SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)
Sree Sainath Nagar, Tirupati
Department of Mechanical Engineering

Supporting Document for 1.1.2

Syllabus Revision carried out in 2016

Program: B.Tech.- Mechanical Engineering

Regulations : SVEC-16

This document details the following:

1. Courses where syllabus has been changed 20% and more.
2. Course-wise revised syllabus with changes highlighted.

Note: *For SVEC-16 revised syllabus, SVEC-14 (previous syllabus) is the reference.*

List of Courses where syllabus has been changed (20% and more)

Course Code	Name of the course	Percentage of Syllabus changed	Page Number in which Details are Highlighted
16BT20301	Engineering Materials	30	4
16BT20332	Materials Science Lab	33	8
16BT30301	Engineering Metallurgy	30	12
16BT30303	Manufacturing Technology	20	17
16BT40305	Thermal Engineering - I	20	23
16BT50306	Human Resources Management	100	28
16BT50307	Instrumentation and Control Systems	100	31
16BT50308	Mechatronics	30	34
16BT40502	Database Management System	100	39
16BT50402	Microprocessors and Microcontrollers	100	42
16BT41202	Java programming	100	45
16BT51201	Computer Graphics and Multimedia	100	48
16BT60306	Mechanical Vibrations	20	51
16BT60304	Gas Turbines and Jet Propulsion	100	55
16BT60305	Hydraulics and Pneumatics	100	57
16BT70304	Cryogenics	100	59
16BT70309	Industrial Robotics	20	61
16BT70331	Computer Aided Manufacturing and Automation Lab	50	66
16BT70332	Industrial Engineering Lab	100	71
16BT60310	Managing Innovation and Entrepreneurship	50	73
16BT1HS01	Technical English	20	78
16BT1HS31	English Language Lab	20	82
16BT1BS02	Engineering Physics	20	86
16BT2BS01	Transformation Techniques and Partial Differential Equations	100	92
16BT4HS31	Soft Skills Lab	100	95
16BT6HS05	French Language	100	97
16BT6HS06	German Language	100	99
16BT6HS07	Indian Constitution	100	101
16BT6HS08	Indian Economy	100	103
16BT6HS09	Indian Heritage and Culture	100	105
16BT6HS10	Indian History	100	107

16BT6HS11	Personality Development	100	109
16BT6HS13	Philosophy of Education	100	111
16BT6HS13	Public Administration	100	115
16BT60112	Building Maintenance and Repair	100	116
16BT60115	Environmental Pollution and Control	40	118
16BT70413	Introduction to Nanoscience and Nanotechnology	100	122
16BT60310	Managing Innovation and Entrepreneurship	50	124
	Average	**72.45**	
	Total No. of Courses in the Program	112	
	No. of Courses where syllabus (more than 20%) has been changed	38	
	Percentage of Syllabus changed in the Program	**24.58**	

DEAN (Academics)

Dean (Academics)
Sree Vidyanikethan Engg. College
Sree Sainath Nagar
TIRUPATI - 517 102, A.P., India

PRINCIPAL

PRINCIPAL
SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)
Sree Sainath Nagar, A. RANGAMPET
Chittoor (Dist.) - 517 102, A.P., INDIA.

I B. Tech. - II Semester

(16BT20301) ENGINEERING MATERIALS

(Mechanical Engineering)

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

PRE-REQUISITES: Intermediate Physics, Engineering Chemistry.

COURSE DESCRIPTION: Classification, properties and applications of materials; atomic and crystal structure of metals; formation of alloys; structure and properties of ferrous and non-ferrous metals; properties and applications of ceramics and composite materials; testing of materials.

COURSE OUTCOMES:

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

CO1: Gain basic knowledge on engineering materials such as,
- Classification.
- Structure, properties and applications.
- Various testing procedures.

CO2: Analyze
- Material microstructure.
- Characterization and properties of various materials.

CO3: Design a crystallographic model of a material at microscopic level.

CO4: Use modern material testing instruments such as ultrasonic flaw detector, Radiography.

CO5: Identify the impact of materials on the environmental issues.

DETAILED SYLLABUS:

UNIT-I: ENGINEERING MATERIALS AND PROPERTIES **(9 Periods)**

Introduction, classification and applications of engineering materials. Mechanical Properties: tensile strength, compressive strength, ductility, malleability, hardness, toughness, brittleness, impact strength, fatigue, creep resistance. Physical properties: density, melting point, specific heat, corrosion resistance. Thermal properties: Thermal conductivity, Thermal expansion and Specific heat. Electrical properties and Magnetic properties.

UNIT-II: STRUCTURE OF MATERIALS (09 Periods)

Primary and secondary bonding in materials, space lattice, unit cell, structure of materials: simple cubic, body centered cubic, face-centered cubic, hexagonal closed-pack. 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-III: FERROUS, NON- FERROUS METALS AND THEIR ALLOYS (09 Periods)

Ferrous metals and its alloys: Structure, properties and applications of plain carbon steel, low carbon steel, Hadfield manganese steel, stainless steel, and tool steel. Structure, properties and applications of grey cast iron, white cast iron, malleable cast iron, spheroidal cast iron, alloy cast iron.

Non-ferrous metals and its alloys: Properties and applications of copper, Tin, Lead, Aluminum, Titanium and their alloys and super alloys.

UNIT-IV: CERAMICS AND COMPOSITE MATERIALS (09 Periods)

Ceramics: Properties and applications of crystalline ceramics, glasses, cermets, abrasive Materials.

Composite materials: Introduction, types of matrices and reinforcement, Polymer-Matrix Composites: Glass-Fiber Reinforced Plastic, Carbon-Fiber Reinforced Plastic, Metal-Matrix Composites , Ceramic-Matrix Composites.

UNIT-V: TESTING OF MATERIALS (09 Periods)

Destructive testing: tensile, compressive, shear, hardness and impact tests.

Non-destructive testing: gamma ray detection, magnetic particle inspection, eddy current inspection, die penetration, radiography and ultrasonic testing.

Total Periods: 45

TEXT BOOKS:

1. William. D. Callister, *Materials Science and Engineering-An Introduction*, John Wiley and sons, 8th edition, 2009.
2. Serope Kalpakjian, Steven R Schmid, *Manufacturing Engineering and Technology*, Pearson Publications, 6th Edition, 2009.

REFERENCE BOOKS:

1. Sidney H Avner, *Introduction to Physical Metallurgy*, Tata Mc Graw Hill, 2nd edition, 2009.
2. V.D. Kodigre, *Material Science and Metallurgy*, Everest Publishing House, 12th edition, 2002.
3. V. Raghavan, *Physical Metallurgy: Principles and Practices*, PHI, 3rd edition, 2015.

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.

I B. Tech. - II Semester

(16BT20332) MATERIALS SCIENCE LAB

(Mechanical Engineering)

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

PRE-REQUISITES: Intermediate Physics, Engineering Chemistry

COURSE DESCRIPTION: Characterization of microstructures of steels, cast irons and non-ferrous metals; heat treatment procedures; data acquisition and recording; grain size analysis; phase segmentation; non-destructive tests; metal powder preparation.

COURSE OUTCOMES:

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

CO1: Acquire knowledge in preparing metallographic specimen and various non-destructive testing methods.

CO2: Analyze the material for
- Material Microstructure.
- Phase distribution.
- Grain size.

CO3: Model appropriate material suitable for engineering applications.

CO4: Use the advanced software testing tool 'Material Plus' for detailed characterization of metal.

CO5: Choose acceptable engineering material for societal and industrial needs.

LIST OF EXPERIMENTS

1. Study of metallurgical instruments & microscope
2. a) Preparation of specimen using cold setting die
   b) Preparation of specimen using hydraulic 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 specimens (any four materials) by Material Plus software
9. Visual Inspection
10. Ultrasonic flaw detection test
11. Magnetic particle inspection
12. Die-penetration test
13. Eddy current testing
14. Preparation of metal powders by ball milling machine
15. Compaction of powders

(**Note:** Student shall perform minimum of **Twelve** experiments.)

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 documen tation 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. - I Semester

(16BT30301) ENGINEERING METALLURGY

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

PRE-REQUISITES: Course on Engineering Materials.

COURSE DESCRIPTION: Extraction of metals from the ores; Different melting techniques; Phase diagrams; Heat treatment procedures and their influence on Mechanical properties; Surface hardening methods; Modern material characterization techniques; Production of metal powders.

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

CO1: Demonstrate the knowledge of engineering metallurgy in extraction of materials by various melting techniques.

CO2: Analyze the structures of various metals influencing various engineering applications.

CO3: Design a suitable heat treatment method to endow required mechanical behavior as per industrial requirements.

CO4: Interpret the data on microstructure of materials using phase diagram and modify the microstructure and properties using different heat treatments.

CO5: Select modern material characterization techniques for analyzing the properties of various materials.

CO6: Identify hazardous substances in metallurgical production and source of environment pollution and propose measures to protect the environment.

DETAILED SYLLABUS:

UNIT – I: MELTING OF METALS **(08 Periods)**

Introduction, Ores of various metals, Melting of iron, Blast furnace, Cupola furnace, Puddling furnace, Melting of steel, Bessemer converter process, L-D process, Basic open hearth process, Electric furnace Melting of super alloys, Vacuum induction melting, Vacuum arc remelting.

UNIT – II: PHASE DIAGRAMS **(10 Periods)**

Cooling curve of pure metals and alloys, 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 OF STEELS **(09 Periods)**

Introduction, Annealing, Full annealing, Isothermal annealing, Spheroidal annealing, Process annealing, Normalizing, Hardening, Age hardening, Tempering, Austempering, Martempering, Sub zero treatment, TTT diagram, CCT diagrams.

UNIT – IV: SURFACE HARDENING METHODS AND MATERIAL CHARACTERIZATION TECHNIQUES **(09 Periods)**

Surface hardening methods: Introduction, Carburizing, Nitriding, Cyaniding, Carbonitriding, Flame and Induction hardening

Material characterization techniques: Introduction, Steps in metallographic specimen preparation, Optical microscope, Scanning electron microscope, Transmission electron microscope, X-ray diffraction.

UNIT - V: POWDER METALLURGY **(09 Periods)**

Introduction, Methods of production of metal powders, Atomization process, Electrolysis, Reduction, Mechanical Alloying, Particle size, Shape and distribution, Mixing, Blending, Compacting, Hot Isostatic pressing, Cold Isostatic pressing, Sintering, Applications, Advantages and limitations of powder metallurgy.

Total Periods: 45

TEXT BOOKS:

1. William. D. Callister, *Materials Science and Engineering- An Introduction*, John Wiley and sons, 8th Edition, 2009.
2. P.N.Rao, *Manufacturing Technology*, Vol.1, TMH, 4th Edition, 2013

REFERENCE BOOKS:

1. Avner, *Introduction to Physical Metallurgy*, Tata Mc Graw Hill, 2nd Edition, 2009.
2. Kodigre V D, *Material Science and Metallurgy*, Everest Publishing House, 12th Edition, 2002.
3. V. Raghavan, *Physical Metallurgy: Principles and Practices*, PHI, 3rd Edition, 2015.

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

(16BT30303) MANUFACTURING TECHNOLOGY

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

PRE-REQUISITES: Course on Engineering Materials.

COURSE DESCRIPTION: Manufacturing Processes; Foundry and Special Casting Processes; Joining Processes; Gas Welding; Electric Arc Welding; Resistance Welding; Metal Forming Processes; Sheet Metal Operations and Plastic Processing.

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

CO1: Demonstrate the knowledge required for Manufacturing Process suitable for fabricating a product.

CO2: Analyze the components of moulds and select materials and allowances of patterns used in casting.

CO3: Design Core, Core Print and Gating System in Metal Casting Processes.

CO4: Conduct investigations on manufacturing process for a particular application.

CO5: Use methodology to manufacture components with less human effort.

DETAILED SYLLABUS:

UNIT – I: FOUNDRY **(09 Periods)**

Introduction, Sand mould making procedure, Types of Patterns, Pattern Materials, Pattern Allowances, Gates and Risers, Design of Gating systems, Properties of Moulding Sand, Testing of Moulding Sand, Moulding Machines, Types of Cores.

UNIT – II: SPECIAL CASTING PROCESSES **(09 Periods)**

Introduction, Special Casting Processes – Shell Moulding, Precision Investment Casting, Permanent Mould Casting, Full Mould Casting, Die Casting, Centrifugal casting, Continuous Casting; Cleaning and Finishing of Castings - Inspection and Testing of Castings, Casting Defects .

UNIT – III: METAL FORMING PROCESSES AND SHEET METAL OPERATIONS (09 Periods)

Metal forming processes: Introduction, Hot Working and Cold Working, Forging, Extrusion – Direct, Indirect and Tube Extrusion; Rolling – Types of Rolling Mills; Drawing – Rod, Wire and Tube Drawing.

Sheet Metal Operations: Shearing operations, Types of dies - Progressive Die, Compound Die and Combin Magnetic Pulse Forming, Electro-Hydraulic Forming.

UNIT – IV: METAL WELDING PROCESSES (09 Periods)

Introduction, Classification of Welding Processes - Arc Welding, TIG Welding, MIG Welding, Submerged Arc Welding; Gas Welding Process – Types of Flames; Resistance Welding – Spot Welding, Seam Welding; Thermit Welding, Electron Beam Welding, Laser Beam Welding, Ultrasonic Welding, Welding Defects - Causes and Remedies; Destructive and Non-destructive Testing of Welds, Soldering and Brazing.

UNIT – V: PLASTIC PROCESSING (09 Periods)

Introduction, Plastics – Properties of Plastics, Additives in Plastics; Types of Plastics- Thermoforming Plastics, Thermosetting Plastics; Injection Moulding, Blow Moulding, Compression Moulding, Transfer Moulding, Extrusion Process, Calendering, Casting of Plastics, Sheet Forming Processes.

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.
3. Hazra Choudary S.K. and Hazra Choudary A.K., *Elements of Workshop Technology*, Vol I, Media Promoters, 12th Edition, 2007.

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. Mikell P.Groover, *Fundamentals of Modern Manufacturing, Materials, Processes and Systems*, John Wiley and Sons, 9th Edition, 2007.

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 - 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

(16BT40305)THERMAL ENGINEERING-I

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

PRE-REQUISITES: Course on Thermodynamics.

COURSE DESCRIPTION: Comparison of air-standard and actual cycles; Components and working of 2-stroke and 4-stroke engines; Combustion phenomena in spark ignition and compression ignition engines; Performance parameters of an internal combustion engine; Estimating heat losses in an engine; Components and working of reciprocating and rotary compressors.

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

CO1. Demonstrate the basic knowledge of an engine and air compressor in developing the analytical models.

CO2. Analyze the combustion and performance parameters of SI engines and CI engines and analyze the performance of air compressors.

CO3. Provide solutions in the design of IC engine.

CO4. Conduct investigation on IC engines for performance improvement and emission reduction.

CO5. Apply new combustion techniques to analyze the combustion in IC Engines.

DETAILED SYLLABUS:

UNIT - I: I.C. ENGINES **(09 Periods)**

Classification of I.C. Engines, engine components, 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
(10 Periods)

Combustion in S.I. Engines: Stages of combustion in SI engines, Flame front propagation, Factors influencing the flame speed, Abnormal combustion, Phenomenon of knock in S.I engines, Combustion chambers for SI Engines, Fuel Requirements and Fuel Rating.

Combustion in C.I. Engines: Stages of combustion in C.I engines, Factor affecting delay period; Phenomenon of knock in C.I engine, comparison of knock in S.I and C.I engines, Combustion chambers for C.I engines, Fuel Requirements and Fuel Rating.

UNIT - III: PERFORMANCE OF I.C. ENGINES (10 Periods)

Performance parameters: Brake power, Indicated power, Friction power, Mean effective pressure, Engine efficiencies, Performance calculations, Heat balance.

Measurement of Performance parameters: Brake power - Rope brake, hydraulic, Eddy current and swinging field DC dynamometers; Measurement of Friction power - Willian's line method, Morse test, motoring test and retardation test; Air and fuel measurement.

UNIT - IV: FUELS AND COMBUSTION (08 Periods)

Introduction, Classification of fuels - Solid fuels, Liquid fuels, Gaseous fuels; Combustion equation, Theoretical air and excess air; Stoichiometric air fuel ratio, Air fuel ratio from analysis of product, Analysis of exhaust gas and flue gas, Internal energy and enthalpy formation, Determination of calorific values of fuels, Adiabatic flame temperature, Chemical equilibrium.

UNIT - V: AIR COMPRESSORS (08 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 blower, Vane type Blower, 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. Mahesh M Rathore, *Thermal Engineering*, Tata Mcgrawhill Education, 2010.

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-gnition 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, Ffuel 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.

III B. Tech. – I Semester

(16BT50306) HUMAN RESOURCE MANAGEMENT

(Interdisciplinary Elective-1)

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of HRM; Environmental Scanning; Human Resource Planning; Job analysis; Job design; Job evaluation; Recruitment; Selection; Placement; Orientation; Training and Development; Performance appraisal; Merit rating; Compensation; Industrial relations; Trade unions; Industrial disputes; Ethical issues; Employee safety.

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

CO1. Demonstrate the knowledge on the principles, processes and practices of human resource management.

CO2. Analyze the key issues related to administering the human elements such as motivation, recruitment, training and development, compensation, appraisal, and career development.

CO3. Provide solutions to plan and manage human resource functions effectively within organization.

CO4. Apply HRM concepts and techniques in strategic planning to improve organizational effectiveness.

CO5. Evaluate HRM related social, cultural and safe responsibilities and issues in a global context.

CO6. Exercise discernment in following ethical code of conduct in human resource planning.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO HRM & HRP **(09 Periods)**

Introduction to Human Resource Management (HRM): Objectives, Scope and Significance of HRM, Functions of HRM, Prospects in HRM, Environmental scanning.

Human Resource Planning (HRP): Introduction, Nature and importance of HRP, Factors affecting HRP, The planning process, Human resource planning and the Government, Requisites for successful HRP, Barriers to HRP.

UNIT – II: RECRUITMENT AND PLACEMENT: (09 Periods)

Job Analysis – Nature and process of job analysis, Methods of collecting job data, Potential problems with job analysis, Requisites for job analysis; Job Design - Factors, Job design approaches, Contemporary issues; Job evaluation - Process, Methods; Recruitment - Nature, Purposes and importance, Factors governing recruitment, Recruitment process, Evaluation and control; Selection – Nature, Process, Barriers to effective selection, Evaluation of selection process, Placement; Separation.

UNIT – III: HUMAN RESOURCE DEVELOPMENT AND COMPENSATION (09 Periods)

Orientation - Orientation programme, Requisites of an effective programme, Evaluation of orientation programme, Problems of orientation; Training and development – Nature, Inputs, Training process, Methods, Impediments to effective training, Management development, Career development, Talent management; Performance Appraisal - Nature, Appraisal process, Challenges of performance appraisal; Merit rating; Compensation - Philosophy, Components, Theories, Factors influencing employee compensation, Challenges, Wage and salary administration.

UNIT – IV: INDUSTRIAL RELATIONS AND TRADE UNIONS (09 Periods)

Industrial Relations (IR): Nature of IR, Importance of Peaceful IR; Approaches to IR - Unitary Approach, Pluralistic approach, Marxist approach; Parties to IR; IR strategy; Industrial Disputes - Nature, Causes, and Settlement.

Trade unions: Nature of trade unions, Strategic choices before unions, Union tactics, Trade union movement in India, Trends in trade union movement, Managing unions; Indian Factories Act; Employee's compensation Act; Industrial disputes Act.

UNIT – V: ETHICAL ISSUES AND SAFETY ADMINISTRATION (09 Periods)

Managing Ethical Issues in HRM: Nature of ethics, Sources of business ethics, Myths about ethics, Ethical dilemmas, HR ethical issues, Managing ethics, Improving ethical decision making.

Employee safety: Safety, Need for safety, Types of accidents, Safety programme, ISO safety standards.

Total Periods: 45

TEXT BOOKS:

1. Aswathappa K, *Human Resource Management*, Tata McGraw Hill Private Limited, 7th edition, 2013.
2. Garry Dessler and Biju Varkkey, *Human Resource Management*, Pearson India, 12th Edition, 2011.

REFERENCE BOOKS:

1. Raymond A. Noe, John R. Hollenbeck, *HRM: Gaining a Competitive Advantage*, TMH, 7th edition, 2010.
2. Bohlander George W, Snell Scott, *Principles of Human Resource Management*, Cengage Learning, 16th edition, 2012.
2. Edwin B. Flippo, *Personnel Management*, McGraw-Hill International editions, 6th edition, 1984.

III B.Tech. - I Semester

(16BT50307) INSTRUMENTATION AND CONTROL SYSTEMS

(Interdisciplinary Elective-1)

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

PRE-REQUISITES: Course on Basic Electrical and Electronics Engineering.

COURSE DESCRIPTION: Fundamentals of instrumentation; Static and Dynamic characteristics; Working principle of instruments used for measurement of level and flow; Basic elements of control systems; Electrical analogue of mechanical, thermal, hydraulic and pneumatic systems; Process contol; PID controllers; Data acquisition systems; Programmable Logic Controllers; SCADA system.

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

CO1. Demonstrate the knowledge of fundamentals of instrumentation, measurement and control systems.

CO2. Select the instruments based on the physical considerations for a particular application.

CO3. Build mathematical models of simple physical systems using transfer functions and design logical control systems.

CO4. Investigate the suitable calibration methodology and error analysis related to measuring instruments for real time applications.

CO5. Apply control engineering techniques to the automatic control systems found in modern mechanical systems.

DETAILED SYLLABUS:

UNIT – I: FUNDAMENTALS OF INSTRUMENTATION:

(09 Periods)

Importance of Instrumentation, Types of instruments, Selection of instruments, Static characteristics- Static calibration, Linearity, Static Sensitivity, Accuracy, Static error, Precision,

Reproducibility, Threshold, Resolution, Hysteresis, Drift, Span and Range; Dynamic performance characteristics - Sources of error, Classification and Elimination of error; Errors in measurement- Types of errors, Effect of component errors, Probable errors, Performance of instruments; Calibration of Instruments - Methods and analysis; Communication Protocols, Hybrid System – HART Communication; Foundation Field Bus – Introduction and classification.

UNIT — II: MEASUREMENT OF LEVEL AND FLOW

(09 Periods)

Measuremnet of Level: Purpose of level measurement, Vessel characteristics, Categories of level measurement, Direct methods of level measurement – Hook type, Sight glass, Float actuated mechanism; Inferential methods in level measurement- Servo level gauge, Pressure transmitters, Differential head devices, Torque tube displacers, Ultrasonic gauging, Capacitive probes, load cells; Interface level measurement, calibration of level transmitters.

Measurement of Flow: Purpose of measuring flow, Categories of flow measurement, Principles of flow measurement, Working and applications of Magnetic flow meter, Turbine flow meter, Vortex shedding flow meter, Mass flow meter, Ultrasonic flow meter, Flow measurement device selection criteria, Calibration procedures for flow meters.

UNIT - III: CONTROL SYSTEMS: **(09 Periods)**

Introduction, Basic elements of control system, Open loop control system, Closed loop control system, Manually controlled closed loop systems, Automatic controlled closed loop systems, Basic elements of a servo mechanism - Electrical analogue of mechanical, Thermal, Hydraulic and Pneumatic systems; Transfer functions of elements, systems and processes, Transient and steady state response of control systems, effect of various types of control actions on dynamic performance, Stability of control systems.

UNIT - IV: PROCESS CONTROL **(09 Periods)**

Process control symbols and hardware components of a control loop, Characteristics of industrial processes – Integrating processes, Inverse acting processes, First order Dead Time Model, PID Controllers – Types, Design, Anaysis, PID controller tuning procedures; Applications of Cascade/feedforward control, Split range control and inferential control.

UNIT - V: DATA ACQUISITION SYSTEMS, PROGRAMMABLE LOGIC CONTROLLERS, SCADA **(09 Periods)**

Data Acquisition Systems: Basic architecture, Various elements/subsystems of a data acquisition system, General telemetry systems.

Programmable Logic Controllers: Architeture and functionality of PLCs, Different programming languages and operations of PLCs.

SCADA: Basic elements of SCADA systems, SCADA architecture- Monolithic, Distributed, Networked systems.

Total Periods: 45

TEXT BOOKS:

1. K. Padma Raju, Y.J. Reddy, *Instrumentation and Control Systems*, McGraw Hill Education (India) Private Limited, 1st Edition, 2016.
2. Dr.R.K.Rajput, *Mechanical Measurements and Instrumentation (Including Metrology and Control Systems)*, Katson Books, 2nd Edition, 2015.

REFERENCE BOOKS:

1. B.C.Nakra, K.K. Chaudhry, *Instrumentation Measurement and Analysis*, McGraw Hill Education (India) Private Limited, 4th Edition, 2016.
2. I.J. Nagrath and M.Gopal, *Control System Engineering*, New Age International Publishers, 5th Edition, 2007.

III B. Tech. – I Semester
(16BT50308) MECHATRONICS
(Interdisciplinary Elective-1)

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

PRE-REQUISITES: Courses on Basic Electrical and Electronics Engineering and Programming in C.

COURSE DESCRIPTION: Mechatronics system; Sensors; Transducers; Actuating systems; DC Motors; Micro controller; Signal Conditioning; Programmable Logic Controllers; Programmable Motion Controllers; Design Approach; Case Studies.

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

CO1. Demonstrate the knowledge on integrative nature of Mechatronics and different components of mechatronics systems.

CO2. Select the appropriate sensors and actuators required for a system by identifying and analyzing real life engineering problems thoroughly.

CO3. Design signal conditioning circuits for mechatronics systems and establish the controlling methods required for that system to meet the specified needs.

CO4. Select, and apply appropriate programmable motion controller techniques and adaptive controllers to complex mechatronics systems with an understanding of the limitations.

CO5. Exhibit the knowledge on design approach, keeping in view of environmental contexts, to reflect the sustainable development.

CO6. Perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

DETAILED SYLLABUS:

UNIT - I: MECHATRONICS SYSTEMS (07 periods)

Definition, Elements of mechatronics System, Mechatronics design process, Measurement systems, Control systems, Examples of Automatic control systems, Advantages and Disadvantages.

UNIT - II: SENSORS AND ACTUATORS (11 periods)

Sensors: Introduction, Types of transducers and sensors, Characteristic Parameters - static and dynamic; Displacement sensors- Potentiometer, Strain gauge, Linear Variable Differential Transformer; Position sensors- Hall effect sensor, Optical Encoder; Proximity- Inductive, Capacitive; Acceleration- Piezoelectric accelerometer; Temperature- Bimetallic strips, Resistance Temperature Detectors (RTD); Light sensors- photo diodes, photo electric transducer; Selection of Sensors.

Actuators: Hydraulic systems, Pneumatic systems, Control valves, Linear and Rotary actuators, Electrical Actuation systems - Switches, Solenoids, Relays, DC motors, AC motors, Stepper motors.

UNIT - III: SIGNAL CONDITIONG (10 Periods)

Elements of signal conditioning, Types- Analog, Amplification, Operation Amplifiers; Noise Filters, Bridge circuits, Current-voltage converters, Voltage-frequency converters; Digital signals - Nyquist Sampling theorem, Analog to digital converter, Digital to analog Converter, Data Acquisition System.

UNIT - IV: PROCESS CONTROLLERS (10 Periods)

Controller principles, Two position controller, Proportional (P) controllers, Integral (I) controllers, Derivative (D) controllers; Composite controller Modes – Proportional Integral (PI), Proportional Derivative (PD), Three mode controller (PID); Selection of controllers, Controller tuning, Adaptive controllers.

UNIT - V: DESIGN OF MECHATRONICS SYSTEMS (07 periods)

Mechatronics approach to design, Case Studies, Future trends, Ethics as design constraint.

Total Periods: 45

TEXT BOOKS:

1. K.P.Ramachandran, *Mechatronics Integrated Mechanical Electronic Systems*, Wiley, 2012.
2. W. Bolton, Mechatronics *Electronics Control systems in Mechanical and Electrical Engineering*, Pearson, 4th edition, 2005.

REFERENCE BOOKS:

1. N.P. Mahalik, *Mechatronics Principles Concepts and Applications*, McGraw Hill Education (India) Private Limited, 2012.
2. Devdas Shetty, Richard, *Mechatronic System Design*, Cengage Learning, 2nd edition, 2012.

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.

III B. Tech. – I Semester

(16BT40502) DATABASE MANAGEMENT SYSTEMS

(Common to EEE & ME)

(Interdisciplinary Elective-1)

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

PRE-REQUISITES: —

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

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

CO1. Demonstrate knowledge on

- Data models and Database Languages
- Database design
- Normal forms
- Storage and Indexing

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

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

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

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

CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO DATABASE SYSTEMS & DATABASE DESIGN (09 periods)

Database Systems: Database system applications, Purpose of database systems, View of data-Data abstraction, Instances and Schemas, Data models; Database languages - DDL, DML; Database architecture, Database users and administrators.

Database Design: ER diagrams, Beyond ER design, Entities, Attributes and entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual design with ER model.

UNIT-II: THE RELATIONAL MODEL & RELATIONAL ALGEBRA AND CALCULUS (08 periods)

Relational Model: Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design, Introduction to views, Destroying/altering tables and views.

Relational Algebra and Calculus: Preliminaries, Relational Algebra operators; Relational Calculus - Tuple and Domain Relational Calculus; Expressive power of Algebra and calculus.

UNIT-III: SQL & SCHEMA REFINEMENT (10 periods)

SQL: Form of basic SQL query- Examples of basic SQL queries; Nested queries- Introduction to nested queries, Correlated nested queries, Set-comparison operators; Aggregate operators, NULL values-Comparison using NULL values, Logical connectives AND, OR and NOT, Impact on SQL constructs, Outer joins, Disallowing NULL values; Complex integrity constraints in SQL,Triggers and active databases.

Schema Refinement: Problems caused by redundancy, Decompositions, Problem related to decomposition, Functional dependencies, Reasoning about FDS, Normal forms – First, second and third normal forms, BCNF; Multi valued dependencies, Fourth normal form, Join dependencies, Fifth normal form.

UNIT-IV: TRANSACTIONS AND CONCURRENCY CONTROL **(09 periods)**

Transactions: Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Implementation of isolation, Testing for serializability.

Concurrency Control: Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple granularity, Deadlock handling.

UNIT-V: STORAGE AND INDEXING **(09 periods)**

Storage and Indexing: Data on external storage, File organization and indexing – Clustered indexes, Primary and secondary indexes; Index data structures – Hash based indexing, Tree based indexing; Comparison of file organizations.

Tree Structured Indexing: Intuition for tree indexes, Indexed Sequential Access Method (ISAM), B+ Trees- A dynamic index structure; Search, Insert, Delete; B-Tree index files.

Total Periods: 45

TEXT BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, Tata McGraw Hill, 3rd Edition, 2014.
2. A. Silberschatz, H.F.Korth and S. Sudarshan, *Database System Concepts*, Tata McGraw Hill, 5th Edition, 2006.

REFERENCE BOOKS:

1. Ramez Elmasri and Shamkant B. Navathe, *Database Systems*, Pearson Education, 6th Edition, 2013.
2. Peter Rob and Carlos Coronel, *Database Systems Design, Implementation and Management,* Cengage Learing, 7th Edition, 2009.

III B. Tech. - II Semester

(16BT50402) MICROPROCESSORS AND MICROCONTROLLERS

(Interdisciplinary Elective-2)

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

PRE-REQUISITES: Course on Basic Electrical and Electronics Engineering.

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

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

CO1. Demonstrate knowledge in

- Internal hardware details of Intel 8086, 8051 and programmable devices like 8255, 8251, 8259, 8257.
- Interfacing various peripherals to build stand alone systems.

CO2. Critically analyze the requirements to meet the specifications of microprocessors and microcontrollers based systems.

CO3. Design and develop suitable interfaces for real time applications.

CO4. Exhibit programming skills, choose suitable hardware and program the devices to solve Engineering problems.

CO5. Apply appropriate techniques, resources to complex engineering activities for modeling microcomputer and microcontroller based systems with understanding of limitations.

CO6. Apply concepts of microprocessors and microcontrollers for solving societal problems.

DETAILED SYLLABUS:

UNIT - I: 8086 ARCHITECTURE AND PROGRAMMING **(10 Periods)**

Microprocessor Evolution, Review of Intel 8085, 8086 internal Architecture - register organization, memory segmentation, memory organization; Introduction to programming the 8086 - Assembler directives, addressing modes, instruction set, simple programs, procedures and macros.

UNIT - II: 8086 INTERFACING AND INTERRUPTS **(08 Periods)**

Pin description, minimum & maximum mode operation of 8086, timing diagram. Interfacing memory (RAM and EPROM) to 8086. 8086 Interrupts - types and interrupt responses, Interrupt vector table, priority of interrupts; 8259 priority interrupt controller - architecture, system connections and cascading, initialization of 8529.

UNIT - III: PROGRAMMABLE DATA COMMUNICATION DEVICES **(11 Periods)**

Introduction to serial and parallel communication, methods of parallel data transfer. 8255 PPI - Internal architecture and system connections, operational modes and initialization, interfacing stepper motor, ADC, DAC, Optical Shaft Encoder; Methods of serial data transfer, 8251 USART - architecture and its initialization, sending and receiving characters; Serial communication standard - RS232C, USB; Architecture and operation of 8257 DMA controller.

UNIT - IV: MICROCONTROLLERS AND PROGRAMMING **(08 Periods)**

Microcontroller Vs General purpose microprocessor, 8051/8052 Microcontroller – architecture, features, register organization, pin diagram, internal and external memories & their interfacing, instruction set, addressing modes, simple programs.

UNIT - V: 8051 INTERFACING **(08 Periods)**

Timer/Counters – Registers, modes and programming; Serial communication – registers, programming 8051 for serial communication; Interrupts – registers, programming; 8051 applications – Interfacing key board, LEDs and LCD.

Total Periods: 45

TEXT BOOKS:

1. Douglas V. Hall, *Microprocessors and Interfacing: Programming and Hardware*, Tata McGraw-Hill, revised 2nd Edition, 2006.
2. Mazidi and Mazidi, *The 8051 Microcontroller and Embedded Systems*, Prentice Hall of India, 2000.

REFERENCE BOOKS:

1. A.K. Ray and K.M. Bhurchandi, *Advanced Microprocessors and Peripherals- Architecture*, Programming and Interfacing, Tata McGraw Hill, 2002 Reprint.
2. Kenneth J. Ayala, *The 8051 Microcontroller*, Thomson Delmar Learning, 3rd Edition, 2004.

III B. Tech. – II Semester
(16BT41202) JAVA PROGRAMMING
(Interdisciplinary Elective-2)

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

PRE-REQUISITES: Course on Programming in C.

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

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

CO1. Demonstrate knowledge on:
- Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
- Packages, interfaces, multithreading, exception handling, event handling.

CO2. Analyze complex engineering problems using object oriented concepts.

CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.

CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.

CO5. Use advanced programming languages to develop web applications.

CO6. Build Java Applications suitable for societal requirements.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION **(10 Periods)**

Data types, Variables, Arrays, Operators, Control statements.

Classes and Objects: Concepts of Classes, Objects, Constructors, Methods, this keyword, Garbage collection, Overloading Methods and Constructors, Parameter passing, Access control, Recursion, String Class.

UNIT-II: INHERITANCE, PACKAGES AND INTERFACES **(09 Periods)**

Inheritance: Inheritance basics, Super keyword, Multi-level hierarchy, Abstract classes, Final keyword with inheritance.

Packages: Definition, Creating and accessing a package, Understanding CLASSPATH, Importing packages.

Interfaces: Definition, Implementing interfaces, Nested interfaces, Applying interfaces, Variables in interface and Extending interfaces.

UNIT-III: EXCEPTION HANDLING AND MULTITHREADING **(08 Periods)**

Exception Handling: Concepts of exception handling, Exception types, Usage of Try, Catch, Throw, Throws and Finally, Built in exceptions, Creating own exception sub classes.

Multithreading: Java thread model, Creating threads, Thread priority, Synchronizing threads, Inter-thread communication.

UNIT-IV: COLLECTION CLASSES, THE APPLET CLASS AND AWT **(10 Periods)**

Collection Classes: ArrayList Class, LinkedList Class, Hashset Class, LinkedHashSet Class, TreeSet Class, PriorityQueue Class, EnumSet Class.

The Applet Class: Types of applets, Applet basics, Applet architecture, Applet skeleton, Passing parameters to applets.

AWT Control Fundamentals: User interface components, Layout managers.

UNIT-V: EVENT HANDLING AND SERVLETS **(08 Periods)**

Delegation event model: Event classes, Event Listener Interfaces – Mouse and Key; Adapter classes.

Servlets: Life cycle of a servlet, Using Tomcat for Servlet development, Create and compile the servlet source code, Servlet API, Javax.Servlet package.

Total Periods: 45

TEXT BOOK:

1. Herbert Schildt, *Java the Complete Reference*, Oracle Press, 9th Edition, 2014.

REFERENCE BOOK:

1. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, Oxford University Press, 2nd Edition, 2014.

III B. Tech. – II Semester

(16BT51201) COMPUTER GRAPHICS AND MULTIMEDIA

(Interdisciplinary Elective-2)

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

PRE-REQUISITES: Course on Matrices and Numerical Methods.

COURSE DESCRIPTION: Introduction to Computer Graphics, Output Primitives; 2D Geometric Transformations and Viewing; 3D object representation and Visible Surface Detection Methods; Introduction to Multimedia, Audio and Video; Multimedia Data Compression.

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

CO1. Demonstrate knowledge on:

- Graphical interactive devices
- Viewing transformations
- 3-D object representations
- Surface detection methods
- Image, audio, video representations and standards.

CO2. Analyze multimedia compression issues using image, audio and video compression techniques.

CO3. Design algorithms to generate points, lines, polygons for 2-D, 3-D objects.

CO4. Apply Transformations and Clipping algorithms for 2-D and 3-D objects, various lossy/ lossless coding techniques on text and images for compression and decompression.

CO5. Build multimedia applications for societal requirements.

DETAILED SYLLABUS:

UNIT –I: INTRODUCTION TO GRAPHICS AND OUTPUT PRIMITIVES **(09 Periods)**

Introduction: Raster-Scan systems, Random Scan systems, Graphics monitors, Work stations and Input devices.

Output Primitives: Points and Lines, Line Drawing algorithms, Mid-point Circle and Ellipse algorithms.

Filled area primitives: Scan Line Polygon Fill algorithm, Boundary-fill algorithms and Flood-Fill algorithms.

UNIT –II: 2-D GEOMETRICAL TRANSFORMS AND 2-D VIEWING **(09 Periods)**

2-D Transforms: Translation, Scaling, Rotation, Reflection and Shear transformations, Homogeneous coordinates, Composite Transforms, Transformations between coordinate systems.

2-D Viewing: The Viewing Pipeline, Viewing coordinate reference frame, Window to View-Port coordinate Transformation, Cohen-Sutherland line clipping algorithms.

UNIT –III: 3-D OBJECT REPRESENTATION AND VISIBLE SURFACE DETECTION METHODS **(09 Periods)**

3-D Object representation: Polygon Surfaces, Quadric surfaces, Spline Representation, Hermite Curve, Bezier Curve and B-Spline Curves, Bezier and B-Spline Surfaces.

Visible Surface Detection Methods: Classification, Back-Face detection, Depth-Buffer, Scan-Line, Depth Sorting, BSP-Tree methods, Area Sub-Division and Octree methods.

UNIT-IV: INTRODUCTION TO MULTIMEDIA, AUDIO AND VIDEO **(09 Periods)**

Introduction: Definition of Multimedia, Multimedia and Hypermedia, Multimedia Software tools, Graphics and Image Data representations-Graphics and Image Data types, File Formats, Color models in images, Color models in video.

Audio and Video: Definition of sound, Digitization, Nyquist Theorem, Signal to Noise ratio, Signal to Quantization-Noise ratio; Types of video signals, Analog video, Digital video.

UNIT-V: MULTIMEDIA DATA COMPRESSION (09 Periods)

Lossless compression algorithms- Introduction, Basics of Information Theory, Run Length Coding, Variable Length coding, Dictionary Based coding, Arithmetic coding; Lossy Compression algorithms- Quantization; Introduction to Transform Coding- DCT, DFT; Image compression techniques-JPEG standard, JPEG 2000; Introduction to video compression- Video compression based on Motion Compensation, MPEG-1, MPEG-2.

Total Periods: 45

TEXT BOOKS:

1. Donald Hearn and M. Pauline Baker, *Computer Graphics C version*, Pearson Education, 2nd Edition, 2006.
2. Ze-Nian Li and Mark S. Drew, *Fundamentals of Multimedia*, Pearson Education, 2nd Edition, 2008.

REFERENCE BOOKS:

1. James D. Foley, Andries van Dam, Steven K. Feiner and John F. Hughes, *Computer Graphics: Principles and Practice in C*, Addison Wesley Professional, 2nd Edition, 2013.
2. Nigel Chapman and Jenny Chapman, *Digital Multimedia*, Wiley Dreamtech, 2nd Edition, 2004.

III B. Tech. – II Semester
(16BT60306) MECHANICAL VIBRATIONS
(Program Elective-1)

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

PRE-REQUISITES: Course on Dynamics of Machinery.

COURSE DESCRIPTION: Basics of vibration; Analysis of two or more degrees of freedom; Multi-body mechanical systems; Undamped free vibrations; Damped free vibration; Forced vibrations; Basic concepts on engineering measurements; Spectrum analysis; signal processing; vibration control.

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

CO1. Demonstrate knowledge on Vibration and its practical applications.

CO2. Analyze the mathematical models of the system and provide a qualitative assessment of the vibrations present in the system.

CO3. Design the possible sources of unwanted vibration and suggest means of rectification.

CO4. Investigate the complex system by analyzing the sub-systems and using their models for quicker solutions.

CO5. Use the different tools involved in Vibration Control to enhance productivity.

CO6. Relate the issue of safety in dynamic systems involving moving parts and propose solutions for society.

DETAILED SYLLABUS:

UNIT - I: FUNDAMENTALS OF VIBRATIONS (09 Periods)

Single degree of Freedom Systems – Definition, Classification and terminology; Simple harmonic motion and Mathematical modeling, Natural vibrations – Equilibrium method, Energy method; Equivalent systems –Damped free vibration, Springs in parallel and series.

UNIT - II: FORCED VIBRATIONS (09 Periods)

Constant harmonic excitation - steady state forced vibration, Impressed harmonic force, Impressed force due to unbalance; Motion excitation – amplitude, absolute, relative, Rotating with reciprocating unbalance; Transmissibility and Isolation – Force and Motion transmissibility; Damping – coulomb damping, Viscous damping.

UNIT - III: TWO DEGREE FREEDOM SYSTEMS (09 Periods)

Free vibrations of spring coupled systems - Natural frequencies and modes of vibration by classical method of spring-mass system; Forced vibration - Dynamic vibration absorber, longitudinal vibrations of bars;

UNIT - IV: TORSIONAL SYSTEMS (09 Periods)

Introduction, Torsional system, Damped mass and distributed mass systems, Natural frequencies and mode shapes - Rayleigh's method, Holzer method, Stodola method.

UNIT - V: VIBRATION MEASUREMENTS (09 Periods)

Vibration measurement - process, classification of measuring instruments; Vibrometers- Stylus type, optical type, seismic instrument, simple potentiometer; capacitance pick-up- Active type and passive type pick-ups; Accelerometers- FFT Spectrum analyzer and its applications; Vibration monitoring technique.

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. S.S.Rao, *Mechanical Vibrations*, Pearson Publication. 4th Edition, 2003.

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 ap proach 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, 8thEdition, 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 Educa -tion (India) Pvt Ltd, 1st Edition, 2013.

III B. Tech. – II Semester

(16BT60304) GAS TURBINES AND JET PROPULSION

(Program Elective-1)

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

PRE-REQUISITES: Course on Thermal Engineering - II

COURSE DESCRIPTION: Jet propulsion gas turbine; Engine types; Performance; Turbojet and turbofan engines; Design of Compressor; Combustor and Turbines; Jet and Rocket propulsions.

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

CO1. Demonstrate the knowledge on gas turbines, Jet and Rocket propulsion systems.

CO2. Identify, Analyze and formulate the performance of components in the engine.

CO3. Design the propulsion systems with an influence on engine output considering the required parameters for a particular gas turbine engine.

CO4. Investigate and carry out a cyclic analysis of a gas turbine engine, including ramjet and turbofan.

CO5. Utilize appropriate analytical methods in integrating the engine into an aircraft system for better performance analysis.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION & ANALYSIS OF GAS TURBINE CYCLES (09 Periods)

Development of gas turbine, Classification of gas turbines, Gas turbine vs. reciprocating I.C. engine, Gas turbine vs steam turbine, Applications of gas turbines, the basic cycle Analysis of simple gas turbine cycle, Effect of thermodynamic variables on the performance of simple gas turbine plant, Improvements in simple gas turbine cycle, Actual gas turbine cycle, Closed cycle gas turbine, Helium cooled, closed gas turbine for nuclear power plants , Total energy system incorporating gas turbine, Semi-closed cycle gas turbine, Gas turbine plant arrangement.

UNIT - II: COMPRESSOR AND TURBINES **(09 Periods)**

Centrifugal and Axial flow compressors, Blowers and Fans, Theory and design of impellers and Blading, Axial flow turbines, Blade diagrams and Design of blading, Performance characteristics, Matching of turbines and compressors.

UNIT - III: GAS TURBINE COMBUSTION CHAMBER **(08 Periods)**

Introduction, Requirements, Combustion process in gas turbine, Types of combustion chamber, Flow pattern in a combustion chamber, Performance and operating characteristics of combustion chambers, Fuel injection in combustion chamber.

UNIT - IV: JET PROPULSION **(09 Periods)**

Introduction, Thrust, Thrust vs. thrust horse power, Efficiencies, Airscrew, Turbojet, Thrust augmentation, Turboprop engine, Bypass and ducted fan engines, Regenerative ducted fan engine, Turbo shaft engine, Ram jet, Pulsejet, Comparison of various propulsion devices.

UNIT - V: ROCKET PROPULSION **(10 Periods)**

Introduction, classification of rockets, Principle of rocket propulsion, Analysis of an ideal chemical rocket, Optimum expansion ratio for rocket, The chemical rocket, Advantages of liquid propellant rockets over solid propellant rockets, Free radical Propulsion, Nuclear Propulsion, Ion propulsion, Plasma propulsion.

Total Periods: 45

TEXT BOOKS:

1. Mathur, M., and Sharma, R.P., *Gas Turbines and Jet & Rocket Propulsion*, Standard Publishers, New Delhi, 2014.
2. Ganesan, V., *Gas Turbines*, Tata McGraw Hill Book Company, New Delhi, 3rd edition, 2010

REFERENCE BOOKS:

1. Yahya. S.M., *Fundamental of Compressible Flow with Aircraft and Rocket Propulsion*, New Age International (p) Ltd., New Delhi, 2005.
2. Cohen.H., Rogers R.E.C and Sravanamutoo, *Gas Turbine Theory*, Addison Wesley Ltd., 1987.
3. Rathakrishnan. E., *Gas Dynamics*, Prentice Hall of India, New Delhi, 1st Edition, 2001.

III B. Tech. – II Semester

(16BT60305) HYDRAULICS AND PNEUMATICS

(Common to ME & EIE)

(Program Elective-1)

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

PRE-REQUISITES: Courses on Fluid Mechanics and Basic Electrical and Electronics Engineering

COURSE DESCRIPTION: Basic fluid power system; Hydraulic components and its use; Hydraulic circuits and its application; Fundamentals of pneumatics: Pneumatic components and its use; Pneumatic circuits; Application; Design of hydraulic and pneumatic systems for various applications; Electro Pneumatics; Logic gates.

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

CO1. Demonstrate the basic mechanism of fluid power systems and automation.

CO2. Identify and analyze engineering problems in automated environment.

CO3. Design the pneumatic and hydraulic circuits for domestic and industrial problems.

CO4. Investigate the issues related to the design and manufacture of pneumatic and hydraulic systems.

CO5. Use modern tools available in automation to enhance the productivity.

CO6. Deploy the best way of implementing the automation to have eco-friendly environment and sustainable development.

DETAILED SYLLABUS:

UNIT - I: FUNDAMENTALS OF HYDRAULIC POWER SYSTEMS. (08 Periods)

Fluid Power Fundamentals, Advantages and Application. Pascal's law, Viscous oils, properties. Components of hydraulic systems- Pumps, Gear pump, Vane pump, and Piston pump; Pumping theory, Actuators –Single acting, Double acting, Tandem, Rod less; Accumulators, Intensifiers.

UNIT - II: HYDRAULIC CONTROL COMPONENTS AND DESIGN OF CIRCUITS **(09 Periods)**

Directional control valves (DCVs), Pressure control valves, Flow control valves, Shuttle valve, Check valve, Sequence valve, Solenoid valve, and Relay, ISO/ANSI symbols, Simple hydraulic circuits, ladder diagram.

UNIT - III: FUNDAMENTALS OF PNEUMATICS **(09 Periods)**

Pneumatic system components, Compressors, Filters, Regulator, Lubricator unit (FRL UNIT), Driers, Valves, Pressure control valve, Flow control valve, Quick exhaust valve, direct control valves, Time delay valve, Memory valve, Shuttle valve, Twin pressure valve, Solenoid valves and Pneumatic cylinders, ISO/ANSI symbols.

UNIT - IV: DESIGN OF PNEUMATIC CIRCUITS (10 Periods)

Pneumatic circuits, Speed control circuits, Multi- Cylinder Application by Coordinated and sequential motion control, Motion and control diagrams, Cascading method- principle, and Practical application (up to two cylinders)

UNIT - V: ELECTRO PNEUMATICS AND LOGIC GATES **(09 Periods)**

Electro- Pneumatic: Principles - Signal input and output, Pilot assisted solenoid control of directional control valves, Use of relay and contactors.

Logic Gates: Introduction and use of Logic gates in pneumatic applications, Practical Examples.

Total Periods: 45

TEXT BOOKS:

1. Srinivasan.R, *Hydraulic and Pneumatic controls*, McGraw Hill Education, 2nd Edition, 2006.
2. Shanmugasundaram. K, *Hydraulic and Pneumatic Controls*, S. Chand & Co, 1st Edition, 2006

REFERENCE BOOKS:

1. Majumdar S.R., *Oil Hydraulics Systems Principles and Maintenance*, McGrawHill Education, 1st Edition, 2000.
2. Majumdar S.R., Pneumatic systems – Principles and Maintenance, McGraw Hill Education, 2nd Edition, 2001.

IV B. Tech. – I Semester
(16BT70304) CRYOGENICS
(Program Elective-2)

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

PRE-REQUISITES: Course on Refrigeration & Air-conditioning

COURSE DESCRIPTION: Necessity of low temperature, Multi stage refrigeration, Cascade system, Properties of cryogenic fluids, Liquefication of air, hydrogen and helium, Applications of low temperature, Low temperature insulation, Storage systems.

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

CO1. Demonstrate the principles of cryogenics in various low temperature refrigeration applications.

CO2. Analyze the various refrigeration cycles in solving cryogenic problems.

CO3. Present the probable solution in the design of insulation to the various systems in handling the cryogenic fluids.

CO4. Conduct investigations cryogenic fluids suitable for low temperature applications in real time situations.

CO5. Apply the suitable storage and handling systems for various cryogenic fluids.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION **(09 Periods)**

Necessity of low temperature, Limitations of vapour compression system for the production of low temperature, Multi-stage refrigeration system - Cascade system.

UNIT - II: PROPERTIES OF CRYOGENIC FLUIDS **(08 Periods)**

Cryogenics - Definition, T-S diagram of a cryogen; Properties of cryogenic fluids - Liquid Methane, Liquid Neon, Liquid Nitrogen, Liquid Oxygen, Liquid Argon, Liquid Air.

UNIT - III: REFRIGERATION AND LIQUEFICATION **(09 Periods)**

Manufacture of Dry ice, Joule's Thomson effect, Liquefication of air - Linde system, Claude system, Liquefication of Hydrogen and Helium.

UNIT - IV: APPLICATIONS OF LOW TEMPERATURE **(09 Periods)**

Effects on the properties of metals - Strength, Thermal properties, Super conductivity and Super fluidity; Applications of low temperature - Expansion fitting, Cryobiology, Cryosurgery, Space research, Computers and Underground power lines.

UNIT - V: LOW TEMPERATURE INSULATION **(10 Periods)**

Types of Insulation - Reflective insulation, Evacuated powders, Rigid foams; Super insulation; Dewar vessels; Hazards in cryogenic engineering.

Total Periods: 45

TEXT BOOKS:

1. Domkundwar Arora Domkundwar, *A course in Refrigeration and Air-conditioning*, Dhanpat Rai Co., 7th Edition, 2002.
2. P L Ballany, *Refrigeration and Air-conditioning*, Khanna Publishers, 15th Edition 2009.

REFERENCE BOOKS:

1. Traugott H.K. Frederking and S.W.K. Yuan, *Cryogenics - Low Temperature Engineering and Applied Sciences*, Yutopian Enterprises, 2005.
2. A. R. Jha, *Cryogenic Technology and Applications*, Butterworth-Heinemann, 2005

IV B. Tech. – I Semester
(16BT70309) INDUSTRIAL ROBOTICS
(Program Elective-3)

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

PRE-REQUISITES: Courses on Matrices and Numerical Methods and Dynamics of Machinery.

COURSE DESCRIPTION: Introduction of Robots classifications; Components; Robot drive mechanisms; Mechanical transmission methods aided in functioning of robots; Forward kinematics; inverse kinematics; Manipulator dynamics; Trajectory planning and avoidance of obstacles; Robot programming; Robot Application in Industry; Future Application and Challenges and Case Studies.

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

CO1. Demonstrate the knowledge on concepts of robot, Kinematics and dynamics, Trajectory planning and programming of robot.

CO2. Identify, analyze and interpret various methods and review the contemporary problems of robotics.

CO3. Optimize various robotic configuration parameters to analyze the reverse and forward kinematics.

CO4. Investigate the performance parameters on the complex robotic designs.

CO5. Apply appropriate functional techniques, resources, and programming tools to robotic engineering activities.

CO6. Consider safety issues in designing robots for societal applications.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION **(09 Periods)**

Robot, Brief History, Classifications, Joint notation schemes, Work volume, Degrees of freedom, Components, End effectors - Classification of End effectors, Tools as end effectors; Drive system for grippers - Mechanical, Adhesive, Vacuum, Magnetic; Hooks & scoops, Gripper force analysis and gripper design, Active and Passive grippers.

UNIT - II: ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS **(08 Periods)**

Robot Drive Mechanisms - Hydraulic, Electric-Servomotor, Stepper Motor; Pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives; Cables, Roller chains, Link Rod systems, Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws.

UNIT - III: MANIPULATOR KINEMATICS & DYNAMICS
(10 Periods)

Manipulator kinematics: 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 & SENSORS
(10 Periods)

Trajectory planning: Trajectory planning and avoidance of obstacles, Path planning, Skew motion, Joint integrated motion, straight line motion.

Sensors: Position sensors, Velocity sensors, Tactile sensors, Proximity sensors, Machine vision sensors, Fail safe hazard sensor systems and Compliance mechanism

UNIT - V: ROBOT PROGRAMMING AND APPLICATIONS
(08 Periods)

Robot programming: Types, Features of languages and Software packages.

Robot application: 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 Periods: 45

TEXT BOOKS:

1. M.P.Groover, *Industrial Robotics: Technology, Programming, and Applications*, Tata McGraw-Hill, 2008.
2. John. J. Craig, *Introduction to Robotics: Mechanics and Control*, Pearson/Prentice Hall, 3rd Edition, 2005.

REFERENCE BOOKS:

1. Richard. D.Klafter, *Robotics Engineering: an integrated approach*, Prentice-Hall publisher, 1st Edition, 1988.
2. K. S. Fu., R. C. Gonzalez, C. S. G. Lee, *Robotics: Control Sensing*, Vision and Intelligence, International Edition, Tata McGraw Hill, 2008.
3. Ashitav Ghosal, *Robotics, Fundamental Concepts and Analysis*, Oxford Press, 2006.
4. Mittal R.K & Nagrath IJ, *Robotics and Control*, Tata McGraw Hill, 6th Edition, 2007.

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 Edition2006.
5. John. J. Craig, Introduction to Robotics, Pearson India, 3rd Edition, 2008.

IV B. Tech. - I Semester
(16BT70331) COMPUTER AIDED MANUFACTURING AND AUTOMATION LAB

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

PRE-REQUISITES: --

COURSE DESCRIPTION: CNC Programming; Pressure control valve; flow control valve; Directional control valve; Logic controls; Timers; PLC; Ladder diagram; Robotics.

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

CO1. Demonstrate the practical usage of automation and robotics.

CO2. Analyse the hydraulic, pneumatic circuits for the appropriateness to real time applications.

CO3. Design and model different components using automation and develop codes for part programming in CNC

CO4. Conduct investigations to suit the automation and robotics for practical applications.

CO5. Using computer numerical control techniques in computer aided manufacturing of components.

CO6. Formulate the team to attain multidisciplinary settings in achieving automation.

CO7. Communicate effectively on sequence of manufacturing operations for the given component or machine.

Any TWELVE Experiments Should Be Coducted and Six Experiments in Each section.

LIST OF EXPERIMENTS:

CAM:

1. Exercise in Basic manual part program and simulation practice in CNC TURN

   a) Step turning.

   b) Step turning and Taper turning, Profile turning.

2. Exercise in manual part program using canned cycle and simulation practice in CNC TURN
   a) Step turning using canned cycle.
   b) Grooving using canned cycle.
   c) Thread cutting using canned cycle.
   d) Drilling using canned cycle.
3. Exercise in Basic manual part program and simulation practice in CNC MILL
   a) Profile Milling.
   b) Circular pocket milling.
   c) Rectangular pocket milling.
4. Component making practice in CNC TURN
   a) Step turning.
5. Component making practice in CNC TURN
   a) Step turning and Taper turning, Profile turning.
6. Component making practice in CNC TURN
   a) Thread cutting using canned cycle.
7. Component making practice in CNC Mill
   a) Profile Milling.
8. Component making practice in CNC Mill
   a) Rectangular pocket milling
9. Die Making practice using CNC Mill

AUTOMATION:

1. Design and testing of hydraulic circuits for Single acting cylinder using pressure control Valves, flow control valves, DCVs (Mechanical, Pilot, Solenoid)
2. Design and testing of hydraulic circuits for double acting cylinder using pressure control Valves, flow control valves, DCVs (Mechanical, Pilot, Solenoid)
3. Design and testing of hydraulic circuits for single/double acting cylinder using Gate valves Pressure control valves, flow control valves, DCVs(Mechanical, Pilot, Solenoid)

4. Design of circuit with programmed logic sequence, using PLC in hydraulic Electro hydraulic Trainer
5. Programming of PLC using ladder logic diagram
6. Circuits with multiple cylinder sequences in Electro pneumatic Trainer using PLC
7. Simulation of basic hydraulic, pneumatic and electrical circuits using Automation studio Soft ware.
8. Modeling and analysis of basic electrical, hydraulic, and pneumatic systems using MATLAB/LABVIEW software
9. Programming exercise for robot

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.

COUSRE 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

(16BT70332) INDUSTRIAL ENGINEERING LAB

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

PRE-REQUISITES: Course on Operations Research.

COURSE DESCRIPTION: Work study; Method Study; Preparation of Process Charts; Work Measurement; Time Study; Productivity; Sampling; Quality control for attributes; Ergonomics; Supply Chain Management, Simulation of Inventory.

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

CO1. Demonstrate the concepts and use of IE techniques in providing solutions to complex productivity related Problems.

CO2. Analyze the process parameters required for conducting the experiments related to industrial engineering problems.

CO3. Prepare (Design) and conduct the exercises on Process chart, Method study and Work Measurement for effective utilization of Man- power resources.

CO4. Investigate the results obtained in the various experiments anovide suitable conclusions.

CO5. Apply IE techniques to achieve Effective work place environment.

CO6. Work and contribute to team to accomplish common goals.

CO7. Communicate effectively about laboratory work reports and presentation.

Any TWELVE Experiments Should Be Coducted

LIST OF EXPERIMENTS

1. Preparation of Process Charts for Method Study
2. String diagram
3. Work Measurement - Time study by Stop watch

4. Bolt & Nut assembly, Productivity enhancement experiment
5. Hand-tool dexterity test –Fatigue Mesurment
6. Minnesota dexterity test
7. Pyramid Puzzle Burmese test
8. O'Connor Finger Dexterity Test
9. Purdue Peg Board test
10. Simple Assembly Process experiment
11. Segregation/Sorting test using different size bolts, washers (rubber & metal), nuts, screws with one hand and with both hands
12. Jebsen Taylor Hand function test
13. Study of Control charts for variables
14. Quality Control of Attributes - Sampling experiments
15. Bull-whip effect /Beer Game/

III B. Tech. – II Semester

(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

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

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

PRE-REQUISITES: —

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

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

CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.

CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.

CO3. Develop a comprehensive and well planned business structure for a new venture.

CO4. Conduct investigation on complex problems, towards the development of Project.

CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.

CO6. Apply ethics in constructive innovation framework.

CO7. Exhibit professionalism by employing modern project management and financial tools.

DETAILED SYLLABUS:

UNIT - I: Creativity and Innovation (07 Periods)

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

UNIT - II: Paradigms of Innovation (11 Periods)

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and its application, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

UNIT - III: Sources of finance and venture capital (07 Periods)

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

UNIT - IV: Intellectual property innovation and Entrepreneurship (11 Periods)

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

UNIT - V: Open Innovation framework & Problem solving (09 Periods)

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and

Opportunities of open innovation framework, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship*, Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, *Managing Technology and Innovation for Competitive Advantage*, Pearson India, 1st Edition, 2002.

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 suessful 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; AcquiringTechnological 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: Ettlie, 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)

I B. Tech. – I Semester [CSE, CSSE, IT, CE & ME]

I B. Tech. – II Semester [ECE, EEE & EIE]

(16BT1HS01) TECHNICAL ENGLISH

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

PRE-REQUISITES: ***English at Intermediate level***

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

COURSE OBJECTIVES:

CEO1. To impart knowledge of the nuances of communication.
CEO2. To develop Listening, Speaking, Reading and Writing skills in order to use language effectively in distinct situations.
CEO3. To imbibe an attitude of assimilating language skills in the sequence of locating, retrieving, reporting, evaluating, integrating, and accurately citing in the required context.

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

CO1: Demonstrate knowledge in

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

CO2: Analyze the possibilities and limitations of language, understanding
- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3: Design and develop functional skills for professional practice**.**

CO4: Apply writing skills in preparing and presenting documents

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

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

DETAILED SYLLABUS:

UNIT I - **INTRODUCTION TO COMMUNICATION: (9 periods)**

Introduction –Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification)

UNIT II - **ACTIVE LISTENING:** **(9 periods)**

Introduction – Reasons for poor Listening – Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information

UNIT III - **EFFECTIVE SPEAKING:** **(9 periods)**

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Persuasive Speaking

UNIT IV - **READING**: **(9 periods)**

Introduction and Reading Rates – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – Reading for Different Purposes – SQ3R Reading Technique – Study Skills

UNIT V – **WRITING**: **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Referencing and Styling – Right Words and Phrases – Sentences

Total Periods: *45*

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt.Ltd., New Delhi, 2015.
2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.
3. Teri Kwal Gamble and Michael Gamble, *Communication Works*, Tata Mc Graw-Hill, New Delhi, 2010.
4. Rajendra Pal and J.S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

14BT1HS01: **TECHNICAL ENGLISH**

I -Year B.Tech.

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	-	-	4

COURSE OBJECTIVES:

1. To lay basic foundation and impart knowledge of English language, grammar and communication skills.
2. To develop listening, speaking, reading and writing skills among students needed in their personal, academic and professional pursuits.
3. To train students apply the nuances of English for various communication needs.
4. To build confidence in effective usage of English language.

COURSE OUTCOMES : After completion of the course the students will be able to

1. Acquire fundamental and functional knowledge of English language, grammar and communication skills.
2. Identify and analyze productive skills (speaking and writing) and receptive skills (listening and reading) of English language proficiency for effective communication and practice.
3. Design and develop functional skills for professional practice through English.
4. Communicate effectively with the engineering community and society to comprehend and deliver effective solutions.
5. Inculcate an attitude to upgrade competence of English knowledge and communication to engage in independent and life-long learning.

DETAILED SYLLABUS:

UNIT – I : (10 periods)

My Early Days, **A. P. J. Abdul Kalam** from **Technical English for Engineer**s by Cambridge University Press for 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 **Technical English for Engineer**s by Cambridge University Press for 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 **Technical English for Engineer**s by Cambridge University Press for India Pvt Ltd. (2014).

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

UNIT – IV : (10 periods)

Dr. C. V. Raman: The Celebrated Genius from **Technical English for Engineer**s by Cambridge University Press for 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)

Lesson Entitled **The Model Millionaire** from **Technical English for Engineer**s by Cambridge University Press for India Pvt. Ltd. (2014).

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

Total periods: 50

TEXT BOOKS:

1. **Technical English for Engineers***,* Cambridge University Press for India Pvt. Ltd., First Edition, (2014),
2. Meenakshi Raman & 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, 1999, New Delhi.

I B. Tech. – I Semester (CSE, CSSE, IT, CE & ME)

I B. Tech. – II Semester (ECE, EEE & EIE)

(16BT1HS31) ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	0	0	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

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

COURSE OBJECTIVES:

CEO1: To impart the knowledge of native pronunciation through Phonetics.

CEO2: To enhance Listening, Speaking, Reading and Writing skills for effective usage of language in formal and informal situations.

CEO3: To imbibe a positive attitude of learning the language through computer-aided multimedia instructions.

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

CO1: Demonstrate knowledge in
- Phonetics
- Information Transfer

CO2: Analyze the situations in professional context by using
- Vocabulary
- Grammar

CO3: Design and develop functional skills for professional practice.

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

CO5: Function effectively as an individual and as a member in diverse teams through
- Extempore talk and
- Role Play

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

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

LIST OF EXERCISES:

1. Phonetics
2. Vocabulary Building
3. Functional Grammar
4. Just a Minute
5. Elocution/Impromptu
6. Giving Directions/Conversation Starters
7. Role Play
8. Public Speaking
9. Describing People, Places, Objects and Events.
10. Reading Comprehension
11. Listening Comprehension
12. Information Transfer

Total Lab Slots: 10

TEXT BOOK:

1. Department Lab Manual

REFERENCE BOOKS:

1. D. Sudha Rani, *A Manual for English Language Laboratories*, Pearson, Noida, 2010.
2. D. Sudha Rani, *Advanced Communication Skills Laboratory Manual*, Pearson, Noida, 2012.
3. R. Manivannan and G. Immanuel, *Communication Skills Laboratory*, VK Publications, Sivakasi, 2013
4. Nira Kumar*, English Language Laboratories*, PHI Learning Pvt. Ltd., New Delhi, 2011.

(14BT1HS02) ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

B. Tech. – I year

(Common to All branches of Engineering)

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

COURSE OBJECTIVES:

1. To impart practical knowledge in segmental features, supra-segmental features and Para- linguistic features.
2. To develop language skills for effective communication with clarity and precision in academic, professional and personal situations.
3. To apply the practical knowledge of functional grammar and vocabulary enrichment in effective writing.
4. To develop interest in English language so that the students use it effectively in various formal, informal and neutral situations.

COURSE OUTCOMES:

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

1. Gain practical knowledge in
   - English Speech Sounds
   - Stress Patterns in word and sentence
   - Intonation Patterns
   - Paralinguistic Features
   - Vocabulary Enrichment
2. Analyse the functional part of the grammatical elements for writing grammatically correct English in various academic and personal practices.
3. Develop various language functions to fulfil the purpose of speaking and writing in academic, professional and personal contexts
4. 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
5. 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 & 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& Error Correction
    f. Essay Writing
7. Just a Minute, Impromptu Speech & 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

I B. Tech. – I/II Semester

(16BT1BS02) ENGINEERING PHYSICS

(Common to all branches)

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

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

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

COURSE OBJECTIVES:

CEO1 : To provide the basic knowledge of architectural acoustics, quantum mechanics, lasers, superconductors, optical fibers, semiconductors and nanotechnology.

CEO2 : To develop skills in using semiconductor devices, lasers, and optical fibers.

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

CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nano materials.

CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.

CO3: Gain skills in designing of lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.

CO4: Develop problem solving skills in engineering context.

CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, pn-junction, Laser

DETAILED SYLLABUS:

UNIT I – LASERS AND FIBER OPTICS (11 periods)

Lasers: Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients – condition for amplification, population inversion, Nd:YAG laser, Helium-Neon laser, semiconductor laser and applications of lasers.

Fiber optics: Introduction, principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, classification of optical fibers optical fiber communication system and applications of optical fibers.

UNIT II – PRINCIPLES OF QUANTUM MECHANICS AND BAND THEORY OF SOLIDS (07 periods)

Principles of Quantum Mechanics: Introduction, de-Broglie's hypothesis, 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).

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

UNIT III – SEMICONDUCTORS AND DIELECTRIC PROPERTIES OF MATERIALS (13 periods)

Semiconductors: Introduction, types of semiconductors, intrinsic carrier concentration, electrical conductivity in semiconductors, drift and diffusion currents, Einstein's relation, Hall effect and its applications, direct and indirect band gap semiconductors, p-n junction, energy band diagram of p-n diode, LED, photo diode and Solar cell.

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, frequency dependence of polarizability (qualitative treatment), ferroelectricity.

UNIT IV – ACOUSTICS OF BUILDINGS AND SUPERCONDUCTIVITY (07 periods)

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.

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

UNIT V – CRYSTALLOGRAPHY AND NANOMATERIALS (07 periods)

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

Nanomaterials: Introduction, principles of nanomaterials, properties of nanomaterials, synthesis of nanomaterials by ball milling and pulsed laser deposition and applications of nanomaterials.

Total Periods: 45

TEXT BOOKS:

1. P. K. Palaniswamy, ***Engineering Physics***, Scitech Publications India Private Limited, 2nd Edition, 2009

REFERENCE BOOKS:

1. Dr. S. Mani Naidu, ***Engineering Physics***, Pearson Education, 1st Edition, 2013.
2. M.N. Avadhanulu, P.G.Kshirsagar, ***A textbook of Engineering Physics***, S.Chand & Company Ltd. Revised edition 2014.

3. K. Thyagarajan***, Engineering Physics-I***, McGraw-Hill Education (India) Pvt.Ltd. 2015

(14BT1BS01) ENGINEERING PHYSICS
(Common to All Branches of Engineering)

I Year B. Tech.

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

Pre requisite: --
COURSE OBJECTIVES:

1. To provide the basic knowledge of space & time, acoustics principles, quantum mechanics, laser concepts, nanotechnology, superconductors, principles of optical fibers and its communication systems, p-n Junction based devices and zero resistance concepts.
2. To develop skills in using semiconductor devices, lasers, magnetic field intensity and fiber optics.
3. To apply laser techniques and optical fibers in communication technology.

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

1. Apply the knowledge of lasers and optical fiber technology in communication systems.
2. Analyze and provide basic information to design acoustically good halls, theatres, sound recording rooms, etc.
3. Gain knowledge of crystal directions and planes and for analyzing the complex crystal structure behavior for engineering and medical applications.
4. Use magnetic materials, lasers and superconductors for the benefit of society.
5. Recognize the importance of lasers, optical fibers and superconductors for effective use in engineering applications.

DETAILED SYLLABI:

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 MECHANICAS 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), 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 only), 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, Einstein's relation, Hall effect, direct and indirect band gap semiconductors, p-n junction, energy 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

TEXT BOOKS :

1. S. Mani Naidu,*Engineering Physics*, Pearson Education, 2013.
2. P. K. Palaniswamy, *Engineering Physics*, Scitech Publications India Private Limited, 2009

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.

I B. Tech. – II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all Branches of Engineering)

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

PRE REQUISITE: Intermediate /Senior secondary mathematics

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

COURSE OBJECTIVES:

CEO 1: To impart basic knowledge on Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations.

CEO 2: To develop skills in analyzing the problems, designing mathematical models, Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations for the problems in engineering.

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

CO 1 :Acquire basic knowledge in
- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations
- (f) Heat transfer and wave motion

CO 2 : Develop skills in analyzing the
- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO 3 :Develop skills in designing mathematical models for
- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO 4 :Develop analytical skills in solving the problems involving
- (a) Fourier series and Fourier transforms
- (b) Laplace transforms
- (c) Z-transforms and difference equations
- (d) Heat transfer and wave motion

CO 5 : Use relevant transformation techniques for
- (a) Obtaining Fourier transforms for different types of functions
- (b) Laplace transforms
- (c) Z- transforms
- (d) Partial differential equations

DETAILED SYLLABUS:

UNIT- I : FOURIER SERIES (7 periods)

Fourier series:Determination of Fourier coefficients, convergence of Fourier series (Dirichlet's conditions),Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT- II: FOURIER INTEGRALS AND FOURIER TRANSFORMS (8 periods)

Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III:LAPLACE TRANSFORMS (12 periods)

Laplace transforms of standard functions. Properties of Laplace transforms. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem (without proof), inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV : Z- TRANSFORMS (9 periods)

Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem(without proof), solution of difference equations by Z– transforms.

UNIT – V : PARTIAL DIFFERENTIAL EQUATIONS (9 periods)

Formation of Partial differential equations – Solutions of first order linear equations by method of grouping. First and second order equations by method of separation of variables – Solutions of one dimensional Wave equation, Heat equation.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, ***Engineering Mathematics, vol-1***, S. Chand & Company 13/e,2014.
2. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad, ***Mathematical Methods***, S.Chand and Company, 8/e,2013

REFERENCE BOOKS:

1. Grewal, B.S., ***Higher Engineering Mathematics***, Khanna publishers, Delhi, 42/e,2012
2. Kreyszig, E., ***Advanced Engineering Mathematics***, John Wiley and Sons, Inc., 9/e,2013.

II B. Tech. – II Semester/ III B.Tech – I Semester

(16BT4HS31) SOFT SKILLS LABORATORY

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	2

PRE-REQUISITES:

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

COURSE DESCRIPTION:

Body Language; Creative Thinking; Stress Management; Goal Setting; Interpersonal Skills; Leadership Skills; Team Work; Assertiveness; Etiquette; Conflict Management; Report Writing; Group Discussions.

COURSE OBJECTIVES:

CEO1: To impart knowledge of Body Language in order to appreciate non-verbal forms of understanding and expression.

CEO2: To develop the principles in understanding the elements of team, anticipating the problem situation and adopt appropriate steps to remedy.

CEO3: To imbibe an attitude of planning & organizing to set and meet goals.

COURSE OUTCOMES:
On successful completion of this course the students will be able to
CO1: Acquire knowledge in

- Goal Setting
- Creative Thinking
- Leadership Skills
- Team Work

CO2: Analyse the functional knowledge in

- Body Language
- Interpersonal Skills
- Stress Management

CO3: Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
CO4: Function effectively as an individual and as a member in diverse teams.
CO5: Communicate effectively in public speaking in formal and informal situations.

LIST OF EXERCISES:

1. Body Language
2. Creative Thinking
3. Stress Management
4. Goal Setting
5. Interpersonal Skills

6. Leadership Skills
7. Team Work
8. Assertiveness
9. Etiquette
10. Conflict Management
11. Report Writing
12. Group Discussions

Total Lab Slots: 10

TEXT BOOKS:

1. Department Lab Manual.

REFERENCE BOOKS:

1. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw-Hill Publishing Company Limited, Third Edition, New Delhi, 2012.
2. Gopalswamy Ramesh and Mahadevan Ramesh, *The Ace of Soft Skills*, Pearson, Noida, 2010.
3. Jeff Butterfeild, *Soft Skills for Everyone*, Cengage learning, Delhi, 2011.
4. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, Noida, 2012.

SUGGESTED SOFTWARE:

1. English Language Communication Skills Laboratory Software – SOFTX Technologies Pvt. Ltd., Hyderabad.
2. GEMS – Globarena E- Mentoring System.
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learning to Speak English 8.1, The Learning Company – 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series of Grammar.
9. Language in Use 1, 2 & 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix – Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. The Ultimate English Tutor.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

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

PRE-REQUISITES

COURSE DESCRIPTION: Oral communications; Basic grmmar; ;advancedgrammar;basic writing; Business French (La Francais Commercial)

COURSE OBJECTIVES:

CEO1. To impart knowledge of the nuances of communication.
CEO2. To develop Speaking and Writing skills in order to use French language effectively in distinct situations.

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

CO1: Demonstrate knowledge in

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

CO2: Analyze the possibilities and limitations of language, understanding

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

CO3: Design and develop language skills for professional practice**.**

CO4: Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5: Understand French culture and civilization.

CO6*:* Communicate effectively with the native French in day to day situation**.**

DETAILED SYLLABUS

UNIT I –ORAL COMMUNICATION: (9 periods)

Introduction - Language as a Tool of Communication, French alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT II –BASIC GRAMMAR: (9 periods)

Introduction –Articles, -Er ending Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT III –ADVANCED GRAMMAR: (9 periods)

Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice.

UNIT IV –BASIC WRITING: (9 periods)

Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT V –BUSINESS FRENCH (La Francais Commercial) (9 periods)

Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.

Case study of influential French companies, Learning computer/desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment

Total Periods: 45

TEXT BOOKS:

1. Annie Berther, ***Alter Ego*** , Hachette Publications, 2012

REFERENCE BOOKS:

1 Regine Merieux, Yves Loiseau, ***Connexions*** , Goyall Publishers, 2011
2 Delphine Ripaud, ***Saison***, French and Euroean Inc., 2015

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS06) GERMAN LANGUAGE

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

PRE-REQUISITES

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Business German

COURSE OBJECTIVES:

CEO3. To impart knowledge of the nuances of communication.
CEO4. To develop Speaking and Writing skills in order to use German language effectively in distinct situations.
COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Demonstrate knowledge in

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

CO2: Analyze the possibilities and limitations of language, understanding

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

CO3: Design and develop language skills for professional practice**.**

CO4: Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5: Understand German culture and civilization.

CO6: Communicate effectively with the native German in day to day situation**.**

DETAILED SYLLABUS

UNIT I –ORAL COMMUNICATION: (9 periods)

Introduction - Language as a Tool of Communication, German alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT II –BASIC GRAMMAR: (9 periods)

Introduction –Articles, Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT III –ADVANCED GRAMMAR: (9 periods)

Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice, Introduction to Case- Akkusativ, Nominativ, Dativ&Genetiv Case.

UNIT IV –BASIC WRITING: (9 periods)

Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT V –BERUFSDEUTCSCH (BUSINESS GERMAN): (9 periods)

Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.

Case studies of influential German companies, Learning computer/desktop/new age-media vocabulary, Introduction to how to present a topic, Fixing an Appointment.

Total Periods: 45

TEXT BOOKS:

1. Heuber, ***Tangram Aktuelleins***, Heuber Verlag Publications , 2011.

REFERENCE BOOKS:

1. Anta Kursisa, Gerhard Newner, Sara vicenta, ***Fir fuer Deutsch 1 und Deutsch 2,*** Heuber Verlag Publications, 2005
2. Herman Funk, ***Studio D A1***, Cornelsen GOYAL SAAB Publication, 2011.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS07) INDIAN CONSTITUTION

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ---

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

COURSE OBJECTIVES:

CEO1: To familiarize the students with parliamentary proceedings, legislature, and administration federal system and judiciary of India, civil services, Indian and international politics

CEO 2: To imbibe attitude for ethical behavior and attitude within provision of Constitution

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

CO1: Gain knowledge in

- parliamentary proceedings, laws, legislature, administration and its philosophy
- federal system and judiciary of India
- socials problems and public services like central civil services and state civil services
- Indian and international political aspects and dynamics

CO2 : Develop etiquette and professional behavior in line with the constitution of India for
becoming a responsible citizen

DETAILED SYLLABUS :

UNIT- I : PREAMBLE AND ITS PHILOSOPHY (8 periods)

Introduction and Evolution of Indian Constitution, preamble and its Philosophy.

UNIT- II :UNION GOVERNMENT (8 periods)

Powers, Functions and Position of President, Vice-President and Council of Ministers, Composition of parliament, Constitution Amendment Procedure, Financial Legislation in Parliament.

UNIT-III :FEDERAL SYSTEM (14 periods)

Centre-State relations, Directive Principles of State Policy, Fundamental Rights and Duties, Centre-State Relations, Features of Federal System, Administrative Relationship

between Union and States, Powers, Functions and Position of Governors, Function of Chief Ministers, Council of Ministers, Composition and powers of the State Legislature.

UNIT-IV :JUDICIARY AND PUBLIC SERVICES (10 periods)

The Union Judiciary - Supreme Court and High Court, All India Services, Central Civil Services, State Services, Local Services and Training of Civil Services.

UNIT-V : INTERNATIONAL POLITICS (5 periods)

Foreign Policy of India, International Institutions like UNO, WTO, SAARC and Environmentalism.

Total periods : 45

TEXT BOOK:

1. Briji Kishore Sharma, ***Introduction to the Constitution of India***, Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Mahendra Pal Singh,V. N. Shukla's ***Constitution of India***, Eastern Book Company,
   2011.
2. Pandey J. N., ***Constitutional Law of India*** - Central Law Agency, 1998

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS08) INDIAN ECONOMY

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: --

COURSE DESCRIPTION:
Introduction; Time Value of Money; Elementary Economic Analysis; Value Analysis/Value Engineering; Economic Planning.

COURSE OBJECTIVES:

CEO1: To familiarize the students with the concept of elementary principles of Indian economy and their operational significance from engineering perspective.
CEO2: To develop skills for effective use of principles of economy in firm/industry/corporation in public or private sector.

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

CO1: Acquire the knowledge in
- Micro and Macro Economics.
- Traditional and Modern methods of Capital Budgeting.
- Five year plans and NITI Aayog.

CO2: Analyze
- Capital Budgeting.
- Value Analysis and Value Engineering.
- Economic analysis
- Law of supply and demand

CO3 : Ability to understand the nuances of project management and finance

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION (9 Periods)
Economics- Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology, and Economic Development; Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

UNIT – II: TIME VALUE OF MONEY (12 Periods)
Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects – Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

UNIT – III: ELEMENTARY ECONOMIC ANALYSIS (9 Periods)

Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product; Material Selection-Process Planning, Process Modification.

UNIT - IV: VALUE ANALYSIS/VALUE ENGINEERING (6 Periods)

Introduction- Value Analysis, Value Engineering, Functions, Aims; Value Analysis vs. Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

UNIT- V: ECONOMIC PLANNING (9 Periods)

Introduction- Need For Planning in India, Five year plans(1951-2012), NITI Aayog (from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

Total Periods: 45

TEXT BOOKS

1. Panneerselvam R. ,***Engineering Economics*** , PHI Learning Private Limited, Delhi , 2/e,2013.
2. Jain T.R., V. K.Ohri, O. P. Khanna. ***Economics for Engineers***. VK Publication, 1/e, 2015.

REFERENCE BOOKS

1. Dutt Rudar & Sundhram K. P. M.***Indian Economy***.S. Chand, New Delhi, 62 revised edition 2010.
2. Misra, S.K. & V. K. Puri. ***Indian Economy*****: Its Development Experience.** Himalaya Publishing House, Mumbai 32/e ,2010.

III - B. Tech. II -Semester./ IV - B. Tech. I - Semester

(16BT6HS09) INDIAN HERITAGE AND CULTURE

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ---

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

COURSE OBJECTIVES:

CEO5. To impart the knowledge on history of India and process of evaluation of Indian Culture and its importance.

CEO6. To develop analytical mind on the administrative hierarchies through the study of ancestral administration and study its relevance to the existing administrative set up

CEO7. To imbibe an attitude of having harmonious relations within society.

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

CO1: Acquaint knowledge in

(a) human aspirations and values in Vedic culture.
(b) cultural aspects of Buddhism and Jainism
(c) unification of our country under Mourya's and Gupta's administrations
(d) socio Religious aspects of Indian culture
(e) reform movements and harmonious relations.

CO2 : Apply ethical principles and reforms as models for the upliftment of the societal \ status in the present cultural contexts

DETAILED SYLLABUS:

UNIT I - : BASIC TRAITS OF INDIAN CULTURE (9 periods)

Meaning and definition and various interpretations of culture. Culture and its features. The Vedic and Upanishadic culture and society. Human aspirations and values in these societies. Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

UNIT II - : HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (9 periods)

Salient features of Jainism - contributions of Jainism to Indian culture. Contributions of Aachaarya and Mahaapragya. Buddhism as a humanistic culture. The four noble truths of Buddhism. Contributions of Buddhism to Indian culture.

Unit- III : CULTURE IN THE MEDIEVAL PERIOD (9 periods)

Unifications of India under Mouryas and Guptas and their cultural achievements. Cultural conditions under satavahanas. Contributions to pallavas and cholas to art and cultural achievements of vijayanagara rulers.

Unit- IV : SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE (9 periods)

Western impact on India, Introductin of western education, social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi- Anne Besant. (theosophical society)

Unit- V : REFORM MOVEMENTS FOR HARMONIOUS RELATIONS (9 periods)

Vivekananda, Eswarchandra vidyasagar and Veeresalingam- emancipation of women and struggle against caste. Rise of Indian nationalism. Mahatma Gandhi- Non violence and satyagraha and eradication of untouchability .

Total Periods: *45*

TEXT BOOKS:

1. Valluru Prabhakaraiah, ***Indian Heritage and Culture***, Neelkamal Publications Pvt. Ltd. Delhi, 1/e , reprint 2015.

REFERENCE BOOKS:

1. L. P. Sharma, ***History of Ancient India***, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, ***History of Medieval India***, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. L. P. Sharma, ***History of Modern India***, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
4. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS10) INDIAN HISTORY

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ----

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

COURSE OBJECTIVES:

CEO1: To familiarize the students with elements of Indian history by which they could correlate contemporary issues and problems in Indian society.
CEO 2: To develop analytical skills on social processes of civilizations, modernization and social change

CEO 3: To imbibe culture that will enhance them to be better citizens of the nation

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

CO 1: Gain knowledge on evolution and history of India as a nation

CO2: Analyze social and political situations of past and current periods

CO3: Practice in career or at other social institutions morally and ethically

DETAILED SYLLABUS:

UNIT-I : INTRODUCTION (8 periods)

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

UNIT-II : ANCIENT INDIA (9 periods)

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

UNIT -III: CLASSICAL & MEDIEVAL ERA (12 periods)

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

UNIT-IV: MODERN INDIA (6 periods)

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947).

UNIT-V :INDIA AFTER INDEPENDENCE (1947 -) (10 periods)

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing
Nature of work and organization.

Total periods : 45

TEXT BOOK:

1. K. Krishna Reddy, ***Indian History***, Tata McGraw-Hill, 21st reprint,2017

REFERENCE BOOKS:

1. Guha, Ramachandra, ***India after Gandhi***, Pan Macmillan,2007 Thapar, Romila, ***Early India***, Penguin, 2002

III B. Tech. – II Semester (CSE, CSSE, IT, CE & ME)

IV B. Tech. – I Semester (ECE, EEE & EIE)

(16BT6HS11) PERSONALITY DEVELOPMENT

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: Soft Skills Lab

COURSE DESCRIPTION:

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

COURSE OBJECTIVES:

CEO1: To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.

CEO2: To impart training for positive thinking, that enables the students to be in a good stead to face the challenges,

CEO3: To imbibe an attitude of planning & organizing to set and meet goals.

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

CO1: Demonstrate knowledge in

- Self-Management
- Planning Career

CO2: Analyze the situations based on

- Attitudes
- Thinking strategies

CO3: Design and develop the functional skills for professional practice in

CO4: Function effectively as an individual and as a member in diverse teams.

CO5: Communicate effectively in public speaking in formal and informal situations.

DETAILED SYLLABUS:

UNIT – I: SELF-ESTEEM & SELF-IMPROVEMENT (9 Periods)

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve - Actively Working to Improve Yourself.

Case study: 1

UNIT – II: DEVELOPING POSITIVE ATTITUDES (9 Periods)

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes.

Case study: 2

UNIT – III: SELF-MOTIVATION & SELF-MANAGEMENT (9 Periods)

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies.

Case study: 3

UNIT – IV: GETTING ALONG WITH THE SUPERVISOR (9 Periods)

Know your Supervisor – Communicating with Your Supervisor – Special Communications With Your Supervisor – What Should You Expect of Your Supervisor? – What Your Supervisor Expects of You - Moving Ahead Getting Along with Your Supervisor.

Case study: 4

UNIT - V: WORKPLACE SUCCESS (9 Periods)

First Day on the Job – Keeping Your Job – Planning Your Career – Moving ahead.

Case study: 5

Total Periods: 45

TEXT BOOK:

1. Harold R. Wallace and L. Ann Masters, *Personality Development*, Cengage Learning, Delhi, Sixth Indian Reprint 2011.

REFERENCE BOOKS:

1. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, New Delhi, 2011.
2. Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, New York, 1989
3. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, Second Revised Edition 2011.
4. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th Edition 2014.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS12) PHILOSOPHY OF EDUCATION

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ---

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

COURSE OBJECTIVES:

CEO1: To familiarize the students with the fundamentals of educational philosophical methods.

CEO2: To impart skills in applying the contextual knowledge of Engineering education and responsibilities.

CEO3: To imbibe an attitude to inculcate and implement values of engineering education.

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

CO1: Acquire knowledge in

- Philosophy of Engineering education.
- Philosophical Methods.
- Knowledge acquiring methods.
- Engineering education and responsibilities.

CO2: Understand the impact of Outcome Based Education for effective educational outcomes

CO3: Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

DETAILED SYLLABUS :

Unit- I:INTRODUCTION TO PHILOSOPHY ANDENGINNERING EDUCATION (9 periods)

Concept , Significance, and Scope of Philosophy in Engineering – Aims of Engineering Education – relationship between philosophy and engineering education – speculative, normative and critical approaches of philosophy in engineering.

Unit- II :PHILOSOPHICAL METHODS AND THEIR IMPLICATIONS IN ENGINEE RING (9 periods)

Introduction to Philosophical approaches: Idealism, Naturalism, Pragmatism, Realism and Existentialism; Significance and Scope in Engineering Education.

Unit: III :PHILOSOPHICAL EDUCATION IN INDIA (9 periods)

Different branches of philosophy- meaning, Epistemology: nature and scope; Knowledge acquiring methods; Kinds and instruments of knowledge; Re-shaping of educational thoughts by Indian thinkers: Rabindranath Tagore, Sri Aurobindo Gosh, Mahatma Gandhi, Jiddu Krishnamurthy and Swamy Vivekananda.

Unit- IV:VALUES AND ENGINEERING EDUCATION (9 periods)

Introduction; Engineering education and responsibilities: health, social, moral, ethics aesthetic; Value: crisis and strategies for inculcation;
Case study: Engineering Solutions given by Mokshagundam Visvesvaraya

Unit-V :OUTCOME- BASED EDUCATION (9 periods)

Institutional visioning ;educational objectives ; programme outcomes , curriculum, stakeholders, infrastructure and learning resources ; governance and management, quality in education.

Total periods: 45

TEXT BOOKS :

1. Ganta Ramesh, ***Philosophical Foundations of Education***, Neelkamal Publications, 1/e,2013
2. Carl Micham, ***Thinking through technology(The Paths between Engineering and Philosophy)***.University of Chicago Press, 1/e,1994.
3. Louis L Bucciarelli, ***Engineering Philosophy,*** Delft University Press,1/e, 2003.
4. NBA/ABET Manuals.

REFERENCE BOOKS :

1. Louis L Bucciarelli, ***Philosophy of Technology and Engineering Sciences***, North Holland, 1/e, 2009 (e-book).
2. Samuel Florman, ***Existential pleasures of education***. Martins's Griffin S.T. publication, 1/e, 1992.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS13) PUBLIC ADMINISTRATION

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: Nil

COURSE DESCRIPTION:
Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OBJECTIVES:

CEO1: To familiarize the students with the theories, concepts and practices of public administration from engineering perspective.

CEO2: To develop critical thinking and problem solving skills for effective practice of Good Governance and Administrative Development that are applied in the chosen domain.

CEO3: To imbibe an attitude of understanding and implementing administration policies for sustainable development in distinguished sectors.

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

CO1: Acquireknowledge in
- Public Policy.
- Good Governance.
- E-governance.
- Development Administration.
-

CO2: Analyze the possibilities and limitations of existing policies through Good Governance perspective.

CO3: Design and develop solutions in e-governance models to find and provide opportunities in e-governance.

CO4: Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.

CO5: Understand the significance of Administrative Development in finding professional engineering solutions by probing
- Bureaucracy.
- Role of civil society.

DETAILED SYLLABUS :

UNIT – I: INTRODUCTION (9 Periods)

Public and Private Administration- Differences and Similarities, Meaning, Scope; Importance of Public Administration in Modern Era; Public Administration and its implications in the field of Engineering.

Case Study: Unique Identification Authority of India (UIDAI):Aadhaar Project: Challenges Ahead

UNIT – II: PUBLIC POLICY (9 Periods)

Meaning and Scope; Policy Formulation in India; Policy making process; Policy Implementation

Engineering and Public Policy, Social, ethical, Monetary and fiscal policies; policy implications of engineering; The engineer's role in Public Policy.

Case Study: NITI Aayog: Demonetization and Aftermath of Demonetization – Cashless transactions.

UNIT – III: GOOD GOVERNANCE (9 Periods)

Significance; Objectives; Concepts; Reforms; Organization and its basic problems Administrative and Governance reforms in India; Sustainable and Inclusive growth in India; Engineering and Sustainable Environment-Role of Engineers; Right to information Act

Case Study: Strategies in Good Governance: A Case Study of Karnataka, Kerala and Orissa.

UNIT – IV: E-GOVERNANCE (9 Periods)

Meaning, Significance, Issues in E-governance; E-governance Models, Problems and Opportunities; Application of Data Warehousing and Data Mining in Governance; Engineers role in re-engineering E-governance.

Case Study: e-Housing System for Bhavana Nirman Dhanasahayam Online disbursement of housing assistance in Kerala.

UNIT - V: DEVELOPMENT ADMINISTRATION (9 Periods)

Introduction; Development Administration-Administrative Development- Sustainable Development -Significance- Objectives; Bureaucracy - Personnel administration and human resources development; Role of civil society-Citizens and administration; Development and Engineering: Issues Challenges and Opportunities.

Case Study: Neeru-Chettu (Water-Tree) of Andhra Pradesh.

Case Study: TPDDL of Delhi and Odisha.

Total Periods: 45

TEXT BOOKS

1. M.P. Sharma, B.L. Sadana, HarpreetKaur. ***Public Administration in Theory and Practice***. KitabMahal, Mumbai, 1/e,2014.
2. CSR Prabhu, ***E. Governance – concepts and case studies***.PHI, New Delhi, 2/e 2012.

REFERENCE BOOKS

1. Surendra Munshi, Bijupaul Abraham ***Good Governance, Democratic societies and Globalization***, Sage publications, New Delhi,1/e ,2004.

2. R.K.Sapru, ***Public Policy,*** Sterling Publishers Pvt Ltd., New Delhi, 1/e, 2001.

(16BT60112) BUILDING MAINTENANCE AND REPAIR

(Open Elective)

(Common to EEE, ECE & EIE)

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

PREREQUISITES: --

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

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

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

DETAILED SYLLABUS:

UNIT-I: DURABILITY AND SERVICEABILITY OF BUILDINGS (10 Periods)
Life expectancy of different types of buildings; Effect of environmental elements such as heat, dampness, frost and precipitation on buildings; Effect of chemical agents on building materials, Effect of pollution on buildings, Effect of fire on building; Damage by biological agents like plants, trees, algae, fungus, moss, insects, etc.; Preventive measures on various aspects, Inspection, Assessment procedure for evaluating for damaged structures, Causes of deterioration, Testing techniques.

UNIT-II:FAILURE AND REPAIR OF BUILDINGS (10 Periods)
Building failure – Types, Methodology for investigation; Diagnostic testing methods and equipment, Repair of cracks in concrete and masonry, Materials for Repair, Methods of repair, Repair and strengthening of concrete buildings, Foundation repair and strengthening, Underpinning, Leakage of roofs and repair methods.

UNIT-III: TECHNIQUES FOR REPAIR (08 Periods)
Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete, Gunite and shotcrete, Epoxy injection, Mortar repairs for cracks, Shoring and underpinning.

UNIT-IV: MAINTENANCE OF BUILDINGS (09 Periods)
Reliability principles and its applications in selection of systems for building, Routine maintenance of building, Maintenance cost, Specifications for maintenance works, Dampness-Damp proof courses, Construction details for prevention of dampness; Termite proofing, Fire protection, Corrosion protection.

UNIT-V: CONSERVATION AND RECYCLING (08 Periods)

Performance of construction materials and components in service, Rehabilitation of constructed facilities, Conservation movement, Materials and methods for conservation work, Recycling of old buildings and its advantages, Examples.

Total Periods: 45

TEXT BOOKS:

1. Dennison Campbell, Allen and Harold Roper, *Concrete Structures – Materials, Maintenance and Repair*, Longman Scientific and Technical, UK, 1991.
2. Allen, R.T. L., Edwards, S.C. and J. D. N. Shaw, *The Repair of Concrete Structures*, Blackie Academic & Professional, UK, 1993.

REFERENCE BOOKS:

1. Peter H. Emmons, *Concrete Repair and Maintenance*, John Wiley and Sons Publications, 2002.
2. Building Construction under Seismic Conditions in the Balkan Region, UNDP/UNIDO Project Rer/79/015,Volume 5, *Repair and Strengthening of Reinforced Concrete, Stone and Brick Masonry Buildings*, United Nations Industrial Development Organisation, Vienna.
3. Shetty, M. S., *Concrete Technology*, S. Chand and Company.
4. Smith, P. and Julian, W., *Building Services*, Applied Science Publications, London, 1976.
5. SP: 25, BIS; *Causes and Prevention of Cracks in Buildings*.
6. Champion, S., *Failure and Repair of Concrete Structures*, John Wiley and Sons Publications, 1961.
7. Perkins, P. H., Repair, Protection and Water Proofing of Concrete Structures, E& FN Spon, UK, 3rd Edition, 1997.

IV B.Tech - I Semester

(16BT60115)ENVIRONMENTAL POLLUTION AND CONTROL

(Open Elective)

(Common to EEE, ECE & EIE)

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

PREREQUISITES: --

COURSE DESCRIPTION:

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

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

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

DETAILED SYLLABUS:

UNIT-I: AIR AND NOISE POLLUTION (08 Periods)

Air Pollution: Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern; Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

Noise Pollution: Sound pressure, Power and intensity, Impacts of noise, permissible limits of noise pollution, measurement of noise.

UNIT-II: AIR AND NOISE POLLUTIONCONTROL (10 Periods)

Self-cleansing properties of the environment, Dilution method, Control at source, Process changes and equipment modifications, Control of particulates–Types of equipment, Design and operation –Settling chambers, Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseous pollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution.

UNIT-III: WATER POLLUTIONAND CONTROL (10 Periods)

Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, Engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment and disposal – Primary, Secondary, Tertiary; Case studies.

UNIT-IV: SOIL POLLUTION AND CONTROL (08 Periods)

Soil pollutants, Sources of soil pollution, Causes, Effects and control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Case studies.

UNIT-V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)

Types of solid waste, Composition of solid waste, Collection and transportation of solid waste, Methods of disposal – Open dumping, Sanitary landfill, Composting, Incineration, Utilization - Recovery and recycling, Energy Recovery.

Total Periods: 45

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.
2. C.S.Rao, *Environmental Pollution Control Engineering*, New Age International Pvt. Ltd., 2nd Edition, 2007.
3. Ibrahim A. Mirsa, *Soil Pollution: Origin, Monitoring & Remediation*, Springer, UK, 2nd Edition, 2008.

REFERENCE BOOKS:

1. M.N. Rao and H.V.N. Rao, *Air Pollution,* Tata McGraw–Hill Education Pvt. Ltd., 19th Edition, 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* Academic Press (Elsevier), 5th Edition, 2014.
3. S.M.Khopkar,*Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd Edition, 2007.
4. V. M. Domkundwar, Environmental Engineering, DhanpatRai& Co. Pvt. Ltd., New Delhi, 2014.

IV B.Tech - I Semester
14BT70106: ENVIRONMENTAL POLLUTION AND CONTROL
(Open Elective)
(Common to ECE, EEE, EIE & CE)

Internal Marks	External Marks	Total	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: 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:
On successful completion of the courses, the students 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: INTRODUCTION TO AIR POLLUTION AND DISPERSION OF POLLUTANTS (08 Periods)
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: EFFECTS AND CONTROL OF PARTICULATES (09 Periods)
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: WATER POLLUTION (10 Periods)
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: SOIL POLLUTION (09 Periods)
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: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)
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 Landfill – 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.

IV B.Tech. - I Semester

(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

(Open Elective)

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

PREREQUISITES:--

COURSE DESCRIPTION:
Introduction to the concept ofnano;Description of nanomaterial;Nanostructure characterization tools;Classification of nanomaterials;Fabrication of nanomaterial;Different applications of nanostructures and nanomaterials.

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

CO1. Demonstrate knowledge in
- Nanoscale technology.
- Difference between micro and nanotechnology
- Classification of Nanostructure and Nanomaterial
- Fabrication of various nanomaterials and nanostructures.

CO2. Analyze numerical and analytical problems in
- Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction

CO3. Design and fabricate devices based on nanostructures like
- Nano solar cell
- Nano cantilever
- Nano bio-sensor

CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.

CO5. Select appropriate technique for fabrication ofnanostructures and Nano composites.

CO6. Apply ethical standards and legal issues while using chemical substances infabrication of new nanostructures.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF NANOTECHNOLOGY(08 Periods)
Introduction – Scientific revolutions, Time and length scale in structures, Definition of a nanosystem; Dimensionality and size dependent phenomena - Surface to volume ratio Fraction of surface atoms, Surface energy and surface stress, surface defects, Properties at nanoscale (optical, mechanical, electronic, and magnetic).

UNIT-II:IDENTIFICATION AND CHARACTERIZATION TOOLS FOR NANOMATERIALS AND NANOSTRUCTURE(10 Periods)
Field Emission Scanning Electron Microscopy (FESEM), Environmental Scanning ElectronMicroscopy (ESEM) High Resolution, Transmission Electron Microscope (HRTEM), Scanning Tunneling Microscope(STM), Surface enhanced Raman spectroscopy (SERS), Secondary Ion Mass Spectroscopy, Focused Ion Beam Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy (XPS), Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), X-Ray Diffraction, Intensities in X-Ray Scattering Particle Size Effect.

UNIT-III:CLASSIFICATION OF NANOMATERIALS(10 Periods)

Classification based on dimensionality, Quantum Dots,Wells and Wires-III-V Nanoparticles, Electronic Structure of Nanosemiconductor, Carbon based nanomaterials (buckyballs, nanotubes, graphene), Metal based nano materials (nanogold, nanosilver and metal oxides), Nanocomposites,Nanopolymers,Nanoglasses, Nano ceramics, Biological nanomaterials, Fulrene-discovery and early years,.

UNIT-IV: SOME FABRICATION TECHNIQUES OF NANOMATERIALS AND NANOSTRUCTURES(09 Periods)

Chemical Methods: Metal Nanocrystals by Reduction, Solvothermal Synthesis, Photochemical Synthesis,Sonochemical Routes, Chemical Vapor Deposition (CVD), Metal Oxide Chemical Vapor Deposition (MOCVD), Plasma Enhanced Chemical Vapour Deposition Technique(PECVD), Hydrothermal Method, Sol-Gel.

PhysicalMethods: Ball Milling, Electrodeposition, Spray Pyrolysis, Flame Pyrolysis, DC/RF Magnetron Sputtering, Molecular Beam Epitaxy (MBE) Thermal Evaporation Method.

UNIT-V:APPLICATIONS (08 Periods)

Solar energy harvesting, Catalysis,Molecular electronics and printed electronics Nanoelectronics, Polymers with aspecial architecture, Liquid crystalline systems, Linear and nonlinear optical and electro-optical properties, Applications in displays and other devices, Nanomaterials for data storage, Photonics, Plasmonics, Chemical and biosensors, Nanomedicine and Nanobiotechnology, MESFET.

Total Periods: 45

TEXT BOOKS:

1. Pradeep T., *A Textbook of Nanoscience and Nanotechnology*, Tata McGraw Hill Education Pvt. Ltd., 2012.
2. Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*,Academic Press, 2002.

REFERENCE BOOKS:

1. Nabok A., *Organic and Inorganic Nanostructures*, Artech House, 2005.
2. Dupas C., Houdy P., Lahmani M*, Nanoscience: Nanotechnologies and Nanophysics*, Springer - Verlag Berlin Heidelberg, 2007.
3. S.M. Sze, Physics of Semiconductor Devices, 2ndEdition, 2001.

III B. Tech. – II Semester

(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

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

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

PRE-REQUISITES: —

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

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

CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.

CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.

CO3. Develop a comprehensive and well planned business structure for a new venture.

CO4. Conduct investigation on complex problems, towards the development of Project.

CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.

CO6. Apply ethics in constructive innovation framework.

CO7. Exhibit professionalism by employing modern project management and financial tools.

DETAILED SYLLABUS:

UNIT - I: Creativity and Innovation (07 Periods)

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

UNIT - II: Paradigms of Innovation (11 Periods)

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and its application, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

UNIT - III: Sources of finance and venture capital (07 Periods)

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

UNIT - IV: Intellectual property innovation and Entrepreneurship (11 Periods)

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

UNIT - V: Open Innovation framework & Problem solving (09 Periods)

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and

Opportunities of open innovation framework, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship*, Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, *Managing Technology and Innovation for Competitive Advantage*, Pearson India, 1st Edition, 2002.

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 suessful 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; AcquiringTechnological 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: Ettlie, 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)