and oblique cutting, classification of cutting tools, principal angles of single and multi point tools, tool signature, tool geometry in coordinate system- ASA and ORS system, types of chips, chip thickness ratio, and chip breakers.

Mechanics of metal cutting: velocity relationships, force relationship in orthogonal cutting, Merchant's circle diagram, forces on a single point tools in turning, stress and strain in the chip, work done in cutting, horse power calculation, popular metal cutting theories, estimation of machining time.

UNIT - II: TOOL MATERIALS AND ENGINE LATHE (9 periods)

Cutting tools: Types of cutting tool materials, tool failure, mechanism of wear, tool life, factors affecting tool life, machinability, dynamometers.

Engine lathe: Lathe and its principle of working, types of lathes, lathe specification and sizes, parts of a lathe, lathe accessories; Chucks, driving plates, dogs, tool holders and posts, centers, collets, rests, mandrels, jigs and fixtures, operations done on a lathe, standard and special operations, Lathe tool dynamometers, taper turning methods, thread cutting, estimation of machining time.

UNIT - III: SPECIAL MACHINES-I (7 periods)

Shaping, Slotting and Planning machines: Principles of working, principal parts, operations performed.

Drilling and Boring Machines: Working principle, types, operations performed, tool holding devices, twist drill, boring machines, fine boring machines, jig boring machine, deep hole drilling machine.

UNIT - IV: SPECIAL MACHINES-II (9 periods)

Grinding machine: Theory of grinding, classification, cylindrical and surface grinding machine, tool and cutter grinding machine, special types of grinding machines, grinding wheel, different types of abrasives, bonds, specification and selection of a grinding wheel, static and dynamic balancing of a wheel truing and dressing of wheels.

Lapping, Honing and Broaching machines: Comparison of grinding, lapping and honing.

UNIT - V: MILLING MACHINE, JIGS AND FIXTURES (9 periods)

Milling machines: Working principle in milling, types of column and knee type milling machines, milling machine attachments, milling methods, milling cutters, milling operations, indexing or dividing heads, plain, universal and optical dividing head, indexing methods, direct indexing, plain or simple indexing, compound indexing, differential indexing.

Jigs and fixtures: important considerations in jigs and fixture design, main principles of design of Jigs and fixtures, principle of six point location (3-2-1 principle), classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, typical examples of jigs and fixtures.

Total Periods: 45

TEXT BOOKS:

1. B.S.Raghuwansi, A course in Workshop Technology, Vol 1, Dhanpat Rai and Co(P) Ltd, New Delhi, 10th revised edition, 2014
2. Hazra Choudary S.K. and A.K., Workshop Technology, Vol II, Media Promoters

REFERENCE BOOKS:

1. C.Elanhezian and M. Vijayan, Machine Tools, Anuradha Agencies Publishers.
2. Kalpakzian, Manufacturing Technology, Pearson
3. R.K. Jain and S.C. Gupta, Production Technology, Khanna Publishers.
4. G.R.Nagpal, Tool Engineering And Design, Khanna Publishers, 2004.

III B.Tech - I Semester

14BT50305: DESIGN OF MACHINE ELEMENTS - I

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

PRE-REQUISITES:

Engineering mechanics; strength of materials; computer aided machine drawing.

COURSE DESCRIPTION:

General considerations of design, design process; BIS codes of materials; Preferred numbers; Simple stresses, combined stresses; theories of failure; Fatigue; Stress concentration; Goodman's line; Soderberg's line; Design of riveted joints; Threaded joints; Shafts; Keys; Muff and split muff and flange couplings; Flexible couplings; Spigot and socket cotter joint; Knuckle joint.

COURSE OUTCOMES:

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

- CO1:** Design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
- CO2:** Analyze the mechanical properties and understand, identify and quantify failure modes for mechanical parts suggest means of rectification.
- CO3:** Address the issues of safety in design involving of threaded joint, riveted joint, shafts, keys, and couplings, cotter and knuckle joint etc.,
- CO4:** Provide environmentally safe and cost effective design solutions.

Detailed Syllabus :

UNIT - I: INTRODUCTION TO DESIGN AND STRESSES IN MACHINE ELEMENTS (9 Periods)

INTRODUCTION: Types of design, general considerations of design, design process; Selection of engineering materials, properties, manufacturing considerations in the design, BIS codes of materials, preferred numbers.

STRESSES IN MACHINE MEMBERS: Simple stresses, combined stresses, torsional and bending stresses, impact stresses, stress-strain relation, various theories of failures, factor of safety.

UNIT-II: DESIGN FOR FLUCTUATING LOADS (7 Periods)

Stress concentration, notch sensitivity, design for fluctuating stresses fatigue failure, endurance limit, estimation of endurance strength, Goodman's line, Soderberg's line, design of components for finite and infinite life.

UNIT-III: DESIGN OF THREADED AND RIVETED JOINTS

(11 Periods)

THREADED JOINTS: Basic types of screw fastenings, cap screws and set screws, bolts of uniform strength, locking devices, I.S.O. metric screw threads, bolts under tension, eccentrically loaded bolted joint in shear, eccentric load parallel and perpendicular to the axis of bolts, and plane containing the bolts.

RIVETED JOINTS: Types of riveted heads, riveted joints; types of failure; efficiency of joint; Boiler shell riveting design and eccentrically loading design of riveted joints.

UNIT-IV: SHAFTS, KEYS AND COUPLINGS

(11 Periods)

SHAFTS: Shaft design on the basis of strength, torsional rigidity and lateral rigidity, A.S.M.E. code for shaft design.

Design of Keys: Sunk, saddle, tangent, round, woodruff, splines, keyways.

COUPLINGS: Design of rigid couplings, sleeve or muff, split-muff or compression and flange couplings; Design of flexible couplings, bushed-Pin type flange coupling.

UNIT-V: DESIGN OF COTTERS AND KNUCKLE JOINTS (7 Periods)

DESIGN OF COTTER JOINTS: spigot and socket, sleeve and cotter, jib and cotter joints; Knuckle joint.

Total Periods: 45

TEXT BOOKS:

1. V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill, 3rd Edition, 2011.
2. R.S. Khurmi and J.K. Gupta, Machine Design, S. Chand, 14th Edition, 2012.

REFERENCE BOOKS:

1. Joseph E. Shigely, Mechanical Engineering Design, TMH, 9th Reprint Edition, 2011.
2. T. Krishna Rao, Design of Machine Elements, I K International, 1st Edition, 2008.
3. Kannaiah, Machine Design, Scitech, 3rd Reprint Edition, 2010.

NOTE: Design data books are not permitted in the examinations.

III B.Tech - I Semester
14BT50306: AUTOMOBILE ENGINEERING

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

PRE-REQUISITES:

Thermal Engineering-I, Thermal Engineering Lab.

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:

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

- CO1:** Employ the basic knowledge in building chassis and the body of an automobile.
- CO2:** Analyze the transmission losses, fuel injection losses, steering geometry, heat losses and over steering of an automobile.
- CO3:** Present the probable solution in the design of mechanical, hydraulic, pneumatic, and vacuum braking systems, and low stress suspension systems, high pressure injection system of an automobile.
- CO4:** Develop the emissions-free automobiles and hybrid vehicles.

Detailed Syllabus:

UNIT- I: BASICS OF AUTOMOBILE (12 periods)

Classification of automobiles, components of a four wheeler automobile, chassis and body, rear wheel drive, front wheel drive, four wheel drive, turbo charging, super charging, oil filters, oil pumps, crank case ventilation.

FUEL SYSTEM: S.I engine: Fuel supply systems, mechanical and electrical fuel pump air and fuel filters, carburetor types, multipoint fuel injection, C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, types of nozzles, nozzle spray formation, injection timing.

UNIT- II: COOLING & IGNITION SYSTEMS (10 periods)

Necessity of cooling system, cooling requirements, types, natural and forced circulation system: Thermostat, evaporative cooling system, types of radiators, cooling fan, water pump, antifreeze solutions, ignition system: Function of an ignition system, battery ignition system, magneto coil ignition system, electronic ignition system using contact breaker, capacitive discharge ignition system.

UNIT- III: EMISSIONS FROM AUTOMOBILES (8 periods)

Pollution standards: National and International, pollution control techniques for SI engines and CI engines, comparison of electronic catalytic converter and conventional catalytic converter, alternative energy sources for automobiles, emissions from alternative energy sources: Hydrogen, biomass, alcohols, LPG, CNG, bio-diesel, their merits and demerits.

UNIT- IV: TRANSMISSION & STEERING SYSTEMS (10 periods)

Types of clutches, cone clutch, single and multi plate clutch, centrifugal clutch; Types of Gear box: constant mesh, sliding mesh, synchromesh gear box; Layout of gear box; gear shifting mechanism; automatic transmission; propeller shaft, universal joint, differential, real axle arrangement, steering system: Requirements, and functions of steering system, Ackermann and Davis principle, steering gears; steering geometry, under steering, over steering, steering ratio, camber, caster, toe-in, toe out ; steering linkages; power steering, wheel alignment, balancing.

UNIT- V: SUSPENSION & BRAKE ACTUATING SYSTEMS (5 periods)

Requirements and functions of suspension system, elements of suspension systems; rigid axle suspension system, torsion bar, shock absorber, telescopic damper, independent suspension system. Brake actuating system: Need and functions of braking system; classification of brakes: Mechanical, Hydraulic, Pneumatic, Vacuum brake systems.

Total Periods: 45

TEXT BOOKS:

1. Dr. Kirpal Singh, Automobile Engineering, Vol.1&Vol.2, standard Publishers distributor, 12th edition, 2011.
2. R.K.Rajput, Automobile Engineering, Lakshmi Publication, 2nd edition 2014.

REFERENCE BOOKS:

1. K.K. Ramalingam, Automobile Engineering, Scitech Publication, reprint August 2013.
2. V.Ganesan, IC Engines, Tata McGraw-Hill, 3rd Edition, 2007.
3. Srinivasan, Automotive Engines, Tata McGraw-Hill Education, New Delhi, 1st edition, 2001.
4. V.M.Domkundwar, A course in internal combustion engines, Dhanpat Rai & Co, Reprint 2014.

III B.Tech - I Semester

14BT50321: MACHINE TOOLS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Metal cutting and Machine Tools.

COURSE DESCRIPTION:

Hands-on-practice on machine tools such as lathe, milling machine, drill press, power saw, surface grinder and other machine shop.

COURSE OUTCOMES:

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

- CO1:** Employ knowledge of different machine tools used in machine shop.
- CO2:** Analyze machine tool problems and offer a qualitative assessment on problem solutions.
- CO3:** Identify different manufacturing techniques to produce complex shapes.
- CO4:** Manufacture simple parts using lathe/milling/drilling/shaper and other allied machine tools.

Any TWELVE experiments to be conducted.

1. Demonstration of construction & operations of general purpose machines: Lathe, drilling machine, milling machine, shaper, planing machine, slotting machine, cylindrical grinder, surface grinder and tool & cutter grinder.
2. Step turning operation.
3. Taper turning operation.
4. Eccentric turning operation.
5. Right hand threading.
6. Square threading.
7. Multiple operations on capstan lathe.
8. Drilling, reaming and tapping & external threading using die.
9. Shaping and planing operations.
10. Slotting operation.
11. Cylindrical surface grinding operation.
12. Gear cutting operation.
13. End milling operation.
14. Centerless grinding operation.
15. Grinding of tool angles on a cutting tool.

III B.Tech - I Semester

14BT50322: THERMAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Engineering Thermodynamics; Thermal Engineering.

COURSE DESCRIPTION:

Assembly and disassembly of an automobile models; Finding performance parameters of 2-stroke and 4- stroke engines; Heat balancing of an engine; Practicing valve and port timing diagrams; Determining friction power for single and multi-cylinder engines; Determining Fuel properties; Compressor performance.

COURSE OUTCOMES:

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

- CO1:** Experimentally determine the performance of 2- stroke, 4-stroke I.C. engines, multi stage reciprocating compressor and blower.
- CO2:** Experimentally determine the conditions for maximizing efficiency w.r.t load and changes in compression ratio on load.
- CO3:** Provide solutions to reduce heat losses
- CO4:** Identify methods to reduce emissions of CO_x, NO_x and SO_x.
- CO5:** Report experimental results, calculations, and inferences systematically

LIST OF EXPERIMENTS

Any TWELVE experiments to be conducted.

- 1 (a) Valve Timing Diagram using a model of 4 -S Diesel, CI engine
- (b) Port timing diagram of a model of 2-S , SI engine
2. Morse Test on 4-S, 4-C, Petrol Engine using Hydraulic Loading
3. Retardation Test on 4-S, 1-C, Diesel Engine using Electrical Loading
4. Performance Test on 2-S, 1-C, Petrol Engine using Electrical Loading
5. Economic speed test on 2-S, 1-C, Petrol Engine using Electrical Loading
6. Performance Test on 4-S, 1-C diesel Engine using Mechanical Loading
7. Heat Balance Test on 4-S, 1-C diesel Engine using Mechanical Loading
8. Performance Test on Variable Compression Ratio Engine (VCR Engine)

9. Motoring Test on Variable Compression Ratio Engine (VCR Engine)
10. Performance Test on Blower rig
11. Performance Test on 2-Stage Reciprocating Air compressor
12. Assembly and Disassembly of an IC engine components
- 13 (a) Bomb calorimeter for finding calorific value of solid and liquid fuel
- (b) Junker's gas calorimeter for calorific value of gaseous fuel
14. Flue gas analysis for engine emissions
15. Performance test on Computerized 4-S, 1-C,C.I engine with electrical loading.

III B.Tech - II Semester

14BT5HS01: MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

(Common to: CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITE: Nil

COURSE DESCRIPTION:

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

COURSE OUTCOMES:

After completion of this course, a successful student 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.
- Using advanced tools like tally and SAP.
- Significance of Economics and Accountancy

CO2: Develop skills in analyzing problems for

- Managerial decisions of an organization.
- Demand & Supply, Production & Cost and Markets & Price through Economic theories.

CO3: Develop effective communication in Business and Accounting transactions.

Detailed syllabus:

UNIT -I: INTRODUCTION TO MANAGERIAL ECONOMICS, DEMAND & SUPPLY ANALYSIS: (9 Periods)

Definition, Nature and Scope of Managerial Economics. Demand: Determinants of demand - Demand function - Law of demand, assumptions and exceptions - Elasticity of demand -Types of elasticity of demand -Demand forecasting and methods of demand forecasting, Supply- Determinants of Supply and Supply function.

UNIT - II : THEORY OF PRODUCTION AND COST ANALYSIS

(9 Periods)

Production Function: Isoquants and Isocosts - Input-output relationship - Law of returns. Cost Concepts: Total, Average and Marginal Cost - Fixed vs. Variable costs - Opportunity Costs Vs Outlay Costs- Separable Costs Vs Joint Costs, Urgent Costs Vs Postponable Costs- Avoidable Costs Vs Unavoidable Costs - Break Even Analysis (BEA)-Assumptions, Merits and demerits - Determination of Break Even Point (Simple problems).

UNIT - III : INTRODUCTION TO MARKETS AND PRICING

(9 Periods)

Market Structure: Types of Markets - Features of perfect competition - Monopoly and monopolistic competition - Price and Output determination in perfect competition and monopoly.

Pricing : Objectives and policies of pricing - Sealed bid pricing - Marginal cost pricing - Cost plus pricing - Going rate pricing - Market penetration - Market skimming - Block pricing - Peak load pricing - Cross subsidization. Capital: Significance - Types of capital - Sources of Capital.

UNIT - IV: INTRODUCTION AND PRINCIPLES OF ACCOUNTING

(9 Periods)

Accountancy: Introduction - Concepts - Conventions - Accounting Principles - Double Entry Book Keeping - Journal - Ledger - Trial Balance (Simple problems).

UNIT - V : FINAL ACCOUNTS

(9 Periods)

Introduction to Final Accounts - Trading account - Profit and Loss account and Balance Sheet with simple adjustments (Simple problems). Computerization of Accounting System : Manual Accounting Vs Computerized Accounting - Advantages and Disadvantages of Computerized Accounting.

Total periods: 45

TEXT BOOKS:

1. A.R. Aryasri, Managerial Economics and Financial Analysis, Tata Mc- Graw Hill, New Delhi, 3rd Edition, 2007. ISBN 13: 9780070078031.
2. R.Cauvery, U.K. Sudhanayak, M. Girija and R. Meenakshi, Managerial Economics, S. Chand and Company, New Delhi, 2nd Edition, 2010. ISBN13:

REFERENCE BOOKS:

1. Vershaney and Maheswari, Managerial Economics, Sultan Chand and Sons, New Delhi, 19th Edition, 2005.
2. H. Craig Petersen and W. Cris Levis, Managerial Economics, Pearson Education, 4th Edition, 2009 ISBN-13: 9786 2833
3. Lipsy and Chrystel, Economics, Oxford University Press, New Delhi, 12th Edition, 2011. ISBN 978-0-19-956338-8
4. S.P. Jain and K.L. Narang, Financial Accounting, Kalyani Publishers, Ludhiana, 6th Edition, 2002. ISBN 8127204242

III B.Tech - II Semester

14BT60301: DESIGN OF MACHINE ELEMENTS -II

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

PRE-REQUISITES:

Engineering Mechanics, Strength of materials, Design of Machine Elements

COURSE DESCRIPTION:

Study, analysis and design of machine components such as curved beams; mechanical springs; spur gears, helical gears; Journal bearings - anti friction bearings; internal combustion engine parts such as piston, crank and connecting rod; Safety and reliability consideration in machine design; detailed design to define the shape, size and material.

COURSE OUTCOMES:

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

- CO1:** Design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
- CO2:** Identify and quantify failure modes for mechanical parts.
- CO3:** Provide innovative solutions/improvisation to improve trial designs.
- CO4:** Provide environmentally safe and cost effective design solutions

Detailed Syllabus:

UNIT - I: DESIGN OF CURVED BEAMS (9 Periods)

Stresses in curved beams; expression for radius of neutral axis for Rectangular, Circular, Triangular, Trapezoidal and T-Section; Design of crane hooks, C-clamps, Ring and chain link; Deflection of a closed ring, Chain link.

UNIT - II: BEARINGS (9 Periods)

Bearing materials; Types of Journal bearings; Lubrication; Bearing Modulus; McKee's equation; Static and Dynamic Load rating; Equivalent Radial Load; Bearing life; Design and Selection of Ball and Roller Bearings; Thrust Bearings, Foot-step and Pivot Bearings, Collar Bearing, bearing life.

UNIT - III: GEARS (10 Periods)

Classification of Gears; Condition for Constant Velocity, Ratio of Gears-Law of Gearing; Forms of Teeth; Systems of gear teeth; minimum number of teeth on the pinion in order to avoid Interference; Gear Materials; Design considerations for a Gear Drive; Beam Strength of Gear Teeth - Lewis Equation; Dynamic Tooth Load; Static Tooth Load; Wear Tooth Load; Causes of Gear Tooth Failure; Design Procedure for Spur Gears; Design of Shaft for Spur Gears; Face Width of Helical Gears; Strength of Helical Gears.

UNIT - IV: MECHANICAL SPRINGS (9 Periods)
Introduction - Classification of springs; Stress and deflections of helical springs; Springs for fatigue loading; Eccentric loading of springs; energy storage capacity in helical springs; Concentric springs; Design of leaf springs.

UNIT - V: I.C ENGINE PARTS (8 Periods)
Design of principal Parts of an I.C Engine: Piston, Cylinder, Connecting Rod and Crankshaft.

Total Periods: 45

TEXT BOOKS:

- 1: V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill, 3rd Edition, 2010.
- 2: R.S. Khurmi and J.K. Gupta, Machine Design, S. Chand, 14th Edition, 2012.

REFERENCE BOOKS:

- 1: Joseph E. Shigley, Mechanical Engineering Design, TMH Publishers, 9th Edition, 2011.
- 2: T. Krishna Rao, Design of Machine Elements, I K International, 1st Edition 2008.
- 3: Balaveera Reddy & Mahadevan, Design Data Handbook for Mechanical Engineers, CBS publishers, 4th Edition, 2013.

NOTE: Design data book should be supplied during examinations(Reference Book No.3).

III B.Tech - II Semester

14BT60302: OPERATIONS RESEARCH

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

PRE-REQUISITES:

Engineering Mathematics, Matrices and Numerical Methods.

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; network models; game theory application.

COURSE OUTCOMES:

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

- CO1:** Identify mathematical model to employ in a given application requiring optimization.
- CO2:** Analyze a practical situation and formulate appropriate objective function and constraints.
- CO3:** Apply concepts of operations research to maximize the efficiency and minimize the wastage in select situations.

Detailed Syllabus:

UNIT - I: LINEAR PROGRAMMING (10 Periods)

Requirements of Linear Programming Problem; Formulation of linear programming problems; Graphical solution; Linear Programming special cases: infeasible solution, unboundedness, redundancy, alternate optimal solutions; Simplex method, Two-phase method, Big-M method; Dual formulation, Dual simplex method.

UNIT - II: TRANSPORTATION AND ASSIGNMENT MODELS (10 Periods)

Transportation model, Initial solution methods: north-west corner rule, least cost method and Vogel's approximation method; Modified distribution (MODI) method of optimal solution; special cases of transportation problems; Transshipment problem; Assignment model: Hungarian method of optimal solution, Variants of Assignment Problem; Travelling salesmen problem.

UNIT - III: NETWORK MODELS (9 Periods)

Minimal spanning tree, maximal flow and shortest route techniques; Project management through network analysis: CPM, PERT, cost analysis and crashing.

UNIT -IV: WAITING LINES AND SIMULATION (8 Periods)

Single Channel - Poisson arrivals - exponential service times - with non finite queue length model; Multichannel - Poisson arrivals - exponential service times with non finite queue length model; Simulation: Monte Carlo simulation, simulation of a waiting line problem, simulation and inventory analysis, simulation model for a maintenance policy, verification and validation.

UNIT - V: DECISION ANALYSIS AND GAMES (8 Periods)

Types of decision making environment; decision making under risk: Expected value of perfect information and imperfect information, and decision tree; decision making under uncertainty: Hurwicz criterion, Laplace criterion, and Savage criterion; Two person zero sum games: Minimax (maximin) Criterion and optimal strategy, Solution of games with saddle points, Rectangular games without saddle points, 2 x 2 games, dominance principle, Graphical method: m x 2 and 2 x n games.

Total Periods : 45

TEXT BOOKS:

1. J.K. Sharma, Operations Research: Theory and Applications, Macmillan, New Delhi, 5th Edition, 2013.
2. Hamdy A Taha, Introduction to Operations Research, Pearson India, 9th Edition, 2014.
3. Kanti Swarup, P.K. Gupta, Manmohan, Operations Research, Sultan Chand & Sons, 2014.

REFERENCE BOOKS:

1. Hillier, Libermann, Introduction to Operations Research, McGraw Hill Education (India) Private Limited, 9th Edition, 2011.
2. Wayne L. Winston, Operations Research: Applications and Algorithms, Thomson Brooks/Cole, 4th Edition(India Edition), 2007.
3. R.Panneerselvam, Operations Research, PHI Learning Pvt. Ltd., 2nd Edition, 2012.

III B.Tech - II Semester
14BT60303: HEAT TRANSFER

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

PRE-REQUISITES:

Engineering Mathematics, Thermodynamics, and Fluid Mechanics.

COURSE DESCRIPTION:

Heat transfer concepts of conduction, convection, and radiation; One-dimensional steady and transient conduction; Analysis of extended surfaces; Convection heat transfer for both free and forced convection regimes; boiling and condensation ; Heat exchangers; general characteristics of radiation; properties of radiating surfaces and radiative heat exchange between surfaces.

COURSE OUTCOMES:

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

- CO1:** Employ knowledge of Mathematics and Heat transfer in solving heat transfer problems and building mathematical models for further analysis.
- CO2:** Analyze the various heat transfer problems and provide numerical solutions.
- CO3:** Provide preliminary heat transfer calculations needed for detailed system design.
- CO4:** Identify societal applications of heat transfer and provide solutions.

Detailed Syllabus:

UNIT - I: BASICS AND CONDUCTION HEAT TRANSFER

(9 periods)

Basics of Heat Transfer: Modes and Mechanism of heat transfer, Conduction, convection and radiation; General differential equation of heat conduction: Cartesian, Cylindrical and Spherical Coordinates; Boundary and Initial Conditions; One dimensional steady state heat conduction: Conduction through plane wall, cylinders and spherical systems; Composite systems; Critical thickness of insulation.

UNIT - II: FINS AND TRANSIENT HEAT CONDUCTION

(9 Periods)

Extended surfaces: Efficiency, Effectiveness and Temperature distribution on Long Fin, Fin with Insulated Tip and Short Fin; Unsteady heat conduction: Lumped heat analysis, Infinite and semi infinite solids.

UNIT - III: CONVECTION HEAT TRANSFER

(9 Periods)

Hydrodynamic and thermal boundary layer theory, Dimensional analysis, Buckingham's -theorem applied to free and forced convection heat

transfer. Forced convection: External flow over plates, cylinders and spheres; Internal flow through Horizontal pipe, Annular pipe; Free convection: Flow over vertical plate, horizontal plate, and cylinders.

UNIT - IV: HEAT EXCHANGERS AND PHASE CHANGE HEAT TRANSFER (9 Periods)

Heat Exchangers: Classification of Heat Exchangers, Overall Heat Transfer Coefficient and Fouling Factor; Concepts of LMTD and NTU Methods.

Boiling: Pool Boiling Regimes, Determination of Heat Transfer Coefficient in Nucleate Boiling, Critical Heat Flux and Film Boiling; Condensation: Filmwise and Dropwise Condensation, Nusselt's Theory of Condensation on a Vertical Plate.

UNIT - V: RADIATION HEAT TRANSFER (9 Periods)

Fundamentals of Radiation: Emission Characteristics and Laws of Black Body Radiation; Irradiation, Total and Monochromatic radiation; Laws of Planck, Wien's displacement, Kirchoff, Lambert's cosine, Stefan and Boltzmann.

Radiative Heat Exchange: Heat Exchange between Two Black Bodies, Concepts of Shape Factor, Emissivity, Heat Exchange between Gray Bodies, Radiation Shields.

Total Periods: 45

TEXT BOOKS:

- 1: R.C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New Age International, 4th Edition, 2014.
- 2: R.K.Rajput, Heat and Mass Transfer, S.Chand & Company Ltd, 6th Edition, 2015.

REFERENCE BOOKS:

- 1: P.K.Nag, Heat Transfer, TMH, 2nd Edition, 2010.
- 2: Holman.J.P, Heat Transfer, TMH, 9th Edition, 2010.
- 3: Incropera, Fundamentals of Heat Transfer, Wiley India, 6th Edition, 2012.
- 4: Yunus Cengel, Heat and Mass Transfer, Mc Graw Hill Publications, 4th Edition, 2014.
- 5: C.P Kothandaraman, Fundamentals of Heat and Mass Transfer, New Age International, 4th Edition, 2014.
- 6: C.P Kothandaraman and S.Subramanyan , Heat and Mass Transfer data book, New Age International, 8th Edition, 2014.

Note: Heat Transfer data books should be supplied during examinations (Reference Book No.6).

III B.Tech - II Semester

14BT60304: CAD/CAM

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

PRE-REQUISITES:

Computer Aided Engineering Drawing, Computer Aided Machine Drawing, Manufacturing Technology.

COURSE DESCRIPTION:

Fundamental and conventional CAD processes, Raster scan graphics co-ordinate system, 3D transformations, Geometric construction models, Curve representation methods, Conventional Numerical Control, Computer Control in NC, GT, CAPP, CIMs, CAQC.

COURSE OUTCOMES:

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

- CO1:** Use the 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:** Use popular drafting packages to develop geometric models of parts and their assemblies.
- CO4:** Use computer aided quality control methods to detect manufacturing errors during inspections.

Detailed Syllabus:

UNIT - I: INTRODUCTION TO CAD/CAM (8 Periods)

CAD/CAM: Introduction, Computers in Industrial manufacturing, Design process, CAD/CAM & CIM, CAD/CAM Hardware (Basic Structure, CPU, Memory Types, Storage Devices, Display devices, Software & System Configuration), CAD/CAM: Applications, Advantages & Disadvantages.
CAD STANDARDS: Objectives, Standardization in graphics, graphical kernel system, Other graphic standards.

UNIT - II: COMPUTER GRAPHICS & GEOMETRIC MODELING (14 Periods)

Computer Graphics: Raster Scan Graphics Coordinate system, Line Drawing Algorithms: DDA Algorithm, Bresenham's Line algorithm, 2D & 3D Transformations (Scaling, Translation, Rotation & Reflection).
GEOMETRIC MODELING: Need & Requirement of Geometric Modeling, Curve Representation methods :(Line & circle), Types of models: Introduction to wireframe modeling, synthetic curves and its representation (Bezier & B-spline), Introduction to Surface modeling, synthetic curves and its representation(Nurbs, Bezier & B-spline), Introduction to Solid Modeling and representation of B-rep & CSG.

**UNIT - III: INTRODUCTUION TO COMPUTER NUMERICAL CONTROL
(7 Periods)**

Computer Numerical Control: Introduction, Numerical Control, Numerical control modes, Numerical Control elements, NC machine tools, Structure of CNC machine tools, Automatic tool changers, CNC Machining centres, CNC Turning centres, Machine control unit.

CNC Programming: Part Programming fundamentals, Manual part programming methods, Computer Assisted Part Programming.

**UNIT - IV: GROUP TECHNOLOGY & PROCESS PLANNING
(7 Periods)**

Group Technology: Introduction, Part Family, Classification and Coding, Three Parts classification and coding systems (Opitz, MICLASS, CODE), Group Technology Cells, Benefits of Group Technology.

CAPP: Planning Function, Types of Process Planning (Retrieval & Generative), Benefits of Computer Aided Process Planning.

**UNIT - V: CIMs & CAQC
(9 Periods)**

Computer Intigrated Manufacturing System: Introduction, Types of Manufacturing System, Machine Tools and Related Equipments, Material Handling System, Computer Control System, Human Labor in Manufacturing System, CIMS Benefits.

Computer Aided Quality Control: Introduction, Terminology in quality control, Computers in Quality Control, Contact & Non-Contact inspection methods, Statistical Quality control, Integration of CAQC with CAD/CAM.

Total Periods: 45

TEXT BOOKS:

- 1: P.N. Rao, CAD/CAM: Principles and Applications, TMH, 2004.
- 2: Mikell P.Groover, Computer Aided Design & Computer Aided Manufacturing, Pearson Education, 2006.

REFERENCE BOOKS:

- 1: Ibrahim Zeid, CAD/CAM Theory and Practice, Mc Graw Hill, 2010.
- 2: Radhakrishnan and Subramaniah, CAD/CAM/CIM, New Age International, 2004.

III B.Tech - II Semester
14BT6HS01: BANKING AND INSURANCE

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE -REQUISITE:

Managerial Economics and Principles of Accountancy

COURSE DESCRIPTION:

Origin and growth of Banking, functions and importance, RBI; Debtor and Creditor relationship, Types of Accounts, Loans and Advances; e-payment, e-cash, NEFT, RTGS, Credit and Debit cards; Insurance elements and risk; LIC, GIC, IRDA.

COURSE OUTCOMES:

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

CO1: Acquire Knowledge in

- a) Tools and concepts of Banking and Insurance.
- b) Basic Principles and concepts of Insurance and Banking.
- c) Provides life skills for effective utilization of Banking and Insurance facilities.
- d) e-fund transfers, e-payments and e-business models.

CO2: Develop analytical skills in understanding problems pertaining to

- a) Online banking and e - payments..
- b) Risk anagement through insurance benefits the society at large.
- c) money management by leveraging on technology, banking and insurance services.

Detailed Syllabus:

UNIT - I : INTRODUCTION TO BANKING (9 Periods)

Origin and growth of banking, meaning and functions of banking, importance of banking, Reserve Bank of India; functions, monetary policy, open market operations.

UNIT - II : BANK-CUSTOMER RELATIONSHIP (9 Periods)

Debtor-creditor relationship, anti money laundering, products or services, payment and collection of cheques and other negotiable instruments. Accounts - Types of accounts, procedure for opening and closing an account. Loans and Advances- principles of lending, types of loans.

UNIT - III : BUSINESS MODELS AND ELECTRONIC PAYMENT SYSTEM (9 Periods)

Features, types of e-payment system, e-cash, NEFT, RTGS, Electronic purses, Credit and Debit cards. Business models- B2B, B2C, C2C, and B2G.

UNIT - IV : INTRODUCTION TO INSURANCE (9 Periods)

Introduction - Insurance definition, elements of insurance concept of risk, risk Vs uncertainty.

UNIT - V : INSURANCE OVERVIEW (9 Periods)

Principles of insurance, insurance types, LIC & GIC insurance contract- nature, elements, functions, IRDA, Insurance Players in India.

Total periods : 45

TEXT BOOKS:

1. A.V. Ranganadha Chary, R.R. Paul- Banking and Financial system, Kalyani Publisher, New Delhi, 2nd Edition.
2. P.K.Gupta- Insurance and Risk Management, Himalaya Publishing House, New Delhi, ISBN: 9789350516676

REFERENCE BOOKS:

1. Diwan, Praj and Sunil Sharma: Electronic Commerce- A Manager's Guide to E-Business, Vanity Books International, Delhi, 2002. ISBN-13: 978- 8174462039
2. Kalakota Ravi and Whinston Andrew B: Frontiers of Electronic Commerce, Pearson Education India, 1996 New Delhi. ISBN: 978-81-7758-392-2
3. Schneider, Grey P: Electronic Commerce, Course Technology, Cengage Learning, 2008, 8th Edition, New Delhi. ISBN-13:978-1-4239-0305-5.

III B.Tech - II Semester
14BT6HS02: COST ACCOUNTING AND
FINANCIAL MANAGEMENT

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

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 Returns on Investment.

COURSE OUTCOMES:

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

- CO1:** Acquire Knowledge in
- Elements of Costing.
 - Basic concepts of Financial Management.
 - Risk and Return
 - Financial Accounting.
 - Using advanced tools like tally and SAP.
 - Significance of Economics and Accountancy

CO2: Do cost, risk and return of investment analysis.

- CO3:** Develop skills in providing solutions for
- Material, Labor, Overheads control.
 - Excellence and ability to minimize the cost of the organization
 - Effective investment decisions

CO4: Prepare cost sheets pertaining to manufacturing of products.

Detailed Syllabus:

Unit I : INTRODUCTION TO COST ACCOUNTING (9 Periods)

Cost and Cost Accounting, Scope, Objectives, Advantages and disadvantages -Cost Accounting Vs Management Accounting - Elements of Costing -Installation of costing system - Material Control, Labor Control, Overhead Control, Fixed and Variable, Direct and Indirect Costs.

Unit II: COST ANALYSIS (9 Periods)

Analysis of Cost - Preparation of cost sheet, estimate, tender and quotation (Simple problems) -Importance of Costing while pricing the products.

Unit III: STANDARD COSTING (9 Periods)

Introduction to Standard Costing & Variances - Variance Analysis: Material variances, Labor variances (Simple Problems).

Unit IV : FINANCIAL MANAGEMENT (9 Periods)

Financial Management-Meaning and Scope, Liquidity, Profitability, Financial Statement Analysis through ratios (Simple Problems).

Unit V: RISK AND RETURNS ON INVESTMENT (9 Periods)

Investment-Meaning and Definition- concept of risk and returns- Investment Alternatives- Introduction to Behavioral Finance - Anomalies - Key Concepts -Anchoring - Mental Anchoring-Confirmation and Hindsight Bias-Gambler's Fallacy-Herd Behavior-Over Confidence-Overreaction and Availability Bias-Prospect Theory.

Total periods : 45

TEXT BOOKS:

1. S.P. Jain and K.L. Narang: Cost Accounting, Kalyani Publishers, Ludhiana, 6th Edition, 2002.
2. James C Van Horne, Financial Management and Policy, Prentice-Hall of India/Pearson, 12th Edition, 2001 ISBN-10: 0130326577

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, Cost and Management Study Material, New Delhi.
2. I.M. Pandey, Financial Management, Vikas Publishing House Pvt. Ltd., 10th Edition, 2010, ISBN- 13 9788125937142.

III B.Tech - II Sem

14BT6HS03: ENTREPRENEURSHIP FOR MICRO SMALL AND MEDIUM ENTERPRISES

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

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:

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

CO1: Acquire Knowledge in

- Schemes and institutions encouraging entrepreneurship.
- Basic Principles and concepts of Accountancy.
- Significance of entrepreneurship.

CO2: (i) Develop analytical skills in understanding problems pertaining to

- Personal excellence through financial and professional freedom.
- Women entrepreneurship acts as contrivance in the societal development

(ii) Develop Critical thinking and evaluation ability.

CO3: Generate ideas for formulating business plans.

Detailed Syllabus:

UNIT - I: INTRODUCTION TO ENTREPRENEURSHIP DEVELOPMENT (9 Periods)

Concept of Entrepreneurship - Growth of Entrepreneurship in India - Factors affecting entrepreneurship growth - Characteristics of an Entrepreneur - Functions of Entrepreneur - Need for an Entrepreneur - Entrepreneurial Decision Process - Types of Entrepreneurs - Distinction between an Entrepreneur and a manager - Intrapreneur - Entrepreneur Vs Intrapreneur.

UNIT-II: IDEA GENERATION AND FORMULATION OF BUSINESS PLANS (9 Periods)

Sources of Ideas - Methods of idea generation - Product Identification - Opportunity Selection - Steps in Setting up of a Small Business Enterprise - Contents Of Business Plans - Significance - Formulation of Business Plan - Business Opportunities in Various Sectors - Common Errors in Business Plan Formulation - Project Report Preparation.

UNIT - III: MICRO AND SMALL ENTERPRISES (9 Periods)

Meaning and Definition - Micro and Macro units - Essentials - Features - Characteristics - relationship between Micro and Macro Enterprises - Rationale behind Micro and Small Enterprises - Scope of Micro and Small Enterprises - Objectives of Micro Enterprises - Problems of Micro and Small Enterprises

UNIT - IV: INSTITUTIONAL FINANCE AND SUPPORT TO ENTREPRENEUR (9 Periods)

Need for Institutional Finance - Commercial Banks - Industrial Development Bank of India (IDBI) - Industrial Finance Corporation of India Ltd. (IFCI) - Industrial Credit Investment Corporation of India Ltd. (ICICI) - State Financial Corporations (SFCs) - State Industrial Development Corporations (SIDCs) - Small Industries Development of Bank of India (SIDBI) -- Need For Institutional Support - National Small Industries Corporation Ltd (NSIC) - Small Industries Development Organisation (SIDO) - Small Industries Service Institutes (SISIs) - District Industries Centres (DICs) - National Institute of Entrepreneurship and Small Business Development (NIESBUD) - Technical Consultancy Organizations (TCOS)(Origin, Mission, and credit facility/support).

UNIT -V: WOMEN ENTREPRENEURSHIP (9 Periods)

Concept of Women entrepreneur - Functions of Women entrepreneurs - Growth of women entrepreneurship in India - Challenges of Women entrepreneurs- Programmes supporting women entrepreneurship - Rural Entrepreneurship - Meaning, Need for Rural entrepreneurship, Problems of rural entrepreneurship, Role of NGOs.

Total periods : 45

TEXT BOOKS:

1. Dr.S.S.Khanka, Entrepreneurial Development, S. Chand and Company Ltd, Revised Edition, 2012. ISBN: 9788121918015
2. Madhurima Lall & Shikha Sahai, Entrepreneurship, Excel Books India, 2nd Edition 2008. ISBN : 9789350620953

REFERENCE BOOKS:

1. Nandan, H., Fundamentals of Entrepreneurship, PHI Learning Pvt. Ltd., 2013, New Delhi, 3rd edition 2013. ISBN: 9788120347502
2. Vasanth Desai, "The Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 4th edition 2009. ISBN: 9788183184113
3. Bholanath Dutta, Entrepreneurship Management - Text and Cases, Excel Books, 1st edition 2009. ISBN: 9789350621257

III B.Tech - II Semester
14BT70105: DISASTER MITIGATION AND
MANAGEMENT

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITE: Environmental Sciences

COURSE DESCRIPTION:

Natural disasters and hazards - Earthquakes - Floods and cyclones, droughts - Landslides - Disaster management.

COURSE OUTCOMES:

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

CO1: Explain various types of disasters and mitigation strategies

CO2: Analyze and interpret the Guidelines for hazard assessment and vulnerability analysis

CO3: Use historical data of disaster losses and inform the people over preparedness

CO4: Address the issues due to disasters and provide conclusions over post disaster events for the benefit of the society

CO5: Function in multidisciplinary teams for the effective displacement of people during disasters

UNIT - I: (8 Periods)

INTRODUCTION: Types of disasters - Natural disasters - Impact of disasters on environment - Infrastructure and development - Concepts of hazards and vulnerability analysis- Hazard Assessment - Guidelines for hazard assessment and vulnerability analysis - Basic principles and elements of disaster mitigation

UNIT -II: (11 Periods)

EARTHQUAKES : Introduction to earthquakes - Intensity scale (MSK-64) - Seismic activity in India - Seismic zones of India - Earthquakes in A.P. - Action plan for earthquake disaster preparedness - Elements at risk, recovery and rehabilitation after earthquake - Earthquake resistant design and construction of buildings. Tsunami - Onset, types and causes - Warning - Element at risk - Typical effects - Specific preparedness and mitigation strategies

UNIT - III: (11 Periods)

FLOODS AND CYCLONES: Onset, types, warnings - Elements at risk - Typical effects - Indian floods and cyclones - Hazard zones - Potential for reducing hazards - Mitigation strategies and community based mitigation.

DROUGHTS: Onset, types and warning - Kinds of droughts - Causes of

droughts - Impact of droughts - Early warning and response mechanisms
- Mitigation strategies - Droughts in India.

UNIT -IV: (7 Periods)

LANDSLIDES: Onset, types and warning - Causes of landslides - Elements at risk - Indian land slides - Hazards zones - Typical effects - Mitigation strategies and community based mitigation

UNIT -V: (8 Periods)

DISASTER MANAGEMENT: Disaster management organization and methodology - Disaster management cycle - Disaster management in India - Typical cases - Cost-benefit analysis with respect to various disaster management programmes implemented by NGOs and Government of India.

Total Periods: 45

TEXT BOOKS:

1. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, 1999.
2. A.S. Arya, Anup Karanth, and Ankush Agarwal, Hazards, Disasters and Your Community: A Primer for Parliamentarians, GOI-UNDP Disaster Risk Management Programme, 2005.

REFERENCE BOOKS:

1. Disaster Management in India, A Status Report Publication of the Govt. of India, Ministry of Home Affairs, National Disaster Management Division, August 2004.
2. R. B. Singh Natural Hazards And Disaster Management, Rawat Publications, 2009.
3. Pardeep sahani, Alka Dhameja, Uma Medury Disaster Mitigation, 4th Edition, PHI Learning Pvt. Ltd., 2011.
4. Sanjay K. Sharma Environment Engineering and Disaster Management, 1st Edition, USP Publishers, 2011.

III B.Tech - II Semester

14BT70106: ENVIRONMENTAL POLLUTION AND CONTROL

(OPEN ELECTIVE)

(Common to CSE,IT, CSSE, CE & ME)

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

PRE-REQUISITES: Environmental Sciences

COURSE DESCRIPTION: Introduction, Sources and Effects of Air Pollution - Dispersion of Pollutants and their control - Surface and Ground Water Pollution and control-Soil Pollution and remediation-Management of Municipal Solid Wastes.

COURSE OUTCOMES:

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

CO1: Explain various pollutants, characteristics and their dispersion

CO2: Analyze the major pollutants that causes environmental pollution.

CO3: Conduct research and select suitable techniques to control pollution.

CO4: Understand the effects of environmental pollutions on human beings and vegetation

CO5: Communicate the methods of management and control of environmental pollution

Detailed Syllabus:

UNIT- I: (8 Periods)

INTRODUCTION TO AIR POLLUTION AND DISPERSION OF POLLUTANTS: Scope - Air Pollutants - Classifications - Natural and Artificial - Primary and Secondary, Point and Non- Point, Line and Area Sources of Air Pollution - Stationary and Mobile Sources - Dispersion of Pollutants - Dispersion Models - Applications.

UNIT -II: (9 Periods)

EFFECTS AND CONTROL OF PARTICULATES: Effects of Air Pollutants on Man, Material and Vegetation - Global Effects of Air Pollution - Green House Effect, Heat Island, Acid Rains, Ozone Holes - Control of Particulates - Control at Sources - Process Changes - Equipment Modifications - Design and Operation of Control Equipment - Settling Chambers - Centrifugal Separators - Bag Filters, Dry and Wet Scrubbers - Electrostatic Precipitators.

UNIT-III: (10 Periods)
WATER POLLUTION: Introduction-Water Quality in Surface Waters - Nutrients - Controlling Factors in Eutrophication-Effects of Eutrophication - Ground Water Pollution - Thermal Pollution - Marine Pollution - Sewage Disposal in Ocean - Types of Marine Oil Pollution - Cleanup of Marine Oil Pollution - Control of Water Pollution - Case Study on Tanneries - Drinking Water Quality Standards.

UNIT-IV: (9 Periods)
SOIL POLLUTION: Soil Pollutants - Sources of Soil Pollution - Causes of Soil Pollution and their Control - Effects of Soil Pollution-Diseases Caused by Soil Pollution - Methods to Minimize Soil Pollution - Effective Measures to Control Soil Pollution - Case Study on Fertilizer.

UNIT-V: (9 Periods)
MUNICIPAL SOLID WASTE MANAGEMENT: Introduction - Types of Solid Wastes - Principles of Excreta Disposal - Domestic Solid Waste - Production Collection of Solid Wastes - Transport of Solid Wastes - Management of Solid Wastes - Methods of Land Disposal - Sanitary Land-fill - Composting - Incineration.

Total Periods: 45

TEXT BOOKS:

1. C.S.Rao, Environmental Pollution Control Engineering, 2nd Edition, New Age International Pvt Ltd., 2007.
2. Y.Anjaneyulu, Introduction to Environmental Science, 1st Edition, BS Publications., 2009.

REFERENCE BOOKS:

1. M.N. Rao and H.V.N. Rao, Air Pollution, 19th Edition, Tata McGraw-Hill Education Pvt. Ltd., 2010.
2. Daniel Vallero, Fundamentals of Air Pollution, 5th Edition, Academic Press (Elsevier), 2014.
3. S.M.Khopkar , Environmental Pollution Monitoring and Control, 2nd Edition, New Age International Pvt Ltd., 2007.
4. S.Deswal and K.Deswal, Environmental Science, 2nd Edition, Dhanpat Rai & Co, 2011.

III B.Tech - II Semester
14BT70107: CONTRACT LAWS AND REGULATIONS

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

COURSE DESCRIPTION: Construction Contracts - Tenders - Arbitration - Legal Requirements - Labour Regulations.

COURSE OUTCOMES:

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

- CO1:** Explain contract documents and tendering processes.
- CO2:** Analyze the legal issues in arbitration and in contracts documents.
- CO3:** Address the legal issues in collecting taxes.
- CO4:** Follow ethics while bidding, sale and purchase of property.
- CO5:** Develop and Prepare tender documents as per the standards.

UNIT- I: (9 Periods)
CONSTRUCTION CONTRACTS: Indian Contracts Act - Elements of Contracts - Types of Contracts - Features - Suitability - Design of Contract Documents - International Contract Document and laws - Standard Contract Document - Law of Torts.

UNIT-II: (9 Periods)
TENDERS: Prequalification - Bidding - Accepting - Evaluation of Tender from Technical, Contractual and Financial Points of View - Two Cover System - Preparation of the Documentation - Contract Formation and Interpretation - Potential Contractual Problems - Price Variation Clause - Comparison of Actions and Laws - Subject Matter - Violations.

UNIT-III: (9 Periods)
ARBITRATION: Arbitration - Comparison of Actions and Laws - Agreements - Appointment of Arbitrators - Conditions of Arbitration - Powers and Duties of Arbitrator - Rules of Evidence - Enforcement of Award - Arbitration Disputes - Dispute Review Board.

UNIT-IV: (9 Periods)
LEGAL REQUIREMENTS: Legal Requirements for Planning - Property Law - Agency Law - Tax Laws - Income Tax, Sales Tax, Excise and Custom Duties - Local Government Approval - Statutory Regulations -

Insurance and Bonding - Laws Governing Purchase and Sale - Use of Urban and Rural Land - Land Revenue Codes - EMD - Security Deposits - Liquidated Damages.

UNIT-V: (9 Periods)
LABOR REGULATION: Social security-Welfare legislation-Laws relating to wages, bonus and industrial disputes-Labor administration-insurance and safety regulations-workmen-compensation act-maternity benefit act-other labour laws.

Total Periods: 45

TEXT BOOKS

1. G.C.V. Subba Rao Law of Contracts I & II, 11th Edition, S.Gogia & Co., 2011.
2. Jimmie Hinze, Construction Contracts, 2nd Edition, Mc Graw Hill, 2001.

REFERENCE BOOKS

1. Gajaria G.T, Kishore Gajaria, Laws Relating to Building and Engineering Contracts in India, 4th Edition, Lexis Nexis Butterworths India, 2000.
2. B. S. Patil, Civil Engineering Contracts and Estimates, 3rd Edition, University Press (India) Private Ltd., 2013.
3. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, 7th Edition, McGraw Hill Education, 2010.
4. Akhileshwar Pathak, Contract Law, 1st Edition, Oxford University Press, 2011.

III B.Tech - II Semester
14BT70108: PLANNING FOR SUSTAINABLE DEVELOPMENT

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

COURSE DESCRIPTION: Introduction to Sustainable Development - Environment, Sciences and Sustainability - Sustainable Development Politics and Governance - Tools, Systems and Innovations for Sustainability - Communication and Learning for Sustainability.

COURSE OUTCOMES:

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

- CO1:** Demonstrate the knowledge of planning, environment, tools and systems for sustainable development
- CO2:** Analyze the current challenges to sustainability.
- CO3:** Use theoretical frameworks and provide solutions to the real world sustainability issues.
- CO4:** Conduct awareness of contemporary issues on globalization in terms of sustainability.
- CO5:** Give recommendations for the sustainability issues and solutions using a holistic approach .
- CO6:** Explain a sense of civic responsibility, including reflection on the student's own role in developing and nurturing sustainable communities.
- CO7:** Participate in decision making as individual and responsible for collective decision.

UNIT-I: (8 Periods)
INTRODUCTION TO SUSTAINABLE DEVELOPMENT: Definition and Concepts of Sustainable Development - Capitalization of Sustainability - National and Global Context - The Millennium Development Goals - Emergence and Evolution of Sustainability and Sustainable Development - Theories of Sustainability - Case Studies

UNIT- II: (8 Periods)
ENVIRONMENT, SCIENCES AND SUSTAINABILITY: Climate Change - Science, Knowledge and Sustainability - Unforeseen Environmental Impacts on Development - Challenges of Sustainable Development - Centrality of Resources in Sustainable Development - Case Studies

UNIT -III: (10 Periods)
SUSTAINABLE DEVELOPMENT POLITICS AND GOVERNANCE: Governance and Democracy and Eco-Welfare - Global Civil Society and World Civil Politics - Civic Environmentalism - Policy Responses to Sustainable Development - Economics of Sustainability - Social Responsibility in Sustainability - National Action

UNIT-IV: (11 Periods)
TOOLS, SYSTEMS AND INNOVATION FOR SUSTAINABILITY: Need for System Innovation - Transition and Co-Evolution - Theories and Methods for Sustainable Development - Strategies for Eco-Innovation - Ecological Foot Print Analysis - Socio Ecological Indicators - Eco Labels- Policy Programmes for System Innovation - Case Studies

UNIT V (8 Periods)
COMMUNICATION AND LEARNING FOR SUSTAINABILITY: Role of Emerging Media - Remarkable Design and Communication Art, Activism and the Public Interest - Education for Sustainability - Participation in Decision Making - Critical Thinking and Reflection - Case Studies

TEXT BOOKS:

1. John Blewitt, Understanding Sustainable Development, Earth Scan Publications Ltd., 2nd Edition, 2008.
2. Jennifer A. Elliot, An Introduction to Sustainable Development, Earth Scan Publications Ltd., 4th Edition, 2006.

REFERENCE BOOKS:

1. Peter Rogers, Kazi F Jalal , John A Boyd, An Introduction to Sustainable Development, Earth Scan Publications Ltd., 1st Edition, 2006.
2. Simon Dresner, The Principles of Sustainability, Earth Scan Publications Ltd., 2nd Edition, 2008.
3. Peter Bartelmus, Environment Growth and Development: The concepts and strategies of sustainability, Routledge, 3rd Edition, 2003.
4. Gabriel Moser, Enric Pol, Yvonne Bernard, Mirilia Bonnes, Jose Antonio Corraliza, Maria Vittoria Giuliani, People places and sustainability, Hogrefe & Huber Publishers, 2nd Edition, 2003.

III B.Tech -II Semester
14BT70109: RURAL TECHNOLOGY

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

COURSE DESCRIPTION: Research & Development - Non Conventional Energy - Community Development - IT Management

COURSE OUTCOMES:

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

- CO1:** Acquire the knowledge of various nonconventional energy systems and technologies for rural development.
- CO2:** Apply the principles of IT for the rural development.
- CO3:** Responsible for the development of technologies in rural areas.
- CO4:** Understand the impact of technologies in societal and environmental aspects.

UNIT-I: (9 Periods)

RESEARCH & DEVELOPMENT: India - Ancient Indian Technologies - Rural India Life - Indian Farmer - Role of Science and Technology in Rural Development - Rural Technology and Poverty Eradication - Rural Business Hubs - Technology in improving rural infrastructure - Various organizations related to innovation - Issues of technology transfer: CAPART, NABARD, CSIR, NIF.

UNIT- II: (9 Periods)

NON CONVENTIONAL ENERGY: Definition of Energy, Types of alternative sources of energy, Sources of non conventional energy - Solar energy - Solar Cooker - Solar Heater - Biogas - Recycling and Management and Wastes Conservation - Assessment & Production of biomass products & their utilization.

UNIT -III: (9 Periods)

TECHNOLOGIES FOR RURAL DEVELOPMENT: Food & Agro based technologies - Tissue culture - Building and Construction technologies - Cultivation and processing of economic plants - Cottage and social Industries.

UNIT IV (9 Periods)

COMMUNITY DEVELOPMENT: Water conservation - Rain water Harvesting - Drinking water - Environment and Sanitation - Bio fertilizers

- Medical and Aromatic plants - Employment generating technologies - Apiculture - Piculture - Aquaculture.

UNIT -V: (9 Periods)

IT IN RURAL DEVELOPMENT: The Role of Information Technology in Rural Areas - Impact of Information Technology in Rural development - Need and Necessity of Technology - Corporate Social Responsibilities - Private sector participation (Activities in different spheres: Employment, Education, Health, Agriculture and Service Sectors) and Saansad Adarsh Gram Yojana (SAGY) - village adoptions schemes.

Total Periods:45

TEXT BOOKS:

1. M.S Viridi, Sustainable Rural Technologies, Daya Publishing House, New Delhi, 1st Edition, 2009.
2. S.V. Prabhath & P. Ch. Sita Devi, Technology and Rural India, Serials Publications, New Delhi, 1st Edition, 2012.

REFERENCE BOOKS:

1. P. R. S. Murthy, R.C. Chackravathy, Information Technology & Rural Development, Pacific Books International, 1st Edition, 2011.
2. Shivakanth Singh, Rural Development Policies and Programmes, Northern book centre, New Delhi, 1st Edition, 2002.
3. L.M.Prasad, Principles and Practice of Management, Sultan Chand & Sons, New Delhi, 8th Edition, 2014.
4. Venkata Reddy. K, Agriculture and Rural Development Gandhia Perspective, Himalaya Publishing House, 1st Edition, 2001.

III B.Tech - II Semester
14BT60305:ARTIFICIAL INTELLIGENCE AND
ROBOTICS

(OPEN ELECTIVE)

(Common to CSE, IT,CSSE, CE & ME)

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

COURSE DESCRIPTION:

Artificial Intelligence; Problem solving strategies; Heuristic search, Production systems; Simple facts in logic, Forward and Backward Reasoning; Fuzzy logic and Neural Nets; Concept of learning; Classification and specification of robots; Different Sensing and Vision techniques; Direct and Inverse Kinematics; Dynamics; Programming Languages, VAL-II programming; Applications of Artificial Intelligence in Robotics, Task Planning.

COURSE OUTCOMES:

On completion of this Course, a successful student will be able to:

CO1: Impart knowledge on forward, backward and plausible reasoning inherent in them for developing Artificial intelligence and expert systems.

CO2: Employ effective methods to analyze a robot motion control while executing a specific task.

CO3: Design and Implement appropriate solutions for search Problems such as playing two person games and for planning problems which involve defining a sequence of actions of a robot.

CO4: Apply various AI techniques to different robotic sub-problems involving task planning and obstacle avoidance.

UNIT-I: ARTIFICIAL INTELLIGENCE & PROBLEM SOLVING

(10 periods)

The Underlying assumption of AI; AI Technique: simple Tic-Tac-Toe program; Problem solving: State space search; Production systems: control strategies, search space control: depth-first, breadth-first search; Heuristic search: Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis.

UNIT-II: KNOWLEDGE REPRESENTATION & LEARNING

(9 periods)

Knowledge Representation; Predicate Logic: Simple facts in logic, resolution, Natural deduction; Procedural versus Declarative Knowledge; Forward reasoning versus Backward reasoning; Semantic Nets; Frames; slots; conceptual dependency; scripts; Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic systems & Neural nets: Basic concepts; Concept of learning.

UNIT-III: ROBOTICS -VISION & SENSING (8 periods)

Robotics: Robot Classification, Robot Specification, notation; Sensing: Range sensing: Triangulation; proximity sensing: Inductive, Capacitive and Ultrasonic sensing; touch sensing: tactile sensing, artificial skins; Force and torque sensing: Wrist force sensors; Vision: low-level vision, high-level vision.

UNIT-IV: ROBOT PROGRAMMING & CONTROL (10 periods)

Direct and Inverse Kinematics: Co-ordinate reference Frames, Rotations, Homogeneous Coordinates; Introduction to arm dynamics; Control: Types of control schemes: Resolved motion control, Adaptive control; Programming: Robot level languages: characteristics, specifications; Task level languages; Language structure: VAL II.

UNIT-V: ROBOT INTELLIGENCE & TASK PLANNING (8 periods)

Artificial intelligence in Robotics: Goals of AI research; Applications of state space search in robotics; graph search technique; Problem solving and problem reduction; robot learning; Task planning: Modelling, task specification, obstacle avoidance, grasp planning; Expert system.

Total Periods: 45

TEXT BOOKS:

- 1: E. Rich and K. Knight, Artificial intelligence, Tata Mc Graw Hill, 2nd edition, 1992.
- 2: K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics: Control, Sensing, Vision, and Intelligence, Mc Graw Hill, International Edition, 1987.

REFERENCE BOOKS:

- 1: Mikell P. Groover, Industrial Robotics, Technology, Programming, and Applications, Tata Mc Graw Hill, 9th reprint 2011.
- 2: D.W. Patterson, Introduction to AI and Expert Systems, PHI, 1992.
- 3: N.J. Nilsson, Principles of AI, Narosa Publishing House, 2000.
- 4: George Luger, AI-Structures and Strategies for and Strategies for Complex Problem solving, Pearson Educations, 4th edition, 2002.

III B.Tech - II Semester
14BT60306: GLOBAL STRATEGY AND TECHNOLOGY
(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: -Nil

COURSE DESCRIPTION:

Introduction to strategic management, strategic management process, principles of good strategy, globalisation, globalisation strategies, research & development strategies, technology management and transfer, significance, elements of transfer process, corporate governance: the Indian scenario.

COURSE OUTCOMES:

After completion of this Course, a successful student will be able to:

- CO1.** Decide upon a macroscopic management strategy to optimize the impact of decisions with limited resources.
- CO2.** Identify the impact of globalization in a given engineering scenario. Participate in elementary discussions on corporate governance.
- CO3.** Analyse an industrial Engineering problem and layout research plan to meet the needs. Identify the crucial stages needed to ensure smooth transfer of technology from concept stage.

Detailed Syllabus:

UNIT-I : INTRODUCTION TO STRATEGIC MANAGEMENT

(9 periods)

Definitions; Classes of decisions; Levels of strategy; Core competence; Strategic intent and stretch; Approaches to strategy making; Roles of different strategists; strategic management process; Benefits and relevance of strategic management; limitations and misgivings; Principles of good strategy growing relevance of strategic management in India, TQM and strategic management.

UNIT-II: GLOBALISATION

(9 periods)

Meaning and dimensions; Stages of globalisation; Essential conditions for globalisation; Competitive advantage of Nations; Globalisation of Indian business; Factors favouring Globalisation; Globalisation strategies.

UNIT-III: RESEARCH & DEVELOPMENT STRATEGIES (9 periods)

Introduction, Concept, Evolution of R & D Management, R & D as a business, R & D and competitive advantage, Integration of R & D,

Elements of R & D strategies, Selection of R & D strategies, Implementation strategies, R & D trends, Responses to changes.

UNIT-IV: Technology Management and Transfer (9 periods)

Technology Management: Introduction, Definition of Technology, Components, Features, Classification of technology, Concept of technology management, Nature of technology management, Drivers of MOT, Significance, Scope of MOT, Responding to technology challenge.

Technology Transfer: Introduction, Definition, Classification, Significance, Elements of transfer process, Types of technology transfer, package, Modes of transfer, Channels of technology flow, Routes of technology transfer, Effectiveness of technology transfer.

UNIT -V: Corporate Governance: The Indian Scenario (9 periods)

Emergence of corporate governance in India and the landmarks, corporate governance models, Codes and status in India, Indian corporate governance - Role and Responsibilities of Regulators and the Board of Directors, Corporate Governance: Specific issues in India, Corporate Governance issues in Family - owned business in India, Corporate Governance and the Indian ethos,

Total Periods: 45

TEXT BOOKS:

1. Francis Cherunilam, Strategic Management, Himalaya Publishing House, 3rd Edition, 2002.
2. C.S.G.Krishnamacharyulu and Lalitha Ramakrishnan , Management of Technology, Strategic Management, Himalaya Publishing House, 2nd Edition, 2012.

REFERENCE BOOKS:

1. White and Bruton, The Management of Technology and Innovation; a Strategic Approach, Cengage Learning, 1st Edition, 2007.
2. S.K.Mandak, Ethics in Business and Corporate Governance, TMH, 2^s Edition, 2012.

III B.Tech - II Semester
14BT60307: INTELLECTUAL PROPERTY
RIGHTS AND MANAGEMENT

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES :- Nil

COURSE DESCRIPTION:

Protection of ideas, innovation and artistic endeavors; Acts and procedure related to patents, trademarks, passing off, copy right, design registration, trade secrets and cyber laws, case studies in each.

COURSE OUTCOMES:

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

CO1 : prepare documents and fill applications needed for filing a patent, design, copy right and trade mark

CO2 : ensure smooth transition from concept to final product.

CO3 : exercise discretion in following ethical aspects in dealing with intellectual property rights. .

UNIT - I: OVERVIEW OF INTELLECTUAL PROPERTY RIGHTS

(9 periods)

Introduction and importance of intellectual property rights (IPRs), types of intellectual property, International scenario in IPR: WIPO, WTO, TRIPS, international and national patent acts: United States of America patent act, United Kingdom patent act, India patent act, recent amendments in India patent act 1972.

UNIT - II: PATENTS

(9 periods)

Introduction, Basic concepts, object and value of patent law, advantages of patent to inventor, patentable inventions, Not patentable inventions, overview of patent procedure, Bio technology patents, patents on computer program, patent rights on micro organism, plant breeding and breeders right, protection of bio diversity, protection of traditional knowledge, infringement of patents and remedy for infringement.

UNIT - III: TRADEMARKS

(9 periods)

Basic concepts, definition, functions, kinds of trademarks: service trademarks, collective trademarks, certification trademarks, textile trade marks, registrable and non registrable trademarks, registration of trademarks, examination process, establishing trade mark right, good will, infringement and action for trademarks, passing off, trade mark and eco label, comparison with patents industrial design and copy right.

UNIT - IV: INDUSTRIAL DESIGN, TRADE SECRETS, CYBER LAWS

(9 periods)

Industrial Design: Basic concepts, scope and nature of rights, process of registration rights, rights after registration, transfer of interest or rights, reliefs and remedies and action for infringement of rights, appeals.

Trade Secrets: Definition, significance, tools to protect trade secrets in India

Cyber laws: Co relation to intellectual property

UNIT - V: COPY RIGHTS

(9 periods)

Introduction, nature and scope, subject matter, related or allied rights, works in which copy rights subsists, registration of copy rights, conferred by copy right, copy right protection in India, transfer of copy rights, right of broad casing organizations and of performer, computer software.

Total Periods: 45

TEXT BOOKS:

1. P.Narayan, Intellectual Property Law, Eastern Law House, New Delhi and Kolkata, 2005,
2. Deborah E. Bouchoux, Intellectual Property Rights, Cengage Learning, India edition, 2011.

REFERENCE BOOKS:

1. Bainbridge David, Intellectual Property Rights: Key to New Wealth, National Research Development Corporation, Pearson Education, New Delhi.
2. W.R.Cornesh, Intellectual Property Rights: Patent, Copy Right, Trade Mark, Allied Rights, Universal law publishing private limited, Delhi, 2001.
3. S.R. Myneni, Law of Intellectual Property, Asia law house, Hyderabad 2001.
4. Prabuddha Ganguly, Intellectual Property Rights: Unleashing Knowledge Economy, TMH New Delhi, 1st edition, 2001.

III B.Tech - II Semester
14BT60308: MANAGING INNOVATION AND
ENTREPRENEURSHIP

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

Course Description:

Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts Shifting Composition of the Economy Purposeful Innovation & 7 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:

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

- CO1:** Define, explain and illustrate theories of business innovation and entrepreneurship, the evolution of industries and economies, and the roles of Entrepreneurs.
- CO2:** Develop a comprehensive and well structured business plan for a new venture.
- CO3:** Present a persuasive business plan to potential investors or to internal stakeholders and effectively answer probing questions on the substance of the plan; and,
- CO4:** Work effectively in multidisciplinary, cross-cultural teams, towards the development of a Team Project.

Unit-I: ENTREPRENEURSHIP (7 Periods)

Introduction to Entrepreneurship: Evolution of entrepreneurship from economic theory; Managerial and entrepreneurial competencies, entrepreneurial growth and development.

UNIT II: CREATIVITY AND INNOVATION (11Periods)

Creativity and Innovation: Concepts Shifting Composition of the Economy; Purposeful Innovation & the 7 Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies: Strategies that aim at introducing an innovation, innovation & entrepreneurship, planning -incompatible with Innovation & entrepreneurship.

Unit-III: THE INDIVIDUAL ENTREPRENEUR (7 Periods)

Entrepreneurial Motivation: Need for continuous learning & relearning; Acquiring Technological Innovation Entrepreneurial motivation (nach story); Achievement Motivation in Real life- Case Study. Entrepreneurs versus inventors

**Unit-IV: INTERNATIONAL ENTREPRENEURSHIP OPPORTUNITIES
(11 Periods)**

International Entrepreneurship: Concepts and Nature of International Entrepreneurship. The changing International environment. Ethics and International Entrepreneurship. Entrepreneurial entry in to international business, strategic Issues in International Entrepreneurship.

Unit-V: Creative Problem Solving (9 Periods)

Problem Identification and Problem Solving: Problem Identification. Problem solving Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

- 1: Martin, M.J. "Managing Innovation and Entrepreneurship in Technology based Firm", John Wiley Interscience, 1994.
- 2: Ettl, J.E. "Managing Technology Innovation", John Wiley & Sons, 2000.
- 3: Robert D Hisrich., Michael P Peters., Dean A Shepherd, "Entrepreneurship" The McGraw-Hill Companies, 6th Edition, 2011

REFERENCE BOOKS:

- 1: Christensen, C. M. and Raynor, M. E. The Innovators Solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press, (2003).
- 2: Drucker, P. F., Innovation and Entrepreneurship, New York: Harper, 1985.
- 3: Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press (2001).
- 4: Harvard Business Review on Entrepreneurship (Collection of articles), Harvard Business School Press (1999)
- 5: Rogers, E.M., "Diffusion of Innovations", New York: Simon and Schuster, 5th Edition, 2003.
- 6: Drucker, P. F. "The Discipline of Innovation," Harvard Business Review, May2000. (Originally published 1985, May-June)

III B.Tech - II Semester
14BT60309: MATERIAL SCIENCE

(OPEN ELECTIVE)

(Common to ME, CSE, IT & CSSE)

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

PRE-REQUISITES:

Engineering Chemistry, Engineering Physics.

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:

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

- CO1.** Understand how materials are formed and their classification based on atomic arrangement.
- CO2.** Illustrate how the design of the various types of steels, cast Irons and Non ferrous alloys influence various engineering applications.
- CO3.** Understand the basic difference in properties of various conductors, Insulators and Semiconductors and application of various advanced materials for different branches of Engineering.

UNIT - I: INTRODUCTION TO MATERIALS SCIENCE (7 periods)

Structure of metals: Bonds in Solids - Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys - determination of grain size.

Constitution of alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT - II: CAST IRONS, STEELS & NON-FERROUS METALS

(12 periods)

Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels. Structure and properties of Copper and its alloys, Aluminum and its alloys.

UNIT - III: ELECTRIC CONDUCTORS & INSULATORS (12 periods)

Type of materials selected for conductors, Insulators and semi conductors. Introduction to ceramics- Bonding and microstructure-DC properties of ceramic materials-AC properties- mechanical properties - Ceramics as Conductors, Insulators and capacitors, introduction to Plastics-DC properties-AC properties-mechanical properties.

UNIT - IV: SEMICONDUCTORS AND MAGNETIC MATERIALS

(9 periods)

Fabrication of Semiconductors-Producing a silicon wafer-Lithography and Deposition-Packaging of semiconductors materials-Types of magnetic materials- Measuring magnetic properties-Application of soft magnetic materials in Electromagnets and relays, AC transformers, Generators and motors.

UNIT -V: ADVANCED MATERIALS AND APPLICATIONS (5 periods)

Composites - Fiber reinforced, Metal Matrix, Ceramic Matrix - properties and applications; Ceramics - Alumina, Zirconia, Silicon Carbide, Sialons, Reaction Bonded Silicon Nitride(RBSN), Glasses- properties and applications, manufacturing of Optical fibers.

Total periods : 45

TEXT BOOKS:

- 1: Kodigre V D, Material Science and Metallurgy, Everest Publishing House, Pune, 31st edition, 2011.
- 2: Ian.P.Jones, Material Science for Electrical and Electronic Engineers, Oxford University Press, New Delhi,2000

REFERENCE BOOKS:

1. V. Raghavan, Physical Metallurgy: Principles and Practices, PHI, New Delhi, 2nd edition, 2006.
2. William. D. Callister, Materials Science & Engineering-An Introduction, John Wiley and sons, New Delhi, 6th edition, 2002.
3. A.J. Dekkar, Electrical Engineering Materials, PHI, New Delhi, 1970.

III B. Tech. - II Semester
14BT60502: ENGINEERING SYSTEMS
ANALYSIS AND DESIGN

(OPEN ELECTIVE)

(Common to CSE, IT , CSSE, CE & ME)

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

PRE-REQUISITES: Nil

COURSE DESCRIPTION:

Overview of the 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:

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

- CO1:** Gain knowledge on:
 - Systems Process and System Design
 - Systems Analysis and Modeling
 - System Development Life Cycle
 - Design Management and Maintenance Tools.
- CO2:** Apply the CASE Tools for System Process and estimation the given models.
- CO3:** Design, Develop and implement new Techniques for modeling the systems.
- CO4:** Work effectively as team member on projects
- CO5:** Manage and Maintain the System Process.

UNIT - I: INTRODUCTION (9 periods)

Introduction- Systems, Types of systems, integrating technologies for systems, Need for system analysis and design, Roll of the systems analyst, the system development life cycle, CASE tools for analysis and design.

UNIT - II: ANALYSIS AND MODELING ORGANIZATIONAL SYTEMS (9 periods)

Organization as system, System Analysis, Depicting systems graphically, Use case Modeling, levels of management, organizational culture.

UNIT- III: PROJECT MANAGEMENT (9 periods)

Project initiation, Problem in organization, Determining feasibilities, ascertaining hardware and software needs, identifying, forecasting, comparing costs and benefits, activity planning and control, managing the project.

**UNIT -IV: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML
(9 periods)**

Object oriented analysis and design- Introduction, Object modeling, Dynamic modeling, functional modeling, packages and other UML artifacts, the importance of using UML for modeling.

UNIT- V: DESIGNING EFFECTIVE OUTPUT (9 periods)

Output design objectives, relating output content to output method, realizing how output bias affects users, designing output for display, Case studies- Designing a web site management, online exam management.

Total Periods: 45

TEXT BOOKS:

1. Kenneth E.Kendall and Julie E.Kendall, System Analysis and Design, 8th Edition, Pearson Education , India,2011.

REFERENCE BOOKS:

1. Dennis, Wixom, and Roth, Systems Analysis and Design, 5th Edition, John Wiley. 2012.
2. Shelly and Rosenblatt, Systems Analysis and Design, 9th Edition, Cengage Learning, 2012.

III B. Tech. - II Semester
14BT71005: MICROELECTROMECHANICAL SYSTEMS

(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

Pre-requisites:

Basic knowledge in Physics.

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: After completion of this course the student will be able to:

CO1: Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators.

CO2: Identify the suitable materials, fabrication techniques, packaging methodologies to develop MEMS devices.

Detailed Syllabus:

Unit-1: OVERVIEW OF MEMS AND SCALING LAWS (9 Periods)

Introduction, MEMS and microelectronics, miniaturization, applications of MEMS in the automotive industry and in other industries.

Scaling laws of miniaturization: Introduction to scaling, scaling in: geometry, rigid- body dynamics, electrostatic forces, electromagnetic forces, Electricity, Fluid mechanics, Heat transfer.

Unit -2: WORKING PRINCIPLES OF MICROSYSTEMS (9 Periods)

Microsensors, acoustic wave sensors, biomedical and biosensors, chemical sensors, pressure sensors, thermal sensors. Microactuation: actuation using thermal forces, shape-memory alloys, piezoelectric crystals, electrostatic forces. MEMS with microactuators, microgrippers, micromotors, microvalves, micropumps. Microaccelerometers, microfluidics.

Unit-3: MATERIALS FOR MEMS AND MICROSYSTEMS (9 Periods)

Substrate and wafers, silicon as a substrate material, silicon compounds, silicon piezoresistors, gallium arsenide, quartz, piezoelectric crystals, polymers, carbon nano tube (CNT), development of CNTs, application of CNTs.

Unit-4: MEMS FABRICATION PROCESS AND MICROMANUFACTURING (9 Periods)

Photolithography, ion implantation, diffusion, oxidation, chemical vapor deposition, physical vapor deposition, deposition by epitaxy, etching, bulk micromanufacturing, surface micromanufacturing, LIGA process.

UNIT-5: MEMS Packaging**(9 Periods)**

Introduction to microsystem packaging, objectives and general considerations in packaging design, three levels of microsystem packaging, interfaces in microsystem packaging, packaging technologies, three-dimensional packaging, selection of packaging materials, signal mapping and transduction, Design case: Pressure sensor packaging.

Total: 45 Periods**TEXT BOOKS:**

1. Tai-Ran Hsu, MEMS & Microsystems, Design and Manufacture, McGraw Hill Education (India) Pvt. Ltd., 2002.

REFERENCE BOOKS:

1. G.K.Ananthasuresh, K.J.Vinoy, Micro and Smart Systems, Wiley India, 1st edition, 2010
2. Nitaigour Premchand Mahalik, MEMS, McGraw Hill Education (India) Pvt. Ltd., eighth reprint, 2013.

III B.Tech - II Semester
14BT61203: BIO - INFORMATICS
(OPEN ELECTIVE)
(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

COURSE DESCRIPTION:

Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Primary databases, Secondary databases and their use in Bioinformatics.

COURSE OUTCOMES:

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

- CO1:** Demonstrate knowledge on concepts of biological databases, Genome and proteome.
- CO2:** Analyze biological database management system.
- CO3:** Create, select and apply appropriate techniques and tools to manage the biological data.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO BIOINFORMATICS (8 Periods)

Internet basics, Scope of bioinformatics, elementary commands and protocols, ftp, telnet, http, primer on information theory, introduction to perl and bioperl.

UNIT-II: BIOLOGY AND INFORMATION (7 Periods)

Bioinformatics, Computers in Biology and Medicine, The Virtual Doctor, Biological Macromolecules as Information Carriers.

UNIT-III: SEQUENCE ALIGNMENT AND DYNAMIC PROGRAMMING (10 Periods)

Heuristic alignment algorithms, global sequence alignments- Needleman-Wunsch algorithm, local sequence alignments- smith-waterman algorithm, amino acid substitution matrices- PAM and BLOSUM, Multiple sequence alignment and phylogenetic analysis.

UNIT-IV: PRIMARY DATABASES AND THEIR USE (11 Periods)

Introduction to biological databases- organization and management, searching and retrieval of information from the World Wide Web, Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB), primary databases NCBI, EMBL, DDBJ.

UNIT-V: SECONDARY DATABASES**(9 Periods)**

Introduction to secondary databases- organization and management of databases Swiss-Prot, Uniprot and PIR, Introduction to biochemical databases-organization and Management of databases, KEGG, ExPASy, BRENDA.

Total Periods: 45**TEXT BOOKS:**

1. David W. Mount, Bioinformatics: Sequence and Genome Analysis, CSHL Press, 2nd edition, 2005.

REFERENCE BOOKS:

1. Hooman H. Rashidi and Lukas K. Buehler, Bioinformatics Basics, Applications in Biological Science and Medicine, CRC Press, Taylor & Francis Group, 2nd edition, 2005.
2. Rastogi S. C., NamitaMendiratta, Parag Rastogi, Bioinformatics: Methodsand Applications: Genomics, Proteomics and Drug Discovery, PHI Learning Pvt. Ltd., 3rd edition, 2011.

III- B.Tech. II Semester
14BT61204: CYBER SECURITY AND LAWS
(OPEN ELECTIVE)

(Common to CSE, IT, CSSE, CE & ME)

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

PRE-REQUISITES: Nil

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:

After completion of the Course, a successful student 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.

Detailed Syllabus:

UNIT-I: INTRODUCTION TO CYBER CRIMES (9 Periods)

Introduction, Definition, Origin, Cyber Crime and Information Security, Cyber Criminals, Classifications of Cyber Crimes, The Legal Perspectives and Indian Perspective, Cyber Crime and Indian ITA 2000, Global Perspective on Cyber Crimes.

Cyber Offenses: Introduction, Criminals Planning on Attacks, Social Engineering, Cyber Stalking, Cyber Café and Crimes, Botnets.

UNIT-II: TOOLS AND METHODS USED IN CYBER CRIME

(9 Periods)

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan horses and Backdoors, Steganography, DoS and DDoS attacks.

Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

UNIT-III: CYBER CRIMES AND CYBER SECURITY-LEGAL PERSPECTIVES (8 Periods)

Introduction, Cyber Crime and the legal landscape around the world. Cyber Laws in Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Consequences of not

addressing the weakness in IT Act, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyberlaw, Technology and Students in India Scenario.

UNIT-IV: CYBER SECURITY-ORGANIZATIONAL IMPLICATIONS

(10 Periods)

Introduction, Cost of Cyber Crimes and IPR issues, Web Threats for Organizations - Evils and Perils, Security and Privacy Implications from Cloud Computing, Social Media Marketing-Security Risks and Perils for Organizations, Social Computing and Associated Challenges for Organizations, Protecting People's Privacy in Organization, Organizational Guidelines for Internet Usage, Safe Computing and Usage Policy, Incident Handling and Best Practices, Media and Asset Protection.

UNIT-V: CYBER TERRORISM AND INFORMATION WARFARE

(9 Periods)

Introduction, Intellectual Property in the Cyber Space, the Ethical Dimension of Cyber Crimes, the Psychology, Mindset and Skills of Hackers and Cyber Criminals, Sociology of Cyber Criminals, Information Warfare.

Cyber Crime Illustrations: Indian Banks lose Millions of Rupees, Justice vs. Justice, Parliament Attack, The Indian case of online Gambling, Bank and Credit card related frauds, Purchasing goods and services scam, Nigerian 419 scam.

Total Periods: 45

TEXT BOOKS:

1. Nina Gobole, Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India, 1st edition, 2011.

REFERENCE BOOKS:

1. Ferrara et al., Cyber Law: Text and Cases, Cengage Learning, 3rd edition, 2012.
2. Vivek Sood, Cyber Law Simplified, Tata McGraw-Hill, 1st edition, 2012.
3. Prashant Mali, Cyber Law and Cyber Crimes, Snow White Publications Pvt. Ltd., 1st edition, 2013.

III B.Tech - II Semester

14BT60321: HEAT TRANSFER AND DYNAMICS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Engineering Mathematics, Thermodynamics, Fluid mechanics, Dynamics of Machinery

COURSE DESCRIPTION:

Experimental studies on mechanisms of heat transfer; Film wise and drop wise condensation; Steady and unsteady flow; Effectiveness of heat exchanger; Investigation on various thermal properties such as conductivity, emissivity, Stefan - Boltzmann constant; Lateral, longitudinal, torsional vibrations; governors and gyroscopic effect.

COURSE OUTCOMES:

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

- CO1:** Estimate heat transfer rates in conduction, convection, radiation heat transfer and also devise experimentation schemes for select scenarios in dynamic machinery.
- CO2:** Estimate the approximate imbalance in machines.
- CO3:** Provide probable solution for heat transfer and dynamics related problems.
- CO4:** Provide experimentation schemes for sub-systems of a complex machine or thermal equipment to predict the characteristics of a complex system.

PART-A: HEAT TRANSFER LAB

LIST OF EXPERIMENTS:

1. Thermal conductivity of metal rod.
2. Overall heat transfer coefficient through Composite Slab Apparatus.
3. Thermal conductivity of insulating material through lagged pipe apparatus.
4. Heat transfer coefficient in natural convection.
5. Heat transfer coefficient in forced convection.
6. Heat transfer in drop and film wise condensation.
7. Emissivity of a gray body through Emissivity apparatus.
8. Experiment on Stefan Boltzmann Apparatus.
9. Heat transfer in pin-fin.
10. Experiment on Parallel and counter flow heat exchanger.

NOTE: Heat Transfer data books are permitted in the examinations.

PART-B: DYNAMICS LAB

LIST OF EXPERIMENTS:

1. Motorized gyroscope - Study of gyroscopic effect and couple.
2. Determination of Moment of Inertia of a Flywheel.
3. Experimental verification of dynamic balancing of
(a) Rotating masses (b) Reciprocating masses.
4. Governor - Determination of range sensitivity, effort etc., for Watt, Porter, Proel, and Hartnel Governors.
5. Cams - Cam profile drawing, Motion curves and study of jump phenomenon.
6. Whirling of shaft - Determination of critical speed of shaft with concentrated loads.
7. Determination of pressure distribution in journal bearing.
8. To determine the natural frequency of damped vibration of single degree freedom system and to find it's damping coefficient.
9. To study shock absorbers and to plot transmissibility curve.
10. To verify natural frequency of torsional vibration of two rotor system and position of node.
11. To determine resonance frequency of transverse vibration of beam.

NOTE: Heat Transfer and Dynamics lab Internal and End examination evaluation will be done separately and the average will be recorded.

III B.Tech - II Semester
14BT60322: CAD/CAM LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Computer Aided Engineering Drawing, Computer Aided Machine Drawing.

COURSE DESCRIPTION:

Fundamental Concepts of CAD/CAM; 2D and 3D Part Modeling; Manual Part Programming, Analysis of simple Structures; CNC Code Generation.

COURSE OUTCOMES:

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

- CO1:** Use software package CREO to generate 3D models of parts and assemblies, and choose appropriate module of ANSYS to perform stress analysis and identify the machine codes for developing CNC part programs to produce the parts.(PO1)
- CO2:** Analyze and Manufacture in a standardized manner suitable for industrial scenarios.(PO2)
- CO3:** Design Components and Develop part programs for mechanical components involving simple features.(PO3)
- CO4:** Identify simpler subsystems in a complex subsystem and employ bottom-up approach to build the model of the entire system and generate drawings or models.(PO4)
- CO5:** Implement appropriate hardware and software for CAD/CAM thereby enhancing productivity in design.(PO5)

LIST OF EXPERIMENTS:

1.Exercises (2-D & 3-D) using design packages (any 3 exercises from each section to be conducted)

- (a)Drafting: Development of part drawings for various components in the form of orthographic and isometric, Representation of dimensioning and tolerances scanning and plotting.
- (b)Part Modeling: Generation of various 3D models through protrusion, revolve, shell sweep, Creation of various features, Study of parent child relation, Feature based and Boolean based modeling surface and assembly modeling, Study of various standard translators, Design simple components.

2. Exercises using Analysis software
 - a. Determination of deflection and stresses in 2D and 3D trusses and beams.
 - b. Determination of deflections component and principal and Von-Mises stresses in plane stress, plane strain and axisymmetric components.
 - c. Steady state heat transfer Analysis of plane and axisymmetric components.
3. Exercises on CNC machines
 - a. Simulation of CNC Lathe and Milling Manual Part Programs.
 - b. Machining of simple components on CNC lathe
 - c. Machining of simple components on CNC Milling.
4. Experimentation and simulation of a robot.

Note: Any Two Software Packages from each of the module:

CAD Packages: AutoCAD, SOLIDWORKS, CATIA, CREO, Unigraphics.

IV B.Tech - I Semester
14BT70301: FINITE ELEMENT METHODS

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

PRE-REQUISITES: Engineering Mathematics, Strength of Materials, Design of Machine Elements-I, Design of Machine Elements-II, Heat Transfer.

COURSE DESCRIPTION:

Fundamentals of finite element analysis including, discrete system analysis, steady state and transient heat transfer analysis; static and dynamic analysis of structures. Modeling, analysis, and design using FEM.

COURSE OUTCOMES:

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

- CO1:** Employ the theoretical knowledge in choosing a proper element type, and boundary conditions to use in a given situation to build a FEM model of a given physical situation.
- CO2:** Analyze the physical system under various types of loading (Structural & Thermal) and identify the problem areas and offer probable solutions to design related problems.
- CO3:** Identify the interrelationships existing between smaller sub-systems in a large-scale system and thus simplify the scope of analysis.

Detailed Syllabus:

UNIT - I: INTRODUCTION (9 Periods)

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain-Displacement relations. Stress-strain relations.

ONE-DIMENSIONAL FINITE ELEMENT METHODS: Bar elements, temperature effects; Finite element modeling coordinates and shape functions. Principle of minimum potential energy; principle of virtual work; Von-mises stress, Element matrices, assembling of global stiffness matrix and load vector, Application of boundary conditions, Elimination and penalty approaches, solution for displacements, reaction, stresses, temperature effects, Quadratic Element.

UNIT - II: BEAMS & TRUSSES (9 Periods)

TRUSSES: Plane trusses, local and global coordinate systems, formulation for direction cosines, Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, and temperature effects.

BEAMS: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses.

UNIT - III: TWO-DIMENSIONAL & AXI-SYMMETRIC MODELS
(9 Periods)

TWO-DIMENSIONAL PROBLEMS: Basic concepts of plane stress and plane strain, stiffness matrix of Constant Strain Triangular (CST) element, finite element solution of plane stress problems.

AXI-SYMMETRIC MODELS: Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements.

UNIT - IV ISO-PARAMETRIC FORMULATION & HEAT TRANSFER ANALYSIS
(11 Periods)

ISO-PARAMETRIC FORMULATION: Concepts, sub parametric, super parametric elements, 2-Dimensional 4 Noded iso-parametric elements, and numerical integration.

HEAT TRANSFER ANALYSIS: Derivation of the basic differential equation, Heat transfer with Conduction, Convection, through fins, Typical units of thermal conductivities; K, and heat transfer coefficients; h, One-dimensional finite element formulation using a variational method; Two-dimensional finite element formulation.

UNIT - V DYNAMIC ANALYSIS
(7 Periods)

Introduction to dynamic considerations, formulation of Lagrangian, Hamilton's principle, Dynamics of a spring mass system; consistent mass matrix, Formulation of FEM Model, element matrices: One dimensional bar, Truss, CST elements; Lumped mass matrices, Evaluation of Eigen values and Eigen vectors for a stepped bar and a beam element.

Total Periods: 45

TEXT BOOKS:

1. Tirupathi R. Chandrupatla & Ashok D. Belegundu, Introduction to Finite Elements in Engineering, PHI Learning, 3rd Edition, 2011
2. Darly L. Logan, First Course in the Finite Element Method, Cengage Learning, 4th Edition 2007.

REFERENCES BOOKS:

1. S. S. Rao, Finite Element Methods in Engineering, Elsevier, 5th Edition, 2012.
2. J. N. Reddy, An Introduction to Finite Element Method, Tata McGraw-Hill, 3rd Edition, 2005.
3. K. J. Bathe, Finite Element Procedures, PHI, 1st Edition, 2008.

IV B.Tech - I Semester
14BT70302: MANUFACTURING SYSTEM
DESIGN

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

PRE-REQUISITES:

Industrial Engineering and Management, CAD/CAM.

COURSE DESCRIPTION:

Introduction to Manufacturing systems and models; Automated Manufacturing systems; automated modeling systems; performance measures of manufacturing systems; assembly lines; high production lines; CFMS; Simulation in system design.

COURSE OUTCOMES:

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

- CO1:** Employ knowledge of manufacturing philosophies in proposing a preliminary FMS.
- CO2:** Use the methodologies required for simulating a manufacturing system.
- CO3:** Identify the stages involved in the design and manufacturing of a product and conduct cost benefit analysis.

Detailed Syllabus:

UNIT - I: INTRODUCTION TO AUTOMATION & MANUFACTURING SYSTEMS (8 periods)

History and overview of manufacturing; Components of manufacturing system; A classification Scheme for manufacturing systems; Overview of the classification scheme; Production systems; Automation in production systems; Manual labor in production systems; Automation principles and strategies; Basic elements of an automated system; Advanced automation functions; Levels of automation.

UNIT - II: MODELING OF AUTOMATED MANUFACTURING SYSTEM (9 periods)

Automated Manufacturing Systems: Manufacturing automation; Modeling of automated manufacturing systems; Role of performance modeling; **Performance measures:** Manufacturing lead time, Work-In-Process (WIP), Machine Utilization, Throughput, Capacity, Flexibility, Perform ability and quality; **Performance modeling tools:** Simulation model and Analytical models

UNIT-III: ASSEMBLY & PRODUCTION LINES (8 periods)

Single station: manned cells, automated cells; Application of single-station cells; Fundamentals of manual assembly lines; Applications of automated production lines; Fundamentals of automated assembly systems; Material handling system.

UNIT - IV: CELLULAR & FLEXIBLE MANUFACTURING SYSTEMS (10 periods)

Cellular Manufacturing System: Introduction to cellular manufacturing; machine cell design and its types; Objectives of Cellular manufacturing system; quantitative analysis in cellular manufacturing.

Flexible Manufacturing System: Introduction; Types; Components; Applications; benefits; FMS planning and Implementation issues; Quantitative analysis of FMS: Simple Bottle model.

UNIT-V: SIMULATION IN MANUFACTURING SYSTEM DESIGN (10 periods)

Introduction to simulation; Types of Simulation models: Static, Continuous and Deterministic Simulation; Techniques of Simulation; Simulation process for manufacturing systems analysis; Simulation software packages; Application of simulation; procedure for simulation using software; Application in Automotive Industry.

Total Periods: 45

TEXT BOOKS:

- 1: N.Viswanadham, Y. Narahari, Performance Modeling of Automated Manufacturing Systems, PHI, 1st edition 2008.
- 2: Mikell.P.Groover, Automation , Production Systems & Computer Integrated Manufacturing, PHI, 3rd edition 2008.
- 3: P.RadhaKrishnan, S.Subramanyan, V.Raju, CAD/CAM/CIM, New Age International, 3rd edition 2007.

REFERENCE BOOKS:

- 1: S.S.Rao, Engineering optimization, New Age International Publications 2nd edition , 2012.
- 2: P. Brandimarte, A Villa, Modeling Manufacturing Systems, Springer Verlag, Berlin, Illustrated edition, 1999.
- 3: Richard Crowson, Factory Operations: Planning and Instructional Methods- Ed2, CRC Press, Second Edition.
- 4: Phillip. F. Ostwald, Jairo Munoz, Manufacturing Processes and Systems, John Wiley and Sons Inc., 9th Edition, 2008.

IV B.Tech - I Semester

14BT70303: METROLOGY AND MEASUREMENTS

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

PRE-REQUISITES:

10+2 Physics, Engineering Physics, Machine Drawing, Machine tools.

COURSE DESCRIPTION:

The fundamental information pertaining to Metrology, use of a various measuring tools and instruments; calculation of geometric dimensions, form tolerances and others with accurate assessment of fits; precision and non-precision instruments; Gear and Screw thread measurement; Machine tool alignment tests, Requirements and preparation of assessment charts; measurement of force, torque, strain, pressure, temperature and others along with their calibration procedures .

COURSE OUTCOMES:

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

- CO1** Identify the uncertainties in dimensional Metrology by defining measurement standards and use electronic Instrumentation.
- CO2** Employ effective methods of measuring straightness, flatness, roundness and profiles of screw threads and gear teeth.
- CO3** Employ knowledge in selecting a suitable instrument/measurement method for a given application.
- CO4** Recognize the importance of accuracy and precision as a mechanical engineer through self motivation for a defect free product.

Detailed Syllabus:

UNIT - I: LIMITS, FITS AND TOLERANCES (10 Periods)

Limits, Fits and Tolerances: Introduction; Definitions; fits and their types; Unilateral and Bilateral Tolerance System; Hole and Shaft basis systems; Interchangeability and Selective Assembly; Compound Tolerances; Accumulation of Tolerances.

Limit Gauges and Gauge Design: Gauges: Plug, Ring, Snap, Gap, Taper gauges; Taylor's principle; Design of Go and No Go gauges.

Comparators: Introduction to Comparator; Characteristics; Classification of comparators; Mechanical comparators: sigma Comparators, Optical Comparators, LVDT, pneumatic comparators

UNIT -II: LINEAR, ANGULAR AND TAPER MEASUREMENT (10 Periods)

Linear Measurement: Length standard, line and end & wavelength standards; Slip Gauges: Calibration of the slip gauges; Dial Indicators; Micrometers; Vernier Height Gauges.

Measurement of Angles and Tapers: Different methods: Bevel protractor, angle gauges, spirit levels, sine bar, sine plate, rollers and spheres used to determine the tapers.

Flatness Measurement: Measurement of flatness of surfaces; straight edges; surface Plates, optical flat and autocollimators, interferometer and their Uses.

UNIT -III: SURFACE AND THREAD MEASUREMENT (9 Periods)

Surface Roughness Measurement: Differences between surface roughness and Surface waviness; Numerical assessment of surface finish: CLA, R.M.S Values; Ra, Rz values; Methods of measurement of surface finish: Profilograph, Talysurf, BIS symbols for indication of surface finish.

Screw Thread Measurement: Elements of measurement; Errors in screw threads; Measurement of effective diameter, angle of thread and thread pitch; profile thread gauges.

Gear Measurement: Gear measuring instruments; Gear tooth profile measurement; Measurement of diameter; pitch, Finding pressure angle and tooth thickness.

Machine Tool Alignment Tests: Requirements of Machine Tool Alignment Tests; Alignment tests on lathe; Milling and Drilling Machine Tools; Preparation of acceptance charts.

UNIT-IV: MEASUREMENT OF DISPLACEMENT, SPEED, STRESS & STRAIN (9 Periods)

Measurement of Displacement: Theory and construction; various transducers to measure displacement: Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers; Calibration procedures.

Measurement of Speed: Mechanical Tachometers; Electrical tachometers; Stroboscope; Non-contact type of Tachometer.

Stress & Strain Measurements: Various Types: Electrical Strain Gauge, Gauge Factor, Method of usage of resistance strain gauge for bending, compressive and tensile strains, usage for measuring torque, Strain gauge Rosettes.

UNIT- V: MEASUREMENT OF TEMPERATURE, PRESSURE, FORCE, TORQUE & POWER (9 Periods)

Measurement of Temperature: Standards and calibration, thermal expansion methods, thermo electric sensors (thermocouples), Electrical Resistance sensors, Junction semiconductor sensors, Digital thermometers, Radiation methods.

Measurement of Pressure: Standards and Calibration; Basic Methods of Pressure measurement; Dead weight gauge.

Measurement of force, torque, and power: Standards and calibration; Basic methods of Force Measurement; Torque measurement on rotating shafts, shaft power measurement: Prony Brake, Hydraulic dynamometer; Vibrating Wire Force Transducers.

Total periods: 45

TEXT BOOKS:

- 1: R.K. Jain, Engineering Metrology, Khanna Publishers, 20th edition, 2013.
- 2: Thomas G. Beckwith, Roy D. Maragoni, John H. Lienhard V, Mechanical Measurements, Pearson Education International Publishers, 6th edition 2013 .
- 3: N.V Raghavendra, L.Krishnamurthy, Engineering Metrology and Measurements, Oxford Univ. Publisher, First Edition, 2013.

REFERENCE BOOKS:

1. M. Mahajan , Engineering Metrology, Dhanpat Rai and Co., 2nd edition, 2013.
2. Anand K Bewoor, Vinay A Kulkarni , Metrology & Measurement, McGraw Hill First Edition, 2013.
3. B.C.Nakra & K.K. Choudhary, Instrumentation, Measurement & Analysis, Tata Mcgraw Hill , 6th edition, 2011.

IV B.Tech - I Semester
14BT70304: INDUSTRIAL AUTOMATION AND
ROBOTICS

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

PRE-REQUISITES:

Matrices and Numerical Methods, Engineering Mechanics, Kinematics of Machinery, Dynamics of Machinery.

COURSE DESCRIPTION:

Integration of robots and CNC machines into manufacturing cells; motion control devices, such as actuators and sensors, conveyors and part feeder mechanisms; use of automation equipment in manufacturing. Integration of automation equipment such as PLCs, motion control devices.

COURSE OUTCOMES:

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

- CO1:** Select suitable sensors and actuators for automating the operations in a given industry using simple automation schemes.
- CO2:** Calculate the forward kinematics, inverse kinematics, for a 3R manipulator and path planning of serial and parallel robot.
- CO3:** Propose preliminary designs for automating simple machining operations, pick and place operations, conveyor operations etc.
- CO4:** Use appropriate software for implementing automation schemes using robot programming languages.

Detailed syllabus:

UNIT -I: INTRODUCTION TO AUTOMATION (8 Periods)

Automation, need, types, Basic elements of an automated system, levels of automation, Part transfer methods and mechanisms, Types of flow lines, Flow line with/without buffer storage. Assembly process and systems assembly line, Line balancing methods, Flexible assembly lines.

UNIT - II: INTRODUCTION TO INDUSTRIAL ROBOTS (9 Periods)

Robots, Brief History, Types of Robots, classification, robot configurations, joint notation schemes, work volume, Degrees of freedom, Components, Common types of arms , joints, Grippers, Drives, pneumatic, hydraulic, Electric, comparison.

UNIT-III: MANIPULATOR KINEMATICS & DYNAMICS (11 Periods)

Mathematical Preliminaries on Vectors & Matrices. Homogeneous transformations as applicable to rotation and translation, (D-H) notation. Forward kinematics, inverse kinematics, Manipulators with two, three degrees of freedom.

Manipulator dynamics: Introduction, Inertia of a Link, Lagrangian formulation for a planar 2R manipulator.

UNIT-IV: TRAJECTORY PLANNING (9 Periods)

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion, and straight line motion.

Sensors: position sensors, potentiometers, resolvers encoders, velocity sensors, tactile sensors, proximity sensors, machine vision sensors, fail safe hazard sensor systems, and compliance mechanism.

UNIT - V: ROBOT PROGRAMMING & ROBOT APPLICATION (8 Periods)

Robot programming, types, features of languages and software packages, Robot application in industry, Task programming, Goals of AI Research, AI techniques, Robot intelligence and task planning, modern robots, future Application and challenges and case studies.

Total No of Periods: 45

TEXT BOOKS:

1. M.P. Groover, Industrial Robotics, McGraw Hill Education (India) Private Limited, 2nd Edition, 2008.
2. S.R. Deb/S. Deb, Robotics Technology & Flexible Automation, McGraw Hill Education (India) Private Limited, 2nd Edition, 2009.

REFERENCE BOOKS:

1. Mikell P. Groover, Automation, Production Systems and CIM, Prentice-Hall of India Pvt. Ltd, 3rd Edition, 2008.
2. Mittal R.K & Nagrath IJ, Robotics and Control, TMH, First Edition, 1st Edition, 2003.
3. K. S. Fu., R. C. Gonzalez, C. S. G. Lee, Robotics: Control Sensing, Vision and Intelligence International Edition, McGraw Hill Book Co, 1st Edition, 2008.
4. Ashitave Ghosal, Robotics, Fundamental Concepts and analysis, Oxford Press, 1st Edition 2006.
5. John. J. Craig, Introduction to Robotics, Pearson India, 3rd Edition, 2008.

IV B.Tech - I Semester
14BT70305: REFRIGERATION AND AIR
CONDITIONING
(Professional Elective-I)

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

PRE-REQUISITES:

Thermodynamics, Fluid Mechanics

COURSE DESCRIPTION:

Refrigeration cycles; analysis and design of various refrigeration systems; components of refrigeration system and refrigerants selection. Properties of air and results of cooling, heating, humidifying or dehumidifying; heat gain and heat loss calculations. Study of air-conditioning equipment; heat pumps; heat pump circuits; analysis and design calculations. Thermal comfort principles, and practice of analysis and design of air-conditioning system, comfort Air conditions and load estimates.

COURSE OUTCOMES:

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

- CO 1:** Employ the knowledge of RAC systems to build mathematical models of physical Systems to predict their performance.
- CO 2:** Analyze refrigeration requirements to arrive at an outline configuration of the refrigeration system.
- CO 3:** Provide heat load estimates needed for detailed design of RAC Systems.
- CO 4:** Assess the safety issues in RAC systems and propose viable solutions.

Detailed Syllabus:

UNIT- I: BASICS OF REFRIGERATION (9 Periods)

Introduction, Unit of refrigeration; C.O.P: refrigerator, heat engine, heat pump; open and dense air refrigeration cycle; Carnot refrigerator; Bell-Coleman cycle; Air Refrigeration: simple air cooling system; simple air evaporative cooling system and bootstrap air cooling system.

UNIT- II: VAPOUR COMPRESSION REFRIGERATION (VCR) SYSTEM (9 Periods)

Basic cycle, Working principle, Essential components of the plant, COP, Representation of cycle on T-S and p-h charts; Cycle analysis; Actual cycle, effect of super heating, sub cooling on system performance; Refrigerants: Desirable properties, Classification of refrigerants used, Nomenclature, selection of refrigerants, and newer refrigerants.

UNIT III: VAPOR ABSORPTION REFRIGERATION (VAR) SYSTEM (9 Periods)

Description and working of NH₃-Water system; Li Br -Water (Two shell & Four shell) System, Calculation of maximum COP; Principle of operation of three Fluid absorption system.

STEAM JET REFRIGERATION SYSTEM : Working principle, basic Components, Estimation of motive steam required.

NON CONVENTIONAL REFRIGERATION SYSTEM: Principle and operation of Thermo-electric refrigerator and Vortex tube or Hilsch tube.

UNIT IV: AIR CONDITIONING SYSTEMS (10 Periods)

Psychrometry: Psychrometry terms, Psychrometric chart, Psychrometric processes, Air conditioning systems: classification of air-conditioning systems, summer, winter and year round air conditioning systems; RSHF, GSHF, ERSHF; Cooling Load calculations: components of cooling load, sensible heat load, latent heat load;

UNIT V: COMFORT AIR CONDITION AND EQUIPMENT (8 Periods)

Comfort Conditions: Requirements of human comfort; concept of effective temperature; Comfort chart.

Humidifiers: Humidification by atomizing the water and Air washing; Dehumidifiers: Spray type dehumidifier; Air-filters; Fans; Blowers; Ducts; Heat pump: Introduction, different heat pump circuits; air to air, water to air.

Total Periods: 45

Text Books:

1. Domkundwar Arora Domkundwar, A Course in Refrigeration and Air Conditioning, Dhanpat Rai publication, 8th Edition, 2011.
2. R. S. Khurmi, J.K.Gupta, A Text book of Refrigeration & Air Conditioning, S. Chand, 5th Edition, 2014.

Reference Books:

1. P.L.Ballaney, Refrigeration and Air Conditioning, Khanna Publications, 15th Edition, 2013
2. C.P Arora, Refrigeration and Air Conditioning, TMH, 8th Edition, 2011
- 3: Manohar Prasad, Refrigeration and Air Conditioning, New Age International, 3rd Edition, 2014

Note: Thermal Engineering Data Book containing Refrigerant and Psychrometric property Tables and charts are permitted in examinations.

IV B.Tech - I Semester
14BT70306: MECHANICAL VIBRATIONS
(Professional Elective -I)

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

PRE-REQUISITES:

Engineering Mechanics, Kinematics of Machinery, Dynamics of Machinery

COURSE DESCRIPTION:

Basics of vibration; analysis of single and two degrees of freedom of lumped mass systems; Undamped free vibrations, damped free vibration; Forced vibrations; Transmissibility and isolation; vibration absorber; critical speed; Spectrum analysis; Introduction to noise: Noise standards, Noise source control, path control and enclosures; sound intensity, sound fields.

COURSE OUTCOMES:

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

- CO1:** Employ knowledge of the dynamics of mechanical systems to build analytical models.
- CO2:** Analyze the mathematical models of the system and provide a qualitative assessment of vibrations present in the system.
- CO3:** Detect possible sources of unwanted vibration and suggest means of rectification.
- CO4:** Analyze complex dynamic systems through systematic approach by identifying suitable sub systems.
- CO5:** Address the issue of safety in dynamic systems involving moving parts.

Detailed Syllabus:

UNIT-I: SINGLE DEGREE OF FREEDOM SYSTEMS - FREE AND DAMPED VIBRATIONS (10 Periods)

Fundamentals of vibration: Elements of a vibratory system, S.H.M, degrees of freedom; modeling of a system; concept of linear and non-linear systems; equivalent spring; linear and torsional systems.

Undamped free vibrations: Natural frequency by equilibrium and energy methods for longitudinal and torsional vibrations.

Damped free vibrations: Different types of damping, equivalent viscous damping; free vibrations with viscous damping: over damped, critically damped and under damped systems; initial conditions; logarithmic decrement; dry friction or coulomb damping, frequency and rate of decay of oscillations.

UNIT-II: SINGLE DEGREE OF FREEDOM SYSTEMS - FORCED VIBRATIONS (9 Periods)

Forced vibrations of longitudinal and torsional systems; Frequency Response Functions: Simple harmonic excitation, excitation due to reciprocating and rotating unbalance, base excitation; magnification factor; resonance phenomenon and phase difference; Quality Factor, Vibration Isolation, Force and Motion transmissibility.

UNIT-III: TWO DEGREE OF FREEDOM SYSTEMS - UNDAMPED VIBRATIONS (9 Periods)

Free vibration of spring coupled systems, longitudinal and torsional, natural frequency and mode shapes; Holzer Method; Free vibration of mass coupled systems, geared systems; undamped vibration absorber; critical speed of shaft having single rotor: damped and undamped systems.

UNIT-IV: INTRODUCTION TO NOISE (9 Periods)

Sound concepts, characteristics of sound wave, sound levels and decibels; fundamentals of noise, sound pressure level, sound intensity, sound fields, sound reflection, absorption and transmission; adding, subtracting and averaging decibels; human hearing mechanisms; sources of noise, Industrial noise and its hazards, Industrial noise control.

UNIT-V: VIBRATION MEASUREMENTS (8 Periods)

Vibration measurement process, classification of measuring instruments; Vibrometer: stylus type, optical type, seismic instrument, simple potentiometer, capacitance pick-up; Velometers: Active type, passive type pick-ups; Accelerometers; FFT spectrum analyzer and its applications; vibration monitoring techniques: time domain, and frequency domain analysis.

Total Periods: 45

TEXT BOOKS:

1. G.K.Groover, S.P. Nigam, Mechanical Vibrations, Nemchand & Brother's, 8th Edition, 2008.
2. V.P.Singh, Mechanical Vibrations, Dhanpat Rai & Co. Pvt Ltd, 4th Edition, 2014.
3. Ramamurti V. Mechanical Vibration Practice and Noise Control, Alpha Science International Ltd, 1st Edition, 2012.

REFERENCE BOOKS:

1. W.T. Thompson, Theory of Vibration with Applications, Pearson Publication, 5th Edition, 2008.
2. S.S.Rao, Mechanical Vibrations, Pearson Publication, 4th Edition, 2003.
3. Meirovitch, Elements of Vibration Analysis, McGraw Hill Education (India) Pvt Ltd, 1st Edition, 2013.

IV B.Tech - I Semester
14BT70307: TOOL DESIGN
(Professional Elective-I)

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

PRE-REQUISITES:

Manufacturing Technology, Machine Tools, Machine Tools lab

COURSE DESCRIPTION:

Introduction and study of cutting tools and its design; determination of cutting forces, stresses and strains; comprehensive knowledge and insight into basic cutting parameters, machining and tooling techniques; tooling equipment and machine tool; tooling materials and heat treatment; design of multipoint cutting tools, jigs and fixtures.

COURSE OUTCOMES:

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

- CO1:** Identify the basic cutting tool angles.
- CO2:** Analyze 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 in selected applications.
- CO4:** Identify the tooling and other requirements for machining an object with complex geometry.

Detailed Syllabus:

UNIT-I: TOOLING MATERIALS AND HEAT TREATMENT (9 periods)

Introduction, properties of materials, Ferrous tooling materials, Non-metallic tooling materials, Nonferrous tooling materials, heat treating, factors affecting heat.

UNIT - II: DESIGN OF SINGLE POINT CUTTING TOOLS (9 periods)

Introduction, brief history of metal cutting, metal cutting process, mechanics and geometry of chip formation, general consideration for metal cutting, metal cutting tools, Cutting tool classification
Design of single point cutting tools: Geometry of single point cutting tool, Nomenclature of single point cutting tool, Mechanics of orthogonal cutting, Merchant's force diagram, geometry and their interrelation, theories of formation of chip and their effect.

UNIT - III: DESIGN OF MULTI POINT CUTTING TOOLS (9 periods)

Classification of various multi point cutting tools, Drill geometry, Design of Drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speeds and feed-machining times-design-form cutters, combination tools, reamers etc.

UNIT - IV: DESIGN OF SHEET METAL OPERATIONS (9 periods)

Design of sheet metal blanking and piercing: Fundamentals of die cutting operations, power press- types, Material handling equipment, cutting action in punch and die operation. Die clearance, Die design fundamentals-blanking and piercing die construction.

Design of sheet metal bending, forming and drawings die: Bending dies, drawing dies, forming dies, drawing operations, Determination of blank size, drawing force, single and double action draw dies

UNIT - V: DESIGN OF JIGS AND FIXTURES (9 periods)

Definition and types of jigs and fixtures, basic principles of location and clamping, locating, methods and devices, jigs, definitions, types, general consideration in the design of jigs, drills bushing, methods of construction, fixtures-vice fixtures milling, boring, and lathe grinding fixtures.

Total periods: 45

TEXT BOOKS:

1. Donaldson, Lecain and Goold, Tool Design, Tata McGraw Hill, 4th edition, 2012.
2. A Bhattacharya, Principles of Metal cutting, New Central Book Agency, Calcutta, 2nd revised edition 2009.
3. G.R.Nagpal, Tool Engineering and Design, Khanna Publishers, 2004.

REFERENCE BOOKS:

1. Surendra Kenav and Umesh Chandra, Satyaprakashan, Production Engineering Design (Tool Design), New Delhi.
2. Amitabha Battacharya and Inyong Ham, Design of Cutting Tools use of Metal Cutting Theory, ASTME Publication, Michigan USA.
3. V.Arshinov, G.Alekseev, Metal Cutting Theory and Cutting Tool Design, MIR Publications.
4. ASTME Fundamentals of tool design, PHI.
5. P. C. Sharma, Textbook of Machine Tools and Tool Design, S. Chand & Co Ltd.

IV B.Tech - I Semester
14BT70308: SUPPLY CHAIN MANAGEMENT
(Professional Elective -I)

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

PRE-REQUISITES:

Industrial Engineering and Management / Management Science, Managerial Economics and Financial Analysis, Operations Research

COURSE DESCRIPTION:

Supply chain management fundamentals, 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 IT in SCM, DSS for SCM, Designing and planning transportation networks thorough infrastructure and strategies, International and Contemporary issues in SCM, Demand and Supply planning, Mass customization, Global issues and Outsourcing problems, SCOR Model, Third party logistics, Retailer-Supplier Partnership, Metrics and Emerging trends in SCM.

COURSE OUTCOMES:

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

- CO1.** Understand need for SCM practices in a firm and provide feasible strategies for better deployment of SCM practices in the firm.
- CO2.** Use software/hardware tools to enhance productivity of the firm through better SCM practices
- CO3.** Formulate appropriate and customized strategies & policies for managing supply chain of the firm and implement the same
- CO4.** Explore the possibility of imbibing emerging trends in SCM practices

Detailed Syllabus:

UNIT - I: INTRODUCTION TO SCM (9 Periods)

Supply Chain - Definition, Objectives; Global optimization, Importance of Supply Chain Decisions, Decision Phases in a Supply Chain and Importance of supply chain. SCM and objectives of SCM; Competitive and Supply Chain Strategies; Achieving Strategic fit, Obstacles to achieve strategic fit. Supply Chan Drivers - Inventory, Information, Transportation and Facilities

UNIT - II: INVENTORY MANAGEMENT IN SCM (9 Periods)

Economic lot size model, Effect of demand uncertainty, Risk pooling, centralized and decentralized system, Managing inventory in the supply chain, Distribution Channel Management, Distribution Resource Planning

UNIT - III: VALUE OF INFORMATION (9 Periods)

Bullwhip effect, Information and supply chain technology, Supply chain integration- push, Pull and push-pull system, Demand driven strategies, Role of Information Technology in SCM - Impact of internet on SCM, DSS for SCM - Goals, Standardization and Infrastructure.

UNIT - IV: DESIGNING AND PLANNING TRANSPORTATION NETWORKS (9 Periods)

The role of transportation in a Supply chain, Modes of transportation and their performance characteristics, Transportation infrastructure and policies, Design options for a transportation network, Trade-offs in transportation design, tailored transportation,

UNIT - V: INTERNATIONAL & CONTEMPORARY ISSUES IN SCM (9 Periods)

Demand and Supply planning, Mass customization, Global issues and Outsourcing problems, aligning the Supply Chain with Business Strategy - SCOR Model, Third party logistics; Retailer-Supplier Partnership, Distributors integration, Supply Chain Management Metrics, Emerging trends in SCM

Total Periods:45

TEXT BOOKS:

1. Sunil Chopra & Peter Meindl, Supply Chain Management strategy, Planning & Operation, 4th Edition, Pearson Education Asia.
2. Janat Shah, Supply Chain Management, Pearson, 1st edition 2009.

REFERENCE BOOKS:

1. Thomas E Vollman and Clay Whybark D, Manufacturing Planning and Control for Supply Chain Management, Tata McGraw Hill, Fifth Edition, New Delhi, 2005
2. Simchi - Levi Davi, Kaminsky Philip and Simchi-Levi Edith, Designing and Managing the Supply Chain, Tata McGraw Hill, New Delhi, 3rd edition 2007.

IV B.Tech - I Semester
14BT70309: POWER PLANT ENGINEERING
(Professional Elective - II)

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

PRE-REQUISITE:

Thermodynamics, Thermal Engineering-II, 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:

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

- CO 1:** Employ the knowledge of thermodynamics, fluid mechanics and heat transfer to propose elementary design of Power plants.
- CO 2:** Use thermodynamic analysis to derive models of the components to predict the performance of the power plants.
- CO 3:** Suggest suitable type of power plant in a given location considering environmentally safe aspects.
- CO 4:** Provide preliminary estimates of the capital cost and operating costs of a power plant.

Detailed Syllabus:

UNIT --I: THERMAL POWER PLANT (9 Periods)

Introduction to the sources of energy; Plant layout; selection of site for power plant; Coal handling systems; overfeed and underfeed stoker principles, Traveling grate stokers, Spreader stokers, Multi retort stokers; Pulverised fuel firing: Pulverized fuel handling, pulverising mills, pulverised fuel burners; Ash handling systems; Dust collectors.

UNIT -II: DIESEL ENGINE AND GAS TURBINE POWER PLANTS (9 Periods)

DIESEL POWER PLANT: Essential components of diesel power plant, operation of diesel power plant, plant layout with auxiliaries, fuel supply system, Supercharging; Gas Turbine Plant: requirements, functions, classification, construction, and layout with auxiliaries, principles of working of closed and open cycle gas turbines, Intercooling, reheating and regeneration in gas turbines, combined cycle power plants and comparison.

UNIT- III: HYDRO ELECTRIC AND NUCLEAR POWER PLANTS

(9 Periods)

HYDRO ELECTRIC POWER PLANT: Selection of site for power plant, typical layouts, Elements of plant, classification of dams, spill ways, surge tank, draft tube; Classification of hydroelectric power plants, Hydrology, hydrological cycle, Hydrographs; Nuclear Power Plants: Requirements, functions, Nuclear fuel, breeding and fertile materials, nuclear reactor, reactor operation; Types Of Reactors: Pressurized water reactor, Boiling water reactor, Sodium-graphite reactor, Fast breeder reactor, Homogeneous reactor, Gas cooled reactor, Radiation hazards and shielding, radioactive waste disposal.

UNIT- IV: NON CONVENTIONAL POWER GENERATION AND DIRECT ENERGY CONVERSION SYSTEMS

(9 Periods)

Non-Conventional Power Generation: solar, wind, tidal, Ocean energy conversion, geothermal, and biogas power plants; Direct energy conversion systems: Thermoelectric conversion system, thermionic conversion system, photovoltaic power systems, Magneto hydrodynamic systems, electrostatic mechanical generators, electro gas-dynamic generators, and fuel cells.

UNIT -V: POWER PLANT ECONOMICS AND PLANT POLLUTANTS

(9 Periods)

Load curves, Load duration curve, Definitions of connected load, Maximum demand, demand factor, Load factor, Plant capacity factor; Plant use factor; Diversity factor; Cost Analysis; Power plant pollution: pollutions from thermal, nuclear, hydroelectric and solar power plants.

Total Periods: 45

TEXT BOOKS:

- 1: R.K.Rajput. A Text Book of Power Plant Engineering, Laxmi Publications, 3rd edition, 2006.
- 2: Arora and S. Domkundwar, A Course in Power Plant Engineering, Dhanpat Rai and Co, 3rd Edition, 1988.

REFERENCE BOOKS:

- 1: P.K.Nag, Power Plant Engineering, TMH, 2nd edition, 2006.
- 2: K.K Ramalingam, Power plant Engineering, Scitech Publishers. 2nd edition, 2010.
- 3: C. Elanchezian, L. Saravanakumar, B. Vijaya Ramnath, Power Plant Engineering, I.K. International, 1st Edition, 2010.

IV B.Tech - I Semester
14BT70310: GEOMETRIC MODELING
(Professional Elective- II)

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

PRE-REQUISITES:

Computer Aided Engineering Drawing, CAD/CAM, Computer Aided Machine Drawing.

COURSE DESCRIPTION:

Basic concepts of coordinate systems; Output primitives; 2-D and 3-D geometrical transformations and viewing; Surface detection methods; advanced modeling concepts.

COURSE OUTCOMES:

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

- CO1.** Understand the role of computer graphics in the context of the object representation.
- CO2.** Represent and generate points, lines and circles using algorithms.
- CO3.** Work with multiple 2-D and 3-D geometrical transformations to represent and solve engineering problems.
- CO4.** Execute design projects through implementation of Modeling & Analysis Packages.

Detailed Syllabus:

UNIT -I: GRAPHICS CONCEPTS (2D AND 3D) (9 Periods)

Introduction to CAD process; Application area of Computer graphics, Output primitives: Points, lines and Circles, Drawing algorithms; transformations in Graphics - Coordinate systems, 2-D Transformations, Homogeneous and combination Transformations, 3-D Transformations- Projections, Techniques of Scan Conversion; Rendering, Hidden surface removal.

UNIT-II: MATHEMATICAL REPRESENTATION OF CURVES (8 Periods)

Types and Parametric Representations of Analytic Curves; wire frame models - Wire frame entities; parametric representation of synthetic curves - Hermite cubic splines, Bezier curves, B-splines rational curves; Curve Manipulations - Displaying, Evaluating points on Curves, Blending, Segmentation, Trimming, Intersection, Transformation.

UNIT -III: SURFACE MODELING (10 Periods)

Mathematical representation surfaces, Surface model, Surface entities surface representation; Parametric representation of surfaces: plane surface, rule surface, surface of revolution, Tabulated Cylinder, Parametric Representation of Synthetic Surfaces: Hermite Bicubic

surface, Bezier surface, B-Spline surface, Coons surface, Blending surface, Sculptured surface, Surface manipulation: Displaying, Segmentation, Trimming, Intersection.

UNIT -IV: SOLID MODELING (9 Periods)

Solid models, solid entities, Solid Representation; Fundamentals of Solid Modeling, Set Theory, Regularized Set Operations, Set Membership Classification; Boundary Representation (B-rep); Constructive Solid Geometry (CSG); Solid Manipulations, Displaying, Evaluating points, Curves and Surfaces on solids, Segmentation, Trimming and Intersection, Editing.

UNIT -V: ADVANCED MODELING CONCEPTS: (9 Periods)

Feature Based Modeling, Assembling Modeling, Behavioral Modeling, and Conceptual Design & Top down Design; Capabilities of Modeling & Analysis Packages such as solid works, Unigraphics, Ansys, Hyper mesh; Computer Aided Design of mechanical parts and Interference detection by motion analysis.

Total Periods: 45

TEXT BOOKS:

1. David F Rogers, Mathematical Elements for Computer Graphics, TMH. 2nd Edition 2010
2. Ibrahim Zeid, CAD/CAM - Theory and Practice, TMH, 2nd edition, New Delhi, 2010.

REFERENCE BOOKS:

1. Donald Hearn and M. Pauline Baker, Computer Graphics C version Pearson India. 2nd Edition, 1997.
2. Radhakrishnan.P, CAD/CAM/CIM, New age international, 3rd Edition, 2008.

IV B.Tech - I Semester

14BT70311: ADVANCED WELDING TECHNOLOGY

(Professional Elective -II)

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

PRE-REQUISITES:

Engineering Workshop, Manufacturing Technology, Manufacturing Technology Lab

COURSE DESCRIPTION:

Welding and allied processes; heat flow in welding; basic metallurgy of fusion welds; welding stress and distortion, cracks in welds, weldability and weldability tests, weldability of specific materials, weld defects; weld inspection and quality control; weld joints, weld symbols; heavy welded fabrication; expert systems in welding

COURSE OUTCOMES:

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

- CO1:** Interpret welding symbols and the type of welded joint to be selected for fabrication process.
- CO2:** Describe the effect of welding parameters and accomplish an optimized choice weld parameters etc. including optimization of quality and costs.
- CO3:** Locate the cracks in welded components using inspection methods and analyze the factors contributing towards the cracks and defects.
- CO4:** Use standards and codes for specifying welded elements.

Detailed Syllabus:

UNIT - I: WELDING AND WELDING PROCESSES (9 Periods)

Classification of welding and allied processes, Cast weld process, Arc and flame welding process, Resistance welding process, Solid-state welding process, Allied process, Thermal cutting process, Modes of welding and positions in welding, Types of joints and weld symbols.

UNIT - II: HEAT FLOW IN WELDING (9 Periods)

Introduction to heat flow in welding, resistance welding, Metallurgical effects of heat flow in welding, Time-Temperature-Transformation diagrams (TTT curves), Continuous Cooling Transformation diagrams (CCT curves), Weld metal zone, Fusion boundary zone, Heat affected zone, Properties of heat affected zone, Residual stresses, Causes of the development of residual stresses.

UNIT- III: CRACKS IN WELDS AND WELDABILITY (9 Periods)

Aims of preheating, Methods of preheating, Classification of weld cracks, Nomenclature, location and orientation of weld cracks, Factors contributing to weld cracking, Weldability assessment, Weldability tests-

-Theoretical, Simulated, Visual examination for weldability, Component sampling tests, Actual welding tests.

**UNIT - IV: WELD DEFECTS, INSPECTION AND QUALITY CONTROL
(9 Periods)**

Classification of weld defects, General sources of weld defects, Weld defects in various welding processes, Visual inspection and measurement, Destructive tests, Non-Destructive tests, Pressure and Leak testing.

**UNIT - V: EXPERT SYSTEMS IN WELDING WELDING CODES AND STANDARDS
(9 Periods)**

Expert Systems-Structure and working methodology, Types of expert systems, Explanation of weldex, Welding Information Network(WIN), Introduction to codes and standards, Welding procedure specification, Welding performance qualification.

Total Periods:45

TEXT BOOKS:

1. Dr.R.S.Parmar, Welding Engineering and Technology, Khanna Publishers, 2nd edition, 2010.
2. Richard L Little, Welding and Welding Technology, Tata McGraw Hill, 2004.

REFERENCE BOOKS:

1. Srinivasan.N.K., Welding Technology, Khanna Publications, Delhi, 1995.
2. Nadkarni S.V., Modern Welding Technology, Oxford IBH Publishers, 1996.

IV B.Tech - I Semester
14BT70312: ENTREPRENEURSHIP
(Professional Elective -II)

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

PRE-REQUISITES:

Managerial Economics and Principles of Accountancy, Industrial Engineering & Management, Operations Research.

COURSE DESCRIPTION:

Introduction to Entrepreneurship ; Cultural diversity of entrepreneurship; Creating and starting the venture; Product planning and development process; Writing business plan; Launching formalities; Venture expansion and harvesting strategies; Methods of protecting innovation and creativity; Start-up capital and financial statements; Venture life cycle and valuation; E-commerce and growing the venture.

COURSE OUTCOMES:

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

- CO 1:** Develop an entrepreneurial mindset to deal with high uncertainty in regional and global market environments.
- CO 2:** Develop a business concept from an idea.
- CO 3:** Broaden the understanding of the status of the ethical and legislative framework which supports entrepreneurship development.
- CO 4:** Develop critical thinking and problem solving skills through creativity, innovation and logical applications.
- CO 5:** Identify information needs and sources for each critical section of the business plan.
- CO 6:** Develop a financial plan for a business venture to be submitted to a financing agency.
- CO 7:** Appreciate the increasing impact of disruptive innovations which lead to rapid transformation of current knowledge, technology and industries.

UNIT - I: ENTREPRENEURIAL MINDSET (10 Periods)

The nature and growth of entrepreneurship; Entrepreneurship and Intrapreneurship; Entrepreneurship and Small business management; Types of Entrepreneur: Nascent, Novice, Habitual, Serial, Portfolio; Characteristics of an entrepreneur; Cultural diversity of entrepreneurship; Mistakes of entrepreneurs; Factors that contribute to the success of entrepreneurs ; Myths of entrepreneurship; Ethics and social responsibility of entrepreneurs.

UNIT - II: ENTREPRENEURIAL PROCESS (8 Periods)

Generating ideas; Opportunity identification; Business concepts; Resources: Financial, Physical and Human; Implementing and managing the venture; Harvesting the venture; Harvesting strategies: absorption of new concept into mainstream operations, licensing of rights, family succession, go public (IPO), employee share ownership plan (ESOP), liquidate (Shut down) venture, selling the venture, management buy-out (MBO), mergers and acquisitions.

UNIT-III: CREATIVITY AND INNOVATION (9 Periods)

Principles of creativity and innovation; Disruptive, incremental and open innovations; Nurturing and managing innovation; Methods of protecting innovation and creativity: Intellectual property rights, Branding, Trademarks, Patents, Copyrights, Registered design protection, Trade secrets (processes, techniques, confidential disclosure agreements).

UNIT - IV: NEW VENTURE PLANNING AND CREATION (10 Periods)

Market research (venture opportunity screening); Feasibility analysis; Start-up capital; Sources of funding: equity financing, debt financing (loans, venture funding, angel funding), grants, gifts, bequests and financial statements; Developing the business model; Introduction to the business plan.

UNIT - V: MANAGING AND GROWING THE VENTURE (8 Periods)

Venture life cycle: new venture development, start-up activities, venture growth, business stabilization, innovation or decline; Venture models: promising start-ups, venture-backed start-ups, corporate-supported start-ups; Venture valuation methods: book value (balance sheet value), price earnings (multiple earnings value), discounted future earnings (discounted cash flow); E-Commerce and growing the venture.

Total Periods: 45

TEXT BOOKS:

1. Robert D. Hisrich, Mathew J. Manimala, Michael P. Peters, Dean A. Shepherd, Entrepreneurship, McGraw Hill Education (India) Private Limited, Eighth Edition, 2013.
2. Barringer, B.R., and D. Ireland, Entrepreneurship: Successfully Launching New Ventures, Pearson Education, Third Edition, 2011.

REFERENCE BOOKS:

1. S. S. Khanka, Entrepreneurial Development, S.Chand Publishing, Fourth revised Edition, 2012.
2. Norman M. Scarborough, Essential of Entrepreneurship and Small Business Management, PHI, Fifth Edition, 2011.

IV B.Tech - I Semester

14BT70321: METROLOGY & MEASUREMENTS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

10+2 Physics, Engineering Physics, Machine Drawing, Machine tools.

COURSE DESCRIPTION:

Need of high precision Metrology and various techniques available with emphasis on standardization; Calibration of instruments such as Vernier calipers, Micrometer, Vernier height gauge etc. by using standard slip gauges; Measure dimensions of shafts, bearings & some other components in metric and imperial units using linear and angular measuring instruments; Alignment tests on lathes and milling machines; Straightness and flatness measurements by using spirit-level and auto collimeter; Identifying uncertainties in dimensional metrology by calculating errors; Measurement of gear and threaded profiles by profilometer and toolmakers microscope; study of Borden pressure gauge, LVDT and other instruments; piezoelectric and capacitive transducers.

COURSE OUTCOMES:

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

- CO1:** Choose correct measurement tools and /or measurement systems in a practical situation.
- CO2:** Identify sources of measurement errors and eliminate them.
- CO3:** Use common and advanced Metrology and measurement appliances which are commonly used in industrial inspection process.
- CO4:** Measure surface roughness by precision measuring instruments such as SJ 210 roughness tester, Autocollimator and Calibrate instruments and/or measurement systems using known standards.

Any TWELVE experiments to be conducted (Six from Each)

PART-A: METROLOGY LAB

1. Measurement of lengths, Heights, Diameters, Internal bores by Vernier, Micrometer, Internal micrometer and dial bore indicators.
- 2.(a) Measurement of angle and taper by using Bevel protractor, sine bars.
(b) Measurement of angle of taper plug gauge, Taper ring gauge, V- groove, and Radius of given ring.
3. Measurement of coordinates of a jig plate.
4. (a) To find module, Addendum, Dedendum, Pitch circle diameter, Tooth width, Pressure angle of a given spur gear by using gear teeth vernier.
(b) Measurement of gear elements using profilometer.

5. (a) Study of screw thread profile using Tool Makers microscope.
(b) Measurement of effective diameter of an external thread by using Two Wire/Three wire method.
6. (a) Measurement of straightness and flatness using spirit level and Autocollimator.
(b) Measurement of surface roughness.
7. Checking the limits of dimensional tolerances using comparators
8. (a) Alignment test on lathe machine.
(b) Alignment on milling machine.

PART-B: MEASUREMENTS LAB

1. Calibration of Bourdon Pressure Gauge.
2. Calibration of transducer for temperature measurement (RTD).
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for load measurement.
5. Calibration of capacitive transducer for angular displacement.
6. Study and calibration, measurement of speed pickups using Stroboscope.
7. Study of Piezo electric transducer.

IV B.Tech - I Semester
14BT70322: MANUFACTURING SYSTEMS
SIMULATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:

Industrial Engineering and Management, CAD/CAM and Operation Research

COURSE DESCRIPTION:

Modeling and simulation of conventional and advanced manufacturing systems; introduction to simulation softwares like Promodel, Arena, Lingo, SPSS, SAS and other softwares in order to demonstrate, predict and measure system strategies for effective, efficient and optimized performance of manufacturing systems.

COURSE OUTCOMES:

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

- CO 1:** Employ knowledge of the methodologies of designing and simulating a manufacturing system for prediction of performance under various constraints.
- CO 2:** Analyze different industrial systems, identify the problems, formulate and model the problems, and find solutions to these problems using simulation.
- CO 3:** Model real life industrial systems using computer simulation methodologies and identify the bottlenecks.

List of Experiments(Any twelve experiments to be conducted)

1. Solving LPP, Transportation, assignment problems using excel solver and or packages.
2. Solving inventory, scheduling lot sizing problems using manufacturing systems simulation software
3. Solving queuing problem and layout optimization using manufacturing systems simulation software
4. Building simulation models for manufacturing operations with layout and transport system.
5. Project evaluation and review based on time and cost
6. Weibull reliability plot creation using component / product failure data
7. Line balancing using manufacturing systems simulation software
8. Current state and future state mapping using value stream mapping software
9. Process capability studies using statistical software
10. Analysis of DoE results using statistical software
11. Statistical Analysis of Simulation models (input analysis)
12. Statistical Analysis of Simulation models (output analysis)

13. 5S practice / Poka Yoke for workplace improvement
14. Design and simulation of a simple manufacturing system using ProModel software.
15. Design and simulation of a simple manufacturing system using Arena software.

At least one software package(s) from each area from the following:

- | | | |
|-----|--------------------|--|
| (a) | Statistics | : SYSTAT/MINITAB/SPSS/SAS |
| (b) | Simulation | : Flexsim/ARENA, ProModel, QUEST/
WITNESS |
| (c) | OR packages | : LINGO/EXCEL |

IV B.Tech - I Semester

14BT70323: SEMINAR

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	50	50	-	-	-	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:

After completion of seminar work, a successful student will be able to:

- CO1. Employ the fundamental knowledge in studying and simulating published works using the tools learnt.
- CO2. Analyze critically chosen seminar topic for substantiated conclusions.
- CO3. Apply the concepts of design and modeling learnt to the seminar topic chosen and explore possible new ideas.
- CO4. Identify subcomponents in the literature study with a view to solve a manageable subproblem in depth.
- CO5. Use the appropriate techniques, resources and modern engineering tools necessary for conducting seminar work.
- CO6. Explore possible avenues where mechanical engineering solutions may yield social benefit.
- CO7. Study an existing problem and identify where possible environmentally sustainable solutions to Mechanical Engineering problems.
- CO8. Identify, after a thorough study, an ethically sound practice and implement it in a Mechanical Engineering situation.
- CO9. Communicate clearly, fluently, and cogently both in written and spoke contexts.
- CO10. Sustain everlasting curiosity to delve into the unknown and to have an attitude of attention to detail.

IV B.Tech - II Semester
**14BT80301: PRODUCTION AND OPERATIONS
MANAGEMENT**

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

PRE-REQUISITES:

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; supply chain management systems.

COURSE OUTCOMES:

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

- CO1:** Apply various planning practices of capacity planning, aggregate planning, project planning and scheduling.
- CO2:** Analyze the operations of an organization and integrate operations management principles and concepts to assess and improve operational performance.
- CO3:** Use basic management tools used in planning, scheduling and controlling production processes and costs and establish methods for maximizing productivity.
- CO4:** Optimize the use of resources which include plant, equipment, tools, premises and information systems.
- CO5:** Determine the necessary steps to increase the levels of skill, motivation and commitment in the workforce.

Detailed syllabus:

UNIT- I: OPERATIONS MANAGEMENT CONCEPTS (9 periods)

Introduction, Historical development, Information and Nonmanufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, environment of operations, Production systems decisions.

UNIT- II : FORECASTING DEMAND (9 periods)

Forecasting objectives and uses, Forecasting variables, Opinion and judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

UNIT-III: AGGREGATE PRODUCTION PLANNING (9 periods)

Planning hierarchies in operations, Need for aggregate production planning, Alternatives for managing supply and demand, Basic strategies for aggregate production planning - level, Chase and mixed, Aggregate production planning methods, Master production scheduling. Introduction to aggregate capacity planning.

UNIT-IV: MATERIAL REQUIREMENTS PLANNING & LEAN SYSTEMS (9 periods)

MRP-underlying concepts, Bill of Material, System parameters, MRP logic, System refinements. Manufacturing Resource Planning, Enterprise Resource Planning. Just-in-Time, Pull method of materials flow, Consistently high quality, Small lot sizes, Uniform workstation loads, Standardized components and work methods, Close supplier ties, Flexible workforce, Line flows, Automated production, Preventive maintenance, continuous improvement, Kaizen.

UNIT-V: MACHINE SCHEDULING & SUPPLY CHAIN MANAGEMENT (9 periods)

Flow shop scheduling- Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic, Palmer Heuristic, Nawaz Heuristic Technique. Job scheduling- Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines. Supply chain components, Supply chain structures, Bullwhip effect, Role of information technology in Supply Chain Management.

Total Periods: 45

TEXT BOOKS:

1. B.Mahadevan, Operations Management, Pearson education, 2nd edition,2010.
2. Everett E. Adams and Ronald J. Ebert, Production and Operations Management, PHI learning, 5th edition, 2009.
3. Lee J Krajewski, Larry P Ritzman and M K Malhotra, Operations management - Processes and Value Chains, 8th edition.

REFERENCE BOOKS:

1. S N Chary, Production and Operations Management, Tata-Mc Graw-Hill education (India), pvt limited, 2013.
2. Monks J.G., Operations Management, Schaums outline series, Mc Graw-Hill International Edition, 5th edition, 1996.
3. R Pannerselvam, Production and Operations Management, PHI learning, 2nd edition, 2009.

IV B.Tech - II Semester
14BT80302: MECHATRONICS
 (Common to ME & EIE)

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

PRE-REQUISITES:

Engineering mathematics, Basics of Electrical and Electronic Engineering, Kinematics of Machines, Design of Machine Elements.

COURSE DESCRIPTION:

Mechatronic system; Signal Conditioning; Actuating systems; sensors; Transducers; Linear Motion Guides; Electronic interface systems; Solenoids; PWM; DC Motor; Micro controller; AD converter; DA converter; PLC; PMC.

COURSE OUTCOMES:

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

- CO1:** Employ the knowledge of Mathematics, Electronics and Mechanical engineering to design a system or component with respect to Mechatronic specifications.
- CO2:** Analyze and interpret the performance of a Mechatronic component, a system, or a process with relevance to simulation techniques.
- CO3:** Provide system level design involving interfacing and actuation used in industries.
- CO4:** Independently plan and design and define a Mechatronic problem by utilizing relevant engineering principles and techniques.

Detailed Syllabus:

UNIT-I: SCOPE OF MECHATRONICS (8 Periods)
 Definitions of Traditional and Mechatronics design; Mechatronics in manufacturing and production; Examples of Mechatronics systems; Fundamentals of electronics; and Data conversion devices.

UNIT-II: PRECISION MECHANICAL SYSTEMS (9 Periods)
Pneumatic and Hydraulic actuation system: Electro-pneumatic actuator; Electro-hydraulic actuator; timing belts; control valves; LVDT; linear motion guides; piezoelectric actuators.
Electro-mechanical drives: Electric motor; LVDT; DC motor; AC motor; DC brushless motor; DC servo motor; 4-Quadrant servo drives, and Pulse Width Modulation-Variable

UNIT-III: SIGNAL PROCESSING AND CONDITIONING (9 Periods)
 Discrete Time signals: sequences; representation of signals on orthogonal basis; discrete systems; Z-transformation; frequency analysis; inverse systems; discrete Fourier transformations (DFT); frequency selective filters; ideal filter characteristics; low pass; high pass-bandpass and bandstop filters, and notch filters.

Electronic interface systems: sensors; transducers; solenoids; transistors; MOSFET isolation scheme; opto coupling; buffer ICs; protection schemes; circuit breakers; over current sensing; resettable fuses; thermal dissipation, and power supply.

UNIT -IV: MICROCONTROLLERS (9 Periods)

8051 Microcontroller; Microprocessor structures; DA interfacing; DA convertors; AD convertors, and applications.

UNIT -V: LOGIC AND MOTION CONTROLLERS (10 Periods)

Programmable Logic Controllers: Basic structure; ladder diagram; timers; internal relays and counters; shift registers; PLC selection, and applications.

Programmable Motion Controller: Introduction, system transfer function, Control system performance and tuning, Digital Controllers, proportional P, proportional PI, proportional integral derivative PID control modes, position, velocity, torque, velocity profiles, controlled velocity profiles and applications.

Total Periods: 45

TEXT BOOKS:

1. K.P.Ramachandran, Mechatronics Integrated Mechanical Electronic Systems,Wiley, 1stedition, 2008.
2. Devdas Shetty, Richard, Mechatronic system design, Cengage learning, 1st edition, 2012.

REFERENCE BOOKS:

1. W. Bolton, Mechatronics Electronics Control systems in mechanical and electrical engineering, Pearson, 3rd Edition, 2005.
2. N.P. Mahalik, Mechatronics Principles concepts and applications, McGraw Hill Education (India) Private Limited, 1st Edition, 2012.
3. Dr. J.S. Chitode, Digital Signal Processing, Technical Publication, 1st Edition,2008.

IV B.Tech - II Semester

14BT80303: COMPUTATIONAL FLUID DYNAMICS (Professional Elective-III)

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

PRE-REQUISITES:

Engineering Mathematics, Thermodynamics, Fluid Mechanics, Heat Transfer.

COURSE DESCRIPTION:

Introduction to CFD; various Numerical methods; Solution methods for governing equations; Finite difference method and its application to heat transfer problems; Errors and stability analysis; governing equations for fluid flow and heat transfer; dimensionless analysis for Study flows; CFD techniques:

COURSE OUTCOMES:

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

- CO1:** Employ the knowledge of computational fluid dynamics to build mathematical models to predict the solutions using different techniques.
- CO2:** Analyze the Fluid mechanics and heat transfer problems and offer probable solutions using Finite Differential approach.
- CO3:** Provide estimates of fluid properties, pressure loadings needed for further detailed design.
- CO4:** Identify subsets of large scale systems to simplify analysis.

Detailed Syllabus:

UNIT - I: BASICS OF CFD

(9 Periods)

Introduction to CFD; Applications of CFD in various fields; Methods to solve a physical problem; numerical methods: Runge-kutta method; Solution of a system of simultaneous linear algebraic equations; iterative schemes of matrix inversion; direct methods for matrix inversions; Finite difference method applications in heat conduction and convection; steady heat conduction in a rectangular geometry; transient heat conduction; finite difference application in convective heat transfer.

UNIT - II: DISCRETIZATION TECHNIQUES

(9 Periods)

Brief comparison between FDM, FEM & FVM.

FDM: Discretization; Consistency; Stability and Fundamentals of fluid flow modeling; Introduction to elementary finite difference quotients; implementation aspects of finite-difference equations; explicit and implicit methods.

UNIT - III: Stability Analysis and Governing Equations**(9 Periods)**

Errors And Stability Analysis: Types of Errors; Introduction to first order wave equation; stability of hyperbolic and elliptic equations; fundamentals of fluid flow modeling; conservative property; the upwind scheme.

Review Of Governing Equations For Fluid Flow And Heat Transfer: Introduction; Conservation of mass Newton's second law of motion; Navier-Stokes equations and its expanded forms; conservation of energy principle.

UNIT - IV: Dimensionless analysis for Steady flow (8 Periods)

Steady Flow; Dimensionless form: momentum and energy equations, Navier-Stoke equation, and conservative body force fields, stream function; vorticity formulation; boundary layer theory; buoyancy; driven convection; and stability.

UNIT - V: CFD Techniques**(10 Periods)**

The Lax-Wendroff Technique; Maccormack's Technique; Viscous flows; Conservation form; Space marching; Relaxation techniques; artificial viscosity; the alternating direction implicit techniques; pressure correction technique: SIMPLE Algorithm; computer graphic techniques used in CFD; Quasi-one-dimensional flow through a nozzle; turbulence models and their applications.

Total Periods: 45**TEXT BOOKS:**

1. John. D. Anderson, Computational Fluid Dynamics, the Basics with Applications, Mc Graw Hill. 6th Edition, 1995.
2. Nu Sumas V. Patankar, Numerical Heat Transfer and Fluid Flow, 1st Edition, CRC, 1980.

REFERENCE BOOKS:

1. Jiyuan and Others, Computational Fluid Dynamics, Butterworth-Heinemann Ltd; 2nd Revised Edition, 2012.
2. Niyogi, Computational Fluid Flow and Heat Transfer, Pearson, 1st Edition, 2005.
3. Fun Tapan K. Sengupta, Fundamentals of Computational Fluid Dynamics, 1st Edition, Universities Press, 2004.

IV B.Tech - II Semester
14BT80304: PRODUCT DESIGN
(Professional Elective -III)

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

PRE-REQUISITES:

Engineering Drawing, Manufacturing Technology, Design of Machine elements, Industrial Engineering and Management, CAD/CAM, Operations Research.

COURSE DESCRIPTION:

Introduction to Design process; Identifying customer needs, Product specifications; Concept Generation, Theory of Inventive Problem solving (TRIZ), Conception selection, Conception testing; Introduction to Embodiment design, product architecture, Industrial design, Design for Environment & Manufacturing, Prototyping, Robust design; Team Work and Ethical issues considered during Engineering Design Process.

COURSE OUTCOMES:

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

- CO1:** Express the basic concept of Embodiment Design to translate conceptual designs to Engineering designs.
- CO2:** Identify the sources of information to support and accelerate Engineering design process.
- CO3:** Illustrate the methods to define the customer needs.
- CO4:** Employ the intuitive and advanced methods used to develop and evaluate a concept.
- CO5:** Exercise discretion to follow ethics during Engineering Design process.

Detailed Syllabus:

UNIT -I: INTRODUCTION TO DESIGN (7 Periods)

Considerations of a Good Design, Design Process, Concurrent and Computer aided engineering concepts, Design codes and Standards, Design Review and societal considerations.

UNIT -II: NEED IDENTIFICATION AND GATHERING INFORMATION (10 Periods)

Evaluating Customer requirements and Bench marking, Quality Function Development - House of Quality (HOQ), Product Design Specification, Information sources, Copyright, Expert systems.

UNIT -III: CONCEPT GENERATION AND EVALUATION (10 Periods)

Creativity and Problem solving, Theory of Inventive Problem solving, Conceptual Decomposition and Axiomatic Design, Decision concept evaluation and decision making.

UNIT -IV: EMBODIMENT DESIGN (11Periods)

Introduction to Product Architecture, Configuration and Parametric design Concepts, Industrial Design, Ergonomics and Design for Environment, Modeling and Simulation for engineering design process, Material selection and detailed design.

UNIT - V: TEAM WORK AND ETHICS IN ENGINEERING DESIGN (7 Periods)

Team formation, functioning, discharge, team dynamics, Ethical issues considered during engineering design process.

Total Periods: 45

TEXT BOOKS:

1. George E Dieter, Linda C. Schmidt, Engineering Design 4th Edition, McGraw Hill 2013.
2. Karl T Ulrich, Steven Eppinger, Anita Goyal, Product Design & Development 4th Edition, McGraw Hill 2009.

REFERENCE BOOKS:

1. A. K. Chitale; R.C. Gupta, Product Design and Manufacturing, 5th Edition, Prentice - Hall India 2011.
2. Dieter Kevin Otto and Kristin Wood, Product Design: Techniques in Reverse Engineering and New Product Development, 1st Edition, Pearson Education Inc 2003.
3. Ken Hurst, Engineering Design Principles, Elsevier 2010.

IV B.Tech - II Semester
14BT80305: ADVANCED CASTING
TECHNOLOGY

(Professional Elective-III)

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

PRE-REQUISITES:

Manufacturing Technology, Material science & Metallurgy.

COURSE DESCRIPTION:

Trends and Scope In Foundry Industry, Its scope and Position worldwide and in India; Properties and Applications of Modern Cast alloys, Computer aided Design and Manufacturing of patterns & Dies; Design of Gating System ,Principles of solidification and Nucleation Kinetics, Melting Practices and Furnaces for Ferrous and Non- ferrous Alloys ; Modern Molding and Mechanization in Foundries ,Molding Line layout, Special casting process such as Centrifugal, Investment castings etc. with calculations ,Limitations applications.

COURSE OUTCOMES:

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

- CO1:** Identify the core trends in foundry Industry by thoughtful awareness on various foundry equipment, process.
- CO2:** Employ effective methods of gating, die and pattern making which involves computer aided design and manufacturing strategies.
- CO3:** Employ knowledge in selecting a suitable casting process considering several vital factors for a given product application.

Detailed Syllabus:

UNIT-I: INTRODUCTION AND DESIGN OF PATTERNS AND DIES

(11 Periods)

Trends and Scope In Foundry Industry: Position of foundry industry worldwide And in India: analysis of data in respect of production and demand; recent trends in Quality specifications like dimensional accuracy, surface finish and property Requirements, specifications; properties and applications of modern cast alloys: SG iron. Al - alloys, Cu- alloys, Zn - alloys.

Design considerations in manufacturing of patterns and dies: Computer Aided Pattern design and manufacture; pattern making machines and equipments; Computer Aided design of dies in die-casting and centrifugal casting; Materials used: Epoxy resins and heat treated Al alloys, allowances in patterns and dies.

UNIT-II: GATING SYSTEM AND SOLIDIFICATION (8 Periods)

Design of Gating System: Elements and types of gating systems; gating ratio; Pressurized and non-pressurized gating; applications; Risers: types and Functions of risers; Directional solidification : factor affecting and significance; use of Exothermic sleeves; Bricks; chills and their types; types and uses of filters; Computer Aided design for gating and risering systems.

Principles of Solidification: Nucleation kinetics; Fundamentals of growth; Solidification of single phase alloys; Solidification of eutectic alloys.

UNIT-III: FURNACES AND MELTING PRACTICES (9 Periods)

Melting Practices and Furnaces for Ferrous and Non-ferrous Alloys: Melting Practices of Al -alloys, Mg - alloys, Cu - based alloys and Zn- based alloys and SG Iron; Degassing process and methods in Al - alloys; Modification treatment in Al- alloys; Use of covering fluxes to avoid oxidation; Furnaces used: oil and gas fired furnaces, Induction furnaces, rotary furnaces, arc furnaces; Desulphurization; Spheroidisation Treatment; Inoculation practice; de-oxidation and alloy additions; Energy saving in melting practices.

UNIT-IV: MODERN MOLDING AND MECHANIZATION (9 Periods)

Modern Molding and Core making Various types of Sands used for molding and core making, Sand testing, high pressure line molding, shell molding binder, hardener ;shell molding sands , procedure, plants used, properties and Tests on shell sand, stick point strength, advantages and applications; Resin bonded sands, Alkyl resins, phenolic resins and furnace sands, cold box method of core making, ceramic molding, vacuum molding, sand reclamation.

Mechanization in Foundries: Conveying systems: Sand bins, belt conveyors, roller Conveyors, Bucket elevators; Pouring systems: Monorail, Auto pour systems; sand plants; Molding line Mechanization and stack molding.

UNIT-V: SPECIAL CASTING PROCESS (8 Periods)

Special Casting Processes: Investment casting processes and applications; Continuous casting processes and applications; Die casting, low pressure / Gravity, pressure and squeeze, advantages, limitations and applications; Centrifugal Casting: Calculations of various parameters in centrifugal casting, die temperature, Rotational speeds, advantages, limitations and applications of centrifugal casting, defects in centrifugal casting.

Total periods: 45

TEXT BOOKS:

1. Heine, Loper and Rosenthal, Principles of Metal Castings, McGraw Hill Education (India) Private Limited, 2nd edition 2013.
2. P.L. Jain, Principles of Foundry Technology, McGraw Hill Education (India) Private Limited, 5th edition 2009.

REFERENCE BOOKS:

1. T.V. Ramana Rao, Metal Casting: Principles and Practice , New Age International , 1 st edition 2013 .
2. B Ravi, Metal Casting: Computer-Aided Design And Analysis, Phi Learning Pvt. Ltd, 1st edition 2010.
3. P.C Mukharjee, Fundamentals of Metal casting Technology, Oxford & IBH Pub. Co., 2nd edition 1988.

IV B.Tech - II Semester
14BT80306: QUALITY MANAGEMENT & RELIABILITY
(Professional Elective-III)

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

PRE-REQUISITES:

Industrial Engineering and Management

COURSE DESCRIPTION:

Introduction to Quality, Stages of evaluation, Standardization, ISO certification process, Quality costs; Control limits, Quality circles, 7QC Tools, control charts; Acceptance sampling evaluation, Acceptance sampling for continuous production; Reliability, Failure data analysis, Types of failures; Reliability improvement, Active and Standby redundancies, Reliability optimization, Maintainability and availability.

COURSE OUTCOMES:

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

- CO1:** Employ concepts of standardization and bodies of standardization for improvement of quality.
- CO2:** Implement the various control charts and quality tools for inspection of quality.
- CO3:** Analyze evaluation of sampling plans for continuous quality production.
- CO4:** Develop failure hazard models to improve reliability.
- CO5:** Employ skills of active and standby redundancies for reliability optimization.

Detailed Syllabus:

UNIT-I: QUALITY AND QUALITY COSTS (9 Periods)

Definition of quality, product quality, quality control, factors affecting quality, stages of evaluation, continuous improvement, quality management system, quality standards, need for standardization, Bodies of standardization, ISO9000 series, ISO14000 series, ISO certification process. Quality costs-prevention, appraisal, internal failure and external failure costs, quality function deployment (QFD), tools for continuous improvement-Deming cycle, Poka-yoke, and Kaizen.

UNIT-II : QUALITY CIRCLES AND CONTROL LIMITS (9 Periods)

Quality Circles- Concepts, Objectives and advantage, Introduction to Six Sigma Concept- advantages and limitations. Control limits, 7QC tools, Natural tolerance limits, Process Capability indices, setting tolerances on assemblies and components, Control charts for variables- X and R charts, Interpretation of control charts, Control Charts for Attributes- P chart, C chart, U chart, Quality Rating System.

UNIT-III: Acceptance Sampling (9 Periods)

Acceptance Sampling Plans for Attributes- Types of Sampling Plans, Advantages and disadvantages of Sampling Plans, Evaluation of Sampling Plans-OC Curve, Characteristics of OC Curve, producer risk and Consumer risk, AOQ, AQL, ATI, ASN, Brief introduction to Acceptance Sampling plans for continuous production and Acceptance sampling plan for variables.

UNIT-IV : Concepts Of Reliability (9 Periods)

Quality and reliability, Importance of reliability, Reliability data collection, Failure data analysis- MTTF, MTBF, Failure rate, Hazard rate, Failure rate curve, Types of failures-Hazard models (Exponential and Weibull), System Reliability with components in Series, in Parallel and Mixed configurations.

UNIT-V : RELIABILITY IMPROVEMENT (9 Periods)

Active and Standby redundancies, Fault Tree Analysis, reliability optimization, maintainability and availability , application of reliability in maintenance strategies.

Total Periods:45

TEXT BOOKS:

1. Dale H Besterfield et al, Total Quality Management, Pearson Education, 3rd edition, 2011.
2. L S Srinath, Reliability engineering, East west press, 4th edition, 2005.

REFERENCES:

1. Howard Giltow, Quality Management, Tata McGrawhill, 3rd edition, 2008.
2. Amitava Mitra, Fundamentals of Quality Control and Improvement , Wiley, 3rd edition, 2013.
3. Grant E.L, statistical Quality Control, McGraw Hill education (India) Pvt limited, 7th edition, 2005.

IV B.Tech - II Semester
14BT80307: NON- CONVENTIONAL ENERGY
SOURCES

(Professional Elective - IV)

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

PRE-REQUISITES:

Heat Transfer, Thermodynamics

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:

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

- CO1:** Employ the knowledge of non-conventional energy resources and build mathematical models to predict their performance.
- CO2:** Analyze requirements for various non-conventional energy conversion systems and propose probable designs for improvement of performance.
- CO3:** Present the feasible non-convention energy conversion systems for the different parts of the society.
- CO4:** Identify non-conventional energy conversion in a given geographic region to reduce environmental pollution.

UNIT- I: ENERGY CONSERVATION AND SOLAR ENERGY(9 periods)

Basics of energy sources and Conservation: Classification and potential of energy sources, Importance of renewable energy sources and energy chain, principles of energy conservation, energy conservation opportunities

Fundamentals of Solar Energy: Extra terrestrial and terrestrial radiation, solar constant and solar radiation geometry, solar time and day length, estimation of monthly average daily total radiation on horizontal surface and tilted surface , measurement of solar radiation: Pyranometer, Pyrheliometer and Sunshine recorder.

UNIT - II: SOLAR ENERGY COLLECTION DEVICES (9 periods)

Flat plate collector, losses through flat plate collector: Top loss, side loss and bottom loss coefficients (no problems), transmissivity of the cover system, transmittance-absorptance product, parameters affecting the collector performance, efficiency of flat plate collector, selective surfaces, air collectors and types, classification and types of concentrating collectors, tracking of cylindrical paraboloid concentrating collector.

UNIT-III: SOLAR THERMAL ENERGY APPLICATIONS AND LATEST TRENDS IN NCES (9 periods)

Solar Thermal Applications: Methods of storing solar energy, solar water heating, Impact of conventional energy sources on environment, applications of solar thermal energy: solar refrigeration, solar thermal power generation, solar distillation, solar space heating and space cooling, solar pond, solar green house.

Solar Voltaic Systems & Emerging Technologies

Basic principle of PV cell, arrangements of PV cells, classification of PV cell, principle of power generation through Magneto Hydro Dynamics, power thermo electric and thermionic power generation, fuel Cell: H₂-O₂ cell, molten carbonate cell.

UNIT-IV: WIND ENERGY AND BIOMASS ENERGY CONVERSION (9 periods)

Wind Energy Conversion: Origin of wind, application of wind power, components and working of horizontal axis wind turbine, Betz limit, types of blades, upwind and downwind turbines , vertical axis Wind turbines: Savonius type, Darrieus type.

Biomass Energy Conversion: Photosynthesis process, Classification of biogas plants, Types of Digesters: KVIC and Deenabandhu digesters, Factors affecting digester performance of digester, Gasification , Types of gasifiers: Updraught, Downdraught and Cross draught gasifiers.

UNIT-V: GEOTHERMAL AND OCEAN ENERGY CONVERSION: (9 periods)

Geothermal Energy Conversion: Introduction, geothermal sources : Hydro thermal resources, geopressurized resources, hot dry rocks, Power generation through liquid dominated system, vapour dominated system and hot dry rocks, applications of geothermal energy, environmental consideration.

Ocean Energy Conversion: Ocean thermal Energy conversion: Lambert's law-, OTEC conversion technologies: Claude cycle and Anderson cycle.

Tidal energy conversion: Introduction, tidal energy conversion: single basin and double basin systems.

Wave energy conversion: Introduction, conversion methods: float method, high level reservoir machine and dolphin type machine.

Total Periods: 45

TEXT BOOKS:

1. G.D, Rai, Non-conventional Energy Sources, 5th Editon, Khanna Publichers, 2011.
2. S.Rao and B.B Parulekar, Energy Technology , 3 rdEdition, Khanna Publishers, 2012.

REFERENCE BOOKS:

1. S.P.Sukhatme and J.K Nayak, Solar Energy principles of thermal collection and storage, third edition, TMH, 2008.
2. B.H.Khan, Non-conventional Energy Sources , 1st Edition, TMH, 2006.
3. W.R.Murphy & G.Mckay, Energy Management , 2nd Edition, Butterworth, London, 2007.
4. B.Sreenivasa Reddy & K.Hemachandra Reddy [2007], Thermal data hand book, IK International Publishers, Bangalore.

Note: Thermal Engineering data hand book is permitted during examinations. (Reference book no. 3)

IV B.Tech - II Semester
14BT80308: COMPOSITE MATERIALS
(Professional Elective-IV)

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

PRE-REQUISITES:

Engineering Mechanics, Materials Science

COURSE DESCRIPTION:

Composite materials and their classifications; various reinforcements and manufacturing methods; Hook's law and Hygrothermal stress-strain relationship; micromechanical analysis of a lamina and laminates; failure analysis and design of laminates.

COURSE OUTCOMES:

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

- CO1:** Identify and explain the types of composite materials and their characteristic features.
- CO2:** Employ the theoretical basis of the experimental techniques to analyze the failure mode of composites and compute the elastic and strength properties of laminates using micromechanical theory.
- CO3:** Use the applicable engineering of composites in the design of light weight components.

Detailed Syllabus:

UNIT - I: INTRODUCTION TO COMPOSITE MATERIALS (8 periods)

Introduction, Classification: Polymer matrix composites, Metal matrix composites, Ceramic matrix Composites, Carbon-Carbon Composites, Fiber, Reinforced composites and nature-made composites and applications.

UNIT - II: TYPES OF REINFORCEMENTS (9 Periods)

Fibres-Glass, Silica, Kevlar, Carbon, Boron, Silicon carbide, and boron carbide, Fibres, Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

Manufacturing methods

Autoclave, Tape production, Moulding methods, Filament winding, Man layup, Pultrusion, RTM.

UNIT - III: Macro mechanical Analysis of a Lamina (10 Periods)

Introduction, Definitions: Stress, Strain, Elastic Moduli, Strain energy, Hooke's law for different Types of materials, Hooke's law for a 2-D, Unidirectional Lamina, Plane stress assumption, Reduction of Hooke's law in three dimensions to two dimensions, Relationship of compliance and stiffness matrix to Engineering elastic constants of a lamina, Tsai-Hill failure theory, Tsai-Wu failure theory, Comparison of

experimental results with failure theories, Hygrothermal stresses and strains in a Lamina: Hygrothermal stress-strain relationships for a unidirectional lamina, Hygrothermal stress-strain relationships for an angle lamina

UNIT-IV: MICROMECHANICAL ANALYSIS OF A LAMINA

(11 Periods)

Introduction, Volume and mass fractions, Density and void content, Evaluation of the four elastic moduli, Strength of materials approach, Semi empirical models, Elasticity approach, elastic moduli of lamina with transversely isotropic fibers, Ultimate strengths of a unidirectional lamina, Coefficients of thermal expansion, Coefficients of moisture expansion.

UNIT - V: MACRO MECHANICAL ANALYSIS OF LAMINATES

(7 periods)

Introduction, Laminate Code, Stress-Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate, Hygrothermal Effects in a Laminate, Warpage of Laminates, Failure criterion for a laminate, Design of a laminated composite, Other mechanical design issues.

Total Periods: 45

TEXT BOOKS:

1. Isaac and M Daniel, Engineering Mechanics of composite Materials, Oxford University Press.
2. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York.

REFERENCE BOOKS:

1. B. D. Agarwal and L.J. Broutman, Analysis and Performance of Fibre Composites, Wiley- Interscience, New York.
2. Autar K. Kaw, Mechanics of Composite Materials, (Mechanical Engineering), 2nd edition, CRC Publications.
3. Kishan K. Chawla, Composite Materials Science and Engineering, Springer.

IV B.Tech - II Semester

14BT80309: RAPID PROTOTYPE TECHNOLOGY

(Professional Elective-IV)

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

PRE-REQUISITES:

CAD/CAM; Manufacturing Technology; Computer Aided Machine Drawing.

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; Genisys Xs 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:

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

- CO1.** Identify the tools needed to produce a prototype of the product using RPT techniques.
- CO2.** Analyze the simulation/prototyping need and select an RPT system in a given situation for economy and rapid results.
- CO3.** Use both hardware and software tools to enhance the productivity in an RPT process.

Detailed syllabus:

UNIT -I: INTRODUCTION

(9 periods)

Definition of Prototype, Types of prototypes, Need for the compression in product development, History of RP systems, Survey of applications, Growth of RP industry, and classification of RP Systems.

UNIT -II: STEREO LITHOGRAPHY SYSTEMS

(9 periods)

Principle, process parameters, process details, data preparation, data files and machine details, Application.

Selective Laser Sintering: Type of machine, principle of operation, process parameters, and data preparation for SLS, applications, and Fusion Deposition Modeling: Principle, process parameters, path generation, applications.

UNIT -III: SOLID GROUND CURING

(9 periods)

Principle of operation, Machine details, Applications, Laminated Object Manufacturing: Principle of operation, LOM materials, process details, application.

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer, Genisys Xs printer HP system - 5, object Quadra systems.

UNIT -IV: RAPID TOOLING (9 periods)

Indirect Rapid tooling, Silicon rubber tooling, Aluminium filled epoxy tooling, Spray metal tooling, cast kirksite, 3D Keltool, Direct Rapid Tooling - Direct, AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling Vs Hard tooling.

UNIT -V: SOFTWARE FOR RP (9 periods)

STL files, Overview of Solid view, magics, magic communicator, Internet based software, Collaboration tools, Rapid Manufacturing Process Optimization: factors influencing accuracy, data preparation errors, Part building errors, Error in finishing, influence of build orientation. Allied Processes: Vacuum casting, surface digitizing, and surface generation from point cloud, surface modification, data transfer to solid models.

Total Periods: 45

TEXT BOOKS:

1. Paul F. Jacobs, Stereo lithography and other RP and M Technologies, SME, New York, 3rd edition, 1996.
2. Frank W. Liou, Rapid Prototyping and Engineering Applications, CRC Press Taylor and Francis Group, New York, Special Indian Edition, 2011.

REFERENCE BOOKS:

1. Fiham D.T, Dinjoy S. S, Rapid manufacturing, Verlog, London, 4th edition, 2002.
2. C. K. Chua, K. F. Leong, C. S. Lim, Rapid Prototyping - Principles and Applications,
3. Yesdee publications Pvt. Ltd., Mumbai, India, 2nd edition, 2010.
4. Hari Prasad, K.S. Badarinarayan, Rapid Prototyping and Tooling, SIP PageT uners, Bangalore, 1st Edition, 2013.

IV B.Tech - II Semester
14BT80310: PROJECT MANAGEMENT
(Professional Elective -IV)

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

PRE-REQUISITES:

Industrial Engineering and Management, Managerial Economics and Principles of Accountancy, and Operations Research.

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.

COURSE OUTCOMES:

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

- CO1:** Identify the resources required for a project and to produce a work plan and resource schedule.
- CO2:** Utilize key performance metrics and audit report in planning a project for success.
- CO3:** Monitor the progress for effective control of the project.
- CO4:** Steer the projects for maximizing societal benefit.
- CO5:** Employ ethical practices in implementing projects.
- CO6:** Provide accurate cost estimates and to plan various activities accordingly.

Detailed Syllabus:

UNIT -I: PROJECT SELECTION AND PLANNING (10 periods)

Project identification and formulation; Needs analysis: Resource surveys, Market research; Identification of investment opportunities; Feasibility analysis: Technical feasibility; Technology forecasting: Choice of technology, Techno economic analysis, Appropriate technology; Project environment: Nature, and Characteristics of projects; Projects screening: Project selection, Project portfolio process; Project life cycle; Work content: Work breakdown structure; Systems integration; Interface coordination; Social Cost Benefit Analysis.

UNIT -II: PROJECT IMPLEMENTATION (9 periods)

Estimating Project Budgets; Process of cost estimation; Project Scheduling tools; Developing Project Plan (Baseline); Project cash flow analysis; Project scheduling with resource constraints: Resource Leveling and Resource Allocation; Project Execution and Administration; Project contracting: Contract pricing, project time monitoring and cost monitoring, Project over runs.

UNIT -III: MONITORING AND INFORMATION SYSTEMS**(8 periods)**

Information needs and the reporting process; computerized project management information system; Earned value analysis; Planning- Monitoring-Controlling cycle; Project control: types of control processes, design of control systems, control of change and scope.

UNIT -IV: PROJECT APPRAISAL AND PROJECT AUDITING**(9 periods)**

Project Appraisal: Objectives, essentials of a project methodology, Market appraisal, Technical appraisal, Financial appraisal, Socio-economic appraisal, Management appraisal; Post-Project analysis: Construction and use of audit report, Project audit life cycle, Essentials of audit and evaluation, Varieties of project termination, the termination process.

UNIT -V: PROJECT FINANCING**(9 periods)**

Rationale of Project Financing; Essential elements of project financing; Analysis of project viability and risk management; Ownership and Financial Structuring; Legal Documentation; Project financing in India and abroad: Source, schemes, and various incentives for new projects.

Total Periods: 45**TEXT BOOKS:**

1. Prasanna Chandra, Projects: Planning, Analysis, Selection, Financing, Implementation and Review, McGraw Hill Education (India) Private Limited, 8th edition, 2014.
2. Jack R. Meredith, and Samuel J. Mantel Jr., Project Management - A Managerial Approach, Wiley India Pvt. Ltd., New Delhi, 8th Edition, 2012.

REFERENCE BOOKS:

1. Harold Kerzner, Project Management - A Systems Approach to Planning, Scheduling and Controlling, Wiley India Pvt. Ltd., New Delhi, 10th Edition, 2013.
2. Larry Richman, Project Management: Step-by-Step, PHI Learning Private Limited, 2011.

IV B.Tech - II Semester

14BT80321: COMPREHENSIVE VIVA-VOCE

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

PRE-REQUISITES:

All courses of the program.

COURSE DESCRIPTION:

Assessment of student learning outcomes.

COURSE OUTCOMES:

Comprehensive Viva-Voce enables a successful student to:

- CO1:** Demonstrate knowledge in the program domain.
- CO2:** Present his views cogently and precisely.
- CO3:** Exhibit professional etiquette suitable for career progression.

IV B. Tech. II Semester

14BT80322: PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
60	140	200	-	-	-	10

PRE-REQUISITES:

All the 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 completion of project work the student will be able to

- CO1:** Employ the fundamental knowledge to develop mathematical models and to infer useful mechanical engineering insights.
- CO2:** Analyze a situation or mechanical system and identify possible ideas for practical implementation.
- CO3:** Design mechanical engineering systems to meet the requirements specified in a given application.
- CO4:** Identify manageable sub-problems from complex situations for quicker solutions through rigorous research methodology.
- CO5:** Select and employ suitable hardware and software tools to enhance productivity as a Mechanical Engineer.
- CO6:** Understand the implications of mechanical systems from societal benefit point of view.
- CO7:** Understand the impact of project results in the context of environmental sustainability.
- CO8:** Understand professional and ethical responsibilities for sustainable development of society in chosen field of project.
- CO9:** Work effectively and amicably in a diverse group and lead the group towards excellence in Mechanical Engineering.
- CO10:** Communicate clearly, fluently, and cogently both in written and spoken contexts.
- CO11:** Manage finances and sizeable projects by choosing the right blend of common sense solutions, rigorous analytical tools, and time-tested traditional methods.
- CO12:** Exhibit sustained curiosity to delve into the unknown and to have an attitude of attention to detail.