VISHNU INSTITUTE OF TECHNOLOGY:: BHIMAVARAM
(Autonomous)
Approved by AICTE, Accredited by NBA, NAAC & Affiliated to JNTUK, Kakinada
MECHANICAL ENGINEERING DEPARTMENT

III-Year I-Semester

S. No	Course Title	L	T	P	C
1	Dynamics of Machinery	3	-	-	3
2	Design of Machine Members	3	-	-	3
3	Machine Tools	3	-	-	3
4	**Professional Elective-I** Automobile Engineering Gas Dynamics and Jet Propulsion Renewable Energy Sources Refrigeration & Air Conditioning	3	-	-	3
5	**Open Elective-I** Remote Sensing & Geographical Information Systems OOPS through JAVA Computer Graphics Automotive Electronics	3	-	-	3
6	**Open Elective-II (Inter Disciplinary Elective – I)** MATLAB and Simulink for Engineers Principles of Electronic Communication Systems AI Tools, Techniques & Applications Green Building Technologies	3	-	-	3
7	Machine Drawing	-	-	3	1.5
8	Dynamics of Machinery Lab	-	-	3	1.5
9	Machine Tools Lab	-	-	3	1.5
10	Computer Aided Simulation And Analysis Lab	-	-	2	1
11	Advanced English Communication Skills Lab	-	-	3	1.5
	Total	18	-	14	25

III B. Tech I Semester

DYNAMICS OF MACHINERY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Develop understanding of gyroscopic forces and moments, and their applications.
- Use the concepts of friction for clutches, brakes and dynamometers.
- Know about the turning moment diagrams and the design of flywheels.
- Develop the understanding of the governor and their working.
- Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
- Develop understanding of vibrations and its significance on engineering design.

UNIT I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships, static and dynamic force analysis of planar mechanisms.

UNIT II

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission.

UNIT III

TURNING MOMENT DIAGRAMS: Dynamic force analysis of slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort and turning moment diagrams, fluctuation of energy, fly wheels and their design.

UNIT IV

GOVERNORS: Watt, porter and proell governors, spring loaded governors, Hartnell and Hartung with auxiliary springs, Sensitiveness, isochronism and hunting.

UNIT V

BALANCING: Balancing of rotating masses single and multiple, single and different planes, use analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. analytical and graphical methods, unbalanced forces and couples: examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT VI

VIBRATIONS: Introduction, terminology, types of free vibrations, Free Vibration of spring mass system, Natural frequency, longitudinal and transverse vibrations, critical speed of shaft, damped free vibrations.

COURSE OUTCOMES:

Upon successful completion of this course the student should be able to

1. Analyse stabilization of sea vehicles, aircrafts and automobile vehicles
2. Compute frictional losses, torque transmission of mechanical systems.
3. Analyse dynamic forces of slider crank mechanism and perform design of flywheel.
4. Describe the operation and perform basic analysis of governors.
5. Know about the static and dynamic balance of reciprocating and rotary masses.
6. Understand the free vibrations of discrete spring mass systems.

TEXT BOOKS:

1. S.S Rattan, Theory of Machines, Mc. Graw Hill, 5th Edition, 2019.
2. Ashok G. Ambedkar, Mechanism and machine theory, PHI Publications, 1st Edition2007.

REFERENCE BOOKS:

1. JS Rao and RV Dukkipati, Mechanism and Machine Theory, New Age, 1992.
2. Shigley, Theory of Machines, Mc. Graw Hill, 4th Edition, 2014.
3. Dr. R. K. Bansal, Theory of Machines, Laxmi Publications, 5th Edition, 2016.
4. G K Grover, Mechanical Vibrations, Nem Chand & Bros, 8th Edition, 2018.

III B. Tech I Semester

DESIGN OF MACHINE MEMBERS

L	T	P	C
3	0	0	3

Note: DESIGN DATA BOOK ALLOWED

COURSE OBJECTIVES:

- Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements required in transmission systems.
- Reinforce the philosophy that real engineering design problems are open-ended and
- applications.
- Understand the principles of stress, strain and Principal stresses as applied to Solid bodies or structural and machine elements under loads
- Procedure for challenging.
- Impart design skills to the students to apply these skills for the problems in real life industrial the different machine elements such as fasteners, shafts, couplings, keys, axially loaded joints etc.
- Develop a holistic design approach to find out pragmatic solutions to realistic domestic and industrial problems.

UNIT I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties, selection, Manufacturing consideration in design, BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses, combined stresses, torsional and bending stresses, impact stresses, stress strain relation, various theories of failure, factor of safety, design for strength and rigidity, preferred numbers. The concept of stiffness in tension, bending, torsion.

UNIT II

STRENGTH OF MACHINE ELEMENTS: Stress concentration, theoretical stress concentration factor, fatigue stress concentration factor notch sensitivity, design for fluctuating stresses, endurance limit, estimation of endurance strength, Goodman's line, Soderberg's line, modified Goodman's line.

UNIT III

Riveted Joints: Introduction, Methods of riveting, Materials of rivets, Types of riveted joins, Lap joint, Butt joint, Failures of riveted joints, Strength of riveted joints, Caulking and Fullering, Design of joints with initial stresses.

Welded Joints: Advantages and disadvantages over riveted joints, Types of welded joints, Lap joint and butt joint, Strength of parallel fillet welded joints, Strength of the transverse welded joints.

UNIT IV

SHAFTS: Design of solid and hollow shafts for strength and rigidity, design of shafts for combined bending and axial loads, shaft sizes. Use of internal and external circlips, gaskets and seals (stationary & rotary).

UNIT V

KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys, stresses in keys, cotter joints, spigot and socket, sleeve cotter joints and knuckle joints.

SHAFT COUPLING: Rigid couplings, muff, split muff and flange couplings, flexible couplings, flange coupling (modified).

UNIT VI

MECHANICAL SPRINGS: Types of springs, Terms used in springs, Applications of springs, Stresses and deflections of helical springs, Design of helical springs, energy storage capacity, leaf springs and construction of multi-leaf springs.

COURSE OUTCOMES:

Students will be able to

1. Select the proper material for the machine component based on theories of failure and estimate the factor of safety.
2. Determine the sizes under different types of fatigue loads and estimate the life of the components.
3. Study the type of failure and estimate the efficiency of welded and riveted joints.
4. Calculate the size of shaft for transmitting torque, bending moment and axial loads.
5. Identify and design of various type of joints and fasteners required for a given application.
6. Analyse the forces and design of helical, torsion and leaf springs and forces.

TEXT BOOKS:

1. Joseph E. Shigley, Mechanical Engineering Design, McGraw Hill, 9th Edition, 2010.
2. Dr.C.S.Shah, Dr.N.C.Pandya, Machine Design, 20th Edition Charotar Publishing House Pvt. Ltd, 2015.

REFERENCE BOOKS:

1. V. B. Bandari, Machine Design, Tata McGraw Hill Publishers 5th Edition, 2020
2. R. L. Norton, Machine Design, McGraw Hill, 5th Edition, 2013.

III B. Tech I Semester

MACHINE TOOLS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- The course provides students with fundamental knowledge and principles in material removal processes.
- To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
- To give an insight on conventional machining principles and operations.
- To design jigs and fixtures for simple parts.
- To get familiarity about CNC programming and about CNC machine tools.

UNIT I

Metal Cutting: Introduction, elements of cutting process, geometry of single point tool, tool angles, chip thickness ratio, chip formation and types of chips, built-up edge & its effects, chip breakers, tool materials: types and properties, types of tool wear, tool life consideration, coolants.

UNIT II

Lathe: Working principle, specifications, lathe :types, parts, operations, taper turning methods, lathe: accessories &attachments, cutting speed, feed, depth of cut, machining time estimation, capstan and turret lathe – comparison.

UNIT III

Shaper, Slotter& Planer: Working principle, parts, Shaper:whitworth quick return mechanism, crank & slotted ink mechanism and automatic table feed mechanism, machining time estimation in a shaper.

Drilling & Boring Machines: Working principle, specifications, types, parts, operations performed, twist drill: nomenclature, machining time calculations.

UNIT IV

Milling Machines: Working principle ,types, up milling *vs* down milling, milling operations, types of milling cutters, geometry of milling cutter, indexing methods, machining time estimation.

UNIT V

Grinding: Working principle, operations & applications of surface, cylindrical &Centre less grinding processes, specification & selection of a grinding wheel, dressing, truing & balancing of grinding wheels, types of abrasives and bonds.

Finishing Processes: Introduction to lapping, honing, polishing and buffing operations.

UNIT VI

Jigs & Fixtures: Introduction, classification of jigs & fixtures, basic principles of location and clamping, typical examples of jigs and fixtures.

CNC Machine Tools: NC, CNC machine tools, structure of CNC machine tools, fundamentals of CNC part programming and applications of CNC machines.

COURSE OUTCOMES:

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

1. Understand the basic metal cutting principles, select cutting tool materials for different materials.
2. Identify various operations performed on a lathe, get familiarity with lathe attachments.
3. Acquire knowledge of machining processes such as shaping, slotting, planning, drilling
4. Understand the fundamentals and basic operations of milling machines.
5. Identify various finishing techniques such as grinding, lapping, honing and broaching.
6. Write simple CNC programs and conduct CNC machining.

TEXT BOOKS:

1. B.S. Raghuwanshi,A Course in Workshop Technology - Vol-II (Machine Tools), DhanpatRai& Co.,15th Edition, 2017.
2. P.N. Rao, Manufacturing Technology - Vol–II, Tata McGraw-Hill, 4th Edition, 2018.

REFERENCE BOOKS:

1. B. L. Juneja, G. S. Sekhon and Nitin Seth, Fundamentals of Metal Cutting and Machine Tools, New Age International (P) Limited, Publishers, Revised 2nd Edition, 2017.
2. SeropeKalpakjian and Steven Schmid, Manufacturing Engineering and Technology, Pearson, 8th Edition, 2020.

III B. Tech I Semester

AUTOMOBILE ENGINEERING

(PROFESSIONAL ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Appreciate and understand the automobile components and their classification.
- Acquire knowledge of automobile engine auxiliary systems.
- Interpret construction, working and functions of transmission systems.
- To understand the need of suspension and braking systems in an automobile.
- To Interpret construction, working and functions of steering system
- To understand emissions from automobile and alternatives to reduce pollution.

UNIT I

Introduction: Types of Automobile, Automobile Layout,Chassis and Body Components, Rear Wheel Drive, Front Wheel Drive, Four Wheel Drive.

Engine: Construction Details and Materials of Cylinder Head, Piston, Piston Rings, Fly Wheel, Valve & Valve Trains, Firing Order.

FuelIntake System: Fuel Injection Systems for Diesel and Petrol, MPFI, GDI, CRDI, Fuel Pump, Filters, Turbo Charging and Super Charging.

Cooling System: Purpose, Methods of Cooling, Air Cooling, Water Cooling, Coolants.

UNIT II

Lubrication System: Objective & Requirements of Lubricant, Types of Lubricants, Various Systems of Engine Lubrication, Oil Additives.

Ignition System: Functions, Battery Ignition System, Magneto Coil Ignition System, Electronic Ignition Systems, Spark Advance and Retard Mechanism.

Electrical System: Starting Systems, BendixDrive, Solenoid Switch, Various Accessories - Horn, Wiper, Fuel Gauge, Oil Pressure Gauge.

UNIT III

Transmission System: Clutches: Principle, Types, Single Plate Clutch, Multi Plate Clutch,Magnetic and Centrifugal Clutches. Gear Boxes: Types, Sliding Mesh, Constant Mesh, Synchro Mesh Gear Boxes.Automatic Transmission:Epicyclic Gear Box, Torque Converter, Continuously Variable transmission (CVT). Propeller Shaft:Hotchkiss Drive, Torque Tube Drive, Universal Joint, Differential Rear Axles.

UNIT VI

Suspension System: Rigid Axle Suspension System, Independent Suspension System, Leaf Spring, Coil Spring, Torsion Bar, Dampers, ShockAbsorber, MacPherson Strut, Air Suspension System.

Braking System: Mechanical Brake System, Hydraulic Brake System, Pneumatic and Vacuum Brakes,Brake System Components: Drum and Disc Brakes, MasterCylinder, Wheel

Cylinder,Tandem Master Cylinder, Requirement of Brake Fluid, Antilock Brake System (ABS).

UNIT V

Steering System: Steering Geometry**:**Camber, Castor, King Pin Rake, Combined Angle Toe-In, Toe-Out. Steering Gears: Types, Steering Linkages, Rack and Pinion Steering Gear, Power Steering. Types of Steering Mechanism:Ackerman Steering Mechanism, Davis Steering Mechanism.Slip Angle, Cornering Power, Under Steer and Over Steer, Wheel Alignment, And Balancing.Introduction to Advanced Driver Assistance Systems (ADAS).

UNIT VI

Vehicle Pollution Control: Components of Exhaust Gas, National and International Pollution Standards, Pollution Control Techniques:Catalytic Converter, Selective Catalytic Reduction (SCR), Diesel particulate filters (DPF), Exhaust Gas Recirculation (EGR), Crank Case Ventilation, Homogeneous Charge Compression Ignition (HCCI).

Alternative Prime Movers: Introduction to Hybrid Vehicles, PHEV, Battery Electric Vehicles (BEV), Fuel Cell Electric Vehicle (FCEV).

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Identify the different types of Automobiles and their components.
2. Discuss the working of auxiliary systems of Automobile Engine.
3. Illustrate the concepts of transmission systems.
4. Identify the suitable suspension system and braking system based on application.
5. Choose suitable steering system based on application.
6. Explain the pollutions norms and technologies available to reduce pollution.

TEXT BOOKS:

1. Kripal Singh, Automobile Engineering (Volume 1 & 2), Standard Publishers, 14th Edition, 2018.
2. William H. Crouse, Automotive Mechanics, Tata McGraw-Hill Education, 10th Edition, 2017.

REFERENCE BOOKS:

1. T. K. Garrett, Kenneth Newton, William Steeds, The Motor Vehicle, SAE International, 13th Edition, 2001.
2. Ehsani, Mehrdad, Modern electric, hybrid electric, and fuel cell vehicles, CRC press, 3rd edition, 2018.

III B.Tech I Semester

GAS DYNAMICS AND JET PROPULSION

(PROFESSIONAL ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basic difference between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow.
- To gain some basic knowledge about propulsion systems.

UNITI

Fundamentals of Compressible Flow: Basic equations of compressible flow, stagnation states, Mach wave and Mach cones, effect of Mach number on compressibility.

UNITII

Flow Through Variable Area Duct: One dimensional isentropic flow in duct of varying cross sectional area; nozzles and diffusers; critical properties and choking.

UNITIII

Shock Waves: Governing equations, Variation of flow parameters across the normal and oblique shocks, Prandtl relation, Rankine- Hugoniot relation,

UNIT IV

Flow In Constant Area Duct With Friction (Fanno Flow): Fanno flow equation and its solution, relation of flow properties with length, experimental coefficient of friction.

UNIT V

Flow In Constant Area Duct With Heat Transfer (Rayleigh Flow): Rayleigh flow equations, variation of flow properties, maximum heat transfer.

UNIT VI

Theory of Jet Propulsion: Operating principle of Propulsive systems; Propulsive, Thermal and Overall efficiency, specific fuel consumption, thrust equation and cycle analysis; performance of ram jet, turbojet, turbofan and turboprop engines.

COURSE OUTCOMES:

At the end of this course students will be able to

1. Outline governing equations of compressible fluidflow.
2. Analyze one dimensional compressible flow through variable areaduct.
3. Analyze compressible flow having normalshock.
4. Apply governing equations to compressible flow through constant area duct withfriction and with heat transfer.
5. Apply governing equations to compressible flow through constant area duct with heat transfer.
6. Interpret propulsive systems for their working andapplication.

TEXT BOOKS:

1. E. Rathakrishnan, Gas Dynamics, Pvt PHI Learning Ltd, 5th Edition, 2014.
2. V Ganesan, Gas Turbines, McGraw Hill Education, 3rd Edition, 2017.

REFERENCE BOOKS:

1. J. D. Anderson, Modern Compressible Flow, McGraw Hill, 3rd Edition, 2017.
2. MJ Zucrow, Aircraft & Missile propulsion Vol: II, Wiley, 1958.

III B. Tech I Semester

RENEWABLE ENERGY SOURCES

(PROFESSIONAL ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce solar energy, collection, and working of solar power plants.
- To introduce the wind energy, bio mass energy, geo thermal energy and ocean energy as alternative energy sources.
- To understand about different equipment's used in generation of energy using renewable sources.
- To understand the working of equipment used for energy collection and conversion of energy.
- To gain knowledge in direct energy conversion systems such as Fuel Cells and MHD.

UNIT I

Introduction to solar power: Role and potential of new and renewable sources, the solar energy option, environmental impact of solar power.

Solar Energy Collection: Working principal of flat plate and concentrating collectors, classifications of solar collectors, orientation and thermal analysis.

Solar Thermal Power plant: Recent developments in solar power plants, power generation through solar central receiver power plant,solar chimney.

UNIT II

Wind Energy: Sources and potentials, Classification of wind mills, horizontal and vertical axis wind mills, performance characteristics, betz criteria, types of winds, wind data measurement, site evaluation.

UNIT III

Bio-Mass: Principle of bio-conversion, anaerobic and aerobic digestion- types of bio-gas digesters, gas yield, Combustion characteristics of bio-gas, utilization for cooking

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT IV

Ocean energy: OTEC, Principles of utilization, classification of OTEC plants, thermodynamic cycles

Wave energy: Working principle, potentialand conversion devices

Tidal energy: Working principle, tidal power plant, classification of tidal plants, operational methods of tidal energy, site selection

UNIT V

Fuel cells: Principle of fuel cells, thermodynamic aspects. Performance limiting factors of fuel cells- types of fuel cells-hydrogen-oxygen fuel cells-biochemical cells-regenerative cells

UNIT VI

Direct Energy Conversion (DEC): Need for DEC, Principles of DEC.Photovoltaic energy conversion,thermoelectric generators, See beck, Peltier and Joule Thompson effects.

MHD generators: principle, dissociation and ionization, Hall Effect, magnetic flux, MHD accelerator, MHD engine, power generation systems.

COURSE OUTCOMES:

After Completion of this course students will be able to

1. Student can acquire the knowledge ofrole and potential of new and renewable sources, working principle of solar collection devices and solar power plants.
2. Explore the concepts involved in wind energy conversion system by studying its components,types and performance.
3. Understand the working principles of biomass, geo thermal energies and how it provides a clean source of energy.
4. Understand the technologies to harness power from ocean, wave and tidal energies
5. Gain the knowledge on Fuel Cells and used as a promising technology in the context of clean power sustainability.
6. Understand the working principles of direct energy conversion systems and also MHD generator.

.TEXT BOOKS:

1. G.D.Rai, Non- Conventional Energy sources, Khanna publication, 5th Edition, 2017.
2. John Twidell and Anthony D Weir, Renewable Energy Sources, Taylor & Francis, 2nd Edition, 2015.

REFERENCE BOOKS:

1. Suhas P. Sukhatme, Solar energy, Tata McGraw-Hill, 4th Edition, 2017.
2. Dr. R.K. Singal, Non- Conventional Energy sources, S.K.Kataria& Sons, 3rd Edition, 2021

III B.Tech I Semester

REFRIGERATION & AIR CONDITIONING
(PROFESSIONAL ELECTIVE - I)

L	T	P	C
3	0	0	3

Note: Refrigeration Tables with Charts &Psychrometric Chart book allowed

COURSE OBJECTIVES:

- To obtain the basic knowledge of refrigeration, refrigerants and its applications in engineering practice.
- To demonstrate basic knowledge of simple vapour compression refrigeration system, their components and got idea about cryogenic refrigeration system.
- To explain the vapour Absorption refrigeration and non conventional refrigeration systems.
- To acquire the basic knowledge on various psychometric processes, estimating air conditioning loads.
- To learn different types of air refrigeration systems, heat pumps and their applications.

UNIT I

FUNDAMENTALS OF REFRIGERATION:

Introduction: Necessity and applications, unit of refrigeration and C.O.P; Heat Engine,

Refrigerator and Heat pump.

REFRIGERANTS: Classification of refrigerants, Desirable properties, Nomenclature, Green house effect, global warming

AIR REFRIGERATION SYSTEM: Introduction: Air refrigeration system working on Reversed Carnot cycle, Air refrigeration system working on Bell Coleman cycle, COP, Open and Dense air systems, Applications.

UNIT II

VAPOUR COMPRESSION REFRIGERATION SYSTEM: Working principle :Simple vapour compression refrigeration cycle, Representation of cycle on T-s and P-h charts, COP, Effect of Sub cooling and Superheating.

UNIT III

VCR System components: Actual vapour compression cycle, System components: Compressors, Condensers, Expansion devices and Evaporators.

Cryogenic Refrigeration: Liquefaction of air and hydrogen.

UNIT IV

Vapor Absorption System: Working principle and components of NH_3 - water and Li Br-water System, Three Fluid absorption system.

Steam Jet Refrigeration System: Working Principle and Basic Components; Thermoelectric and Vortex tube refrigeration system (working principle).

UNIT V

Air conditioning: Psychometric properties and processes, Psychometric chart, summer, winter and year round A/C systems, human comfort and effective temperature. Cooling Loads: Sensible and latent heat loads, RSHF, GSHF, ESHF & ADP, air conditioning load calculations.

UNIT VI

Air Conditioning systems: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills, registers, fans and blowers, heat pump, different heat pump circuits.

COURSE OUTCOMES:

After Completion of this course students will be able to

1. Understand the basic concepts of refrigeration and their applications.
2. Evaluate the performance parameters of different types of VCR systems.
3. Understand how the liquefaction of gases is done and the working of various components used in refrigeration system.
4. Evaluate the performance of air and steam jet refrigeration systems.
5. Analyze the psychrometric properties and Able to design air conditioning system for a particular application.
6. Understand the different types of refrigeration systems and heat pump circuits.

TEXT BOOKS:

1. C.P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill, 4th Edition, 2020.
2. S.C. Arora & S. Domkundwar, A Course in Refrigeration and Air conditioning,Dhanpatrai publications, 8thEdition, 2016.

REFERENCE BOOKS:

1. Manohar Prasad, Refrigeration and Air Conditioning, New Age International, 3rdEdition, 2015.
2. R.F Barron, Cryogenic Systems, Oxford University Press, 2nd edition, 1985.
3. R.S. Khurmi& J.K. Gupta, Refrigeration and Air Conditioning, S.Chand, 5th Edition, 2019.

III B. Tech I Semester

REMOTE SENSING & GEOGRAPHICAL INFORMATIONSYSTEMS

(OPEN ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the principles, applications, trends, and pertinent issues of geographical information systems and sciences, including remote sensing (RS), photogrammetry, cartography, and global positioning systems (GPS).
- To provide learning and teaching experiences with real world problems.
- To develop technical skills and competence in data and information acquisition, extraction, management and analysis; spatial and statistical modeling; mapping and visualization.
- To describe how geographical information is used, managed, and marketed globally.
- To gain an understanding of how to manipulate and apply vector and raster spatial data, particularly with regard to local/state/national issues, emphasizing lands in and near it.

UNIT I

Introduction to remote sensing: Basic concepts of remote sensing,electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems.

Sensors and platforms: Introduction, types of sensors, airborne remotesensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT II

Image analysis: Introduction, elements of visual interpretations, digitalimage processing-image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III

Geographic Information System: Introduction, key components,application areas of GIS, map projections.

Data entry and preparation: spatial data input, raster data models, vectordata models.

UNIT IV

Spatial data analysis: Introduction, overlay function-vector overlayoperations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions,

overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT V

RS and GIS applications General: Land cover and land use, agriculture,forestry, geology, geomorphology, urban applications.

UNIT VI

Application to Hydrology and Water Resources: Flood zoning andmapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

COURSE OUTCOMES

At the end of the course the student will be able to

1. Be familiar with ground, air and satellite based sensor platforms.
2. Interpret the aerial photographs and satellite imageries.
3. Create and input spatial data for GIS application.
4. Apply RS and GIS concepts in water resources engineering.

TEXT BOOKS:

1. Lillesand, T. M, R.W. Kiefer and J. W. Chipman, Remote Sensing and Image Interpretation, Wiley India Pvt. Ltd., 7th Edition, 2013.
2. George Joseph and C Jeganathan, Fundamentals of Remote Sensing, The Orient Blackswan publisher, 3rd Edition, 2018.

REFERENCES:

1. Narayana LRA, Remote Sensing and its Applications, Universities Press, 2012.
2. ChorPand Lo and A. k. W. Yeung, Concepts and techniques of Geographic Information System, Pearson Education, 2nd Edition, 2016.
3. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, Principles of Geographical Information System, Oxford University Press, 3rd Edition, 2015.

III B.Tech I Semester

OOPS THROUGH JAVA

(OPEN ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Implementing programs for user interface and application development using core javaprinciples.
- Focus on object-oriented concepts and java program structure and its installation.
- Comprehension of java programming constructs, control structuresin Java ProgrammingConstructs.
- Implementing Object oriented constructs such as various class hierarchies, interfacesand exception handling.
- Understanding of Thread concepts and I/O inJava.
- Understanding of Various Components of Java Swing and write Code Snippets using them.

UNIT I

Introduction to OOP

Introduction, Need of Object-Oriented Programming, Principles of Object-Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Program Structures

Variables, Primitive Data types, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and Ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of Control-Branching, Conditional Loops.

UNIT II

Classes and Objects- Classes, Objects, Creating Objects, Methods, Constructors-Constructor Overloading, Cleaning up Unused Objects-Garbage Collector, Class Variable and Methods, Static Keyword, this keyword.

UNIT III

Inheritance: Types of Inheritance, Deriving Classes using Extends Keyword, Method Overloading, Super Keyword, Final Keyword, Abstract Class.

Interfaces, Packages: Interface-Extending Interface, Interface Vs Abstract Classes, Packages-Creating Packages, Using Packages, Access Protection, java.lang Package.

UNIT IV

Exceptions: Introduction, Exception Handling Techniques-try...catch, throw, throws, finally block, User Defined Exception.

Multi-Threading:java.lang.Thread, The main Thread, Creation of New Threads, Thread Priority, Multithreading- Using isAlive() and join(), Synchronization, Suspending and Resuming Threads, Communication between Threads.

Unit V

Input/Output: File I/O: Reading data from files and writing data to files, accessing data

from CSV and Excel files**.**

String Handling: String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous

Methods, Class String Buffer, Class String Builder.

Unit VI

Event Handling: Event Delegation Model, Sources of Event, Event Listeners, Adapter Classes, Inner Classes.

Swings: Introduction, JFrame, JApplet, JPanel, Components in Swings, Layout Managers, List and JScroll Pane, SplitPane, JTabbedPane, JTree, DialogBox, Pluggable Look and Feel.

COURSE OUTCOMES:

At the end of the course the student will be able to

1. Write, compile, execute and troubleshoot Java programming for networking concepts.
2. Build Java Application for distributed environment.
3. Design and Develop multi-tier applications.
4. Identify and Analyze Enterprise applications.

TEXT BOOKS:

1. Herbert Schildt, The Complete Reference Java, TMH, 9th Edition, 2017.
2. Sachin Malhotra, SaurabhChoudhary, Programming in JAVA, Oxford university press, 2nd Edition, 2018.

REFERENCE BOOKS:

1. K.Rajkumar, JAVA Programming, Pearson publishers, 1st Edition, 2018.
2. Nageswara Rao, Core JAVA Black Book, Wiley, Dream Tech, 1st Edition, 2008.
3. RashmiKantaDas, Core JAVA for Beginners, Vikas, S.Chand, 1st Edition, 2010.

III B. Tech I Semester

COMPUTER GRAPHICS

(OPEN ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

UNIT I

2D Primitives Output primitives – Line, Circle and Ellipse drawing algorithms - Attributes of output primitives – Two dimensional Geometric transformations - Two dimensional viewing – Line, Polygon, Curve and Text clipping algorithms

UNIT II

3D Concepts Parallel and Perspective projections - Three dimensional object representation–

Polygons, Curved lines, Splines, Quadric Surfaces, - Visualization of data sets - 3Dtransformations – Viewing -Visible surface identification.

UNIT III

Graphics Programming Color Models – RGB, YIQ, CMY, HSV – Animations – General

Computer Animation, Raster, Keyframe - Graphics programming using OPENGL – Basic

graphics primitives –Drawing three dimensional objects - Drawing three dimensional scenes

UNIT IV

Rendering Introduction to Shading models – Flat and Smooth shading – Adding texture to faces–Adding shadows of objects – Building a camera in a program – Creating shaded objects– Rendering texture – Drawing Shadows.

UNIT V

Fractals Fractals and Self similarity – Peano curves - Creating image by iterated functions –

Mandelbrot sets – Julia Sets – Random Fractals

UNIT VI

Overview of Ray Tracing Intersecting rays with other primitives – Adding Surface texture –

Reflections andTransparency – Boolean operations on Objects.

COURSE OUTCOMES:

At the end of the course the student will be able to

1. Know and be able to describe the general software architecture of programs that use 3Dcomputer graphics.
2. Know and be able to discuss hardware system architecture for computer graphics. ThisIncludes, but is not limited to: graphics pipeline, frame buffers, and graphicaccelerators/co-processors.
3. Know and be able to select among models for lighting/shading: Color, ambient light;distant and light with sources; Phong reflection model; and shading (flat, smooth,Gourand, Phong).

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics – C Version, Pearson Education, 2nd Edition, 2004.
2. F.S. Hill, Computer Graphics using OPENGL, Pearson Education, 2ndEdition, 2003.
3. REFERENCE BOOKS:
4. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, ComputerGraphics- Principles and practice, , Pearson Education, 2nd Edition, 2007.

III B. Tech ISemester

AUTOMOTIVE ELECTRONICS

(OPEN ELECTIVE - I)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the application of sensors, actuators, microcontrollers in Automobiles.
- To creates awareness on smart vehicle control systems.
- To train the students to use the control strategies to improve performance of the vehicle.
- To enable the engineer to fit anywhere in the automotive industry.

UNIT I

Introduction

Evolution of Automotive Electronics. Need of Electronics in Automobiles. Application Areas of Electronic Systems in Modern Automobiles

Engine Control Unit(ECU): Engine Performance Terms, Effect of Air/Fuel Ratio, Spark Timing and EGR on Performance, Electronic Fuel Control System, Modes of Fuel Control,EGR Control, Analysis of Intake Manifold Pressure, Electronic Ignition Systems – Spark Advance Correction Schemes, Fuel Injection Timing Control.

UNIT II

Sensors

Mass Airflow Sensor, Engine Speed Sensor, Engine Crankshaft Angular Position Sensor, Oxygen Sensor, Spark Knock Sensor, Manifold Absolute Pressure (MAF) Sensor, Fuel Temperature Sensor, Voltage Sensor, Camshaft Position Sensor, Throttle Position Sensor, Steering Angle Sensor.

UNIT III

Sensors for ADAS and Autonomous Technology

Navigation Sensors, Proximity Sensors, Ultrasonic Sensors, LIDAR, RADAR, Cameras.

Electrical Actuators

Mechanical Switches, Solenoids, DC Motors, AC Motors, Stepper Motors, and Servo Motors.Relays (Solid State Relays Nanoelectromechanical Relays). Electro-Mechanical, Electro-Pneumatic, Electro-Hydraulic Actuators.

UNIT IV

Control Unit

Operating Conditions, Design, Data Processing, Programming, Digital Modules in the Control Unit, Control Mechanism, ControlUnit Software.

Communication: Classification, Applications in the Vehicle, Coupling of Networks, Examples of Networked Vehicles. Buses - CAN Bus, LIN Bus, MOST Bus, Bluetooth, Flexray, Diagnostic Interfaces.

UNIT V

Vehicle Motion Control

Antilock Brake System (ABS), Electronic Stability Program (ESP), Traction Control System(TCS), ActiveSteering, and Electronic Transmission Control.

UNIT VI

Vehicle Safety Control

Obstacle Avoidance Radar, Adaptive Cruise Control, Advanced driver assistance systems (ADAS), Occupant Protection Systems, Door locking circuit, Accelerometer Based Air Bag Systems. **Introduction to** Heads-Up Display, Infotainments and Telematics.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Understand the importance of the electronic systems in automobile, and acquire an overview of theelectronic engine control unit.
2. Select the suitable sensor for the automotive electronic systems design.
3. Apply advance sensors and actuator technologiesfor the design of autotronics systems
4. Understand the networking of various modules in automotive systems, communication protocols and diagnostics of the sub systems.
5. Implement the electronic operation in the vehicle dynamicsto achieve the reliability, safety, and smartness.
6. Get fair idea on future Automotive Electronic Systems, andunderstand the add-on comforts.

TEXT BOOKS:

1. Konrad Reif Ed., Automotive Mechatronics: Automotive Networking, Driving Stability Systems, Electronics, Springer, Rev Edition, 2015.
2. Denton, T., Automobile Electrical and Electronic Systems. United Kingdom: CRC Press, 5th Edition, 2017.

REFERENCES BOOKS:

1. NajamuzZaman, Automotive Electronics Design Fundamental, Springer, 1st Edition, 2015.
2. William B.Ribbens, Understanding Automotive El ectronics, Butterworth-Heinemann, 8th Edition, 2017.

III B. Tech. I-Semester

MATLAB AND SIMULINK FOR ENGINEERS

(OPEN ELECTIVE - II)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To Understand the basicsof MATLAB commands
- To acquire the knowledge on mathematical operations in MATLAB
- To gain the knowledge of writing a program using MATLAB.
- To understand the concepts of Polynomial functions in MATLAB environment.
- To acquire the knowledge on various plots (2D-Plots) in MATLAB.
- To understand basics of MATLAB Simulink.

UNIT I

MATLAB Fundamentals: Brief Introduction, History, use of MATLAB, key Features, command window, workspace, command history, setting directory, Working with the matlab user Interface, Basic Commands, Assigning variables, operation with variables, character and string, Arrays and vectors.

UNIT II

Mathematical Operations: Arithmetic operations, BODMAS rule, operators and special characters, Mathematical and logical operators.

Creating row and column matrices, Matrix operations-transpose, determinant, inverse, Eigen values and Eigen vectors. Trigonometric functions, fractions, real numbers, and complex numbers, Random Number generation.

UNIT III

Programming in MATLAB: Introduction, M-file scripts, M-file functions, examples, control structures – if statement, Switch statement, for loop & While loop, continue statement and break statement, examples, saving output file, debugging process.

UNIT IV

Polynomials: MATLAB functions for polynomial, Roots of a polynomial, multiplying and dividing polynomials, derivatives and integrals of a polynomial, Evaluation, Curve fitting.

UNIT V

Two Dimensional Graphics: The plot Function,Line styles, Markers, and Colors,Plot Grids, Axes Box, and Labels,Customizing Plot Axes,Multiple Plots, Subplots, Easy Plotting, Text Formatting.

Handle Graphics, object hierarchy,Object handles,Object properties,modifying an existing plot.

UNIT VI

Introduction to Simulink: Simulink Environment and study of library, Custom Blocks, performing matrix operations, computing value of functions, input/ output signals from/to the MATLAB workspace, simulating a mechanical system, working with second order differential equation.

COURSE OUTCOMES:

At the end of the course the student will be able,

1. To use various MATLAB commands.
2. To do mathematical operations like addition, subtraction etc., in MATLAB
3. To write programs using M-file functions, if, for, while etc., in MATLAB.
4. To solve polynomial equations using MATLAB.
5. To generate various plots (2D-Plots) in MATLAB.
6. To develop block diagrams in MATLAB Simulink environment.

TEXT BOOKS:

1. RudraPratap, Getting Started with MATLAB, Oxford University Press, 7th Edition, 2019.
2. Stormy Attaway, MATLAB: A Practical Introduction to Programming and Problem Solving, Butterworth - Heinemann; 5th Edition , 2018.

REFERENCE BOOKS:

1. Devendra K. ChaturvediModeling and Simulation of Systems Using MATLAB and Simulink, CRC Press, 1st Edition, 2010.

III B. Tech. I-Semester

PRINCIPLES OF ELECTRONIC COMMUNICATION SYSTEMS

(OPEN ELECTIVE - II)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

This course will enable students to

- Understand the basics of semiconductor and components like diode, transistor, FET, MOSFET
- Understand and analyze concepts of Analog Modulation schemes: AM, FM.
- Understand and analyze concepts digitization of signals: sampling, quantizing and encoding.
- Evolve the concept of quantization noise for sampled and encoded signals and study the concepts of reconstruction from these samples at a receiver.

UNIT I

Semiconductors: Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

UNIT II

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener diode, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode.

Half-wave & Full-wave Bridge Rectifiers, PIV, DC voltage and current, Ripple factor, Efficiency.

UNIT III

Bipolar Junction Transistors: Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes.

Field Effect Transistors: Concept of Field Effect Transistors, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type.

UNIT IV

Amplitude modulation:

Amplitude Modulation: Introduction, Amplitude Modulation: Time & Frequency: Domain description, Envelop detector.

DSBSC Modulation: Time and Frequency: Domain description, Balanced modulator, Coherent detection, Costas Receiver.

SSB and VSB Methods of Modulation: SSB Modulation, VSB Modulation, Time and Frequency: Domain description, Frequency: Division Multiplexing.

UNIT V

Angle modulation:

Angle Modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals,

Generation of FM Signals, Demodulation of FM Signals.

UNIT VI

Pulse Analog Modulation:

Introduction, The Low pass Sampling process, Pulse Amplitude Modulation, PWM, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, Comparison of FDM and TDM.

Sampling and Quantization:

Why Digitize Analog Sources?

Pulse - Code Modulation: Sampling, Quantization, Encoding, Quantization Noise, Differential pulse code modulation Delta Modulation, Adaptive delta modulation, Comparison between PCM, DM, ADM and DPCM.

COURSE OUTCOMES:

Course Outcomes: After studying this course, students will be able to

- Understand the basics of semiconductor & devices and their applications in different areas.
- Understand different biasing techniques to operate transistor, FET, MOSFET.
- Describe the basic principle of communication system.
- Demonstrate and solve communication system parameters for various types of modulation and demodulation techniques.
- Differentiate between various types of pulse modulation.

TEXT BOOK:

1. R.S.Sedha, A Text book of Electronics, S Chand and Co., 3rd Edition , 2012.
2. Haykins& Moher Simon, Communication Systems, John Willey, 5th Edition, 2010.

REFERENCE BOOKS:

1. V.K. Mehta, Rohit Mehta, Principles of Electronics ,S.Chand& Co, 7th Edition, 2014.

2. B. P. Lathi, Modern Digital and Analog Communication Systems, Oxford University Press., 4th Edition, 2011.

III B. Tech. I-Semester

AI TOOLS, TECHNIQUES & APPLICATIONS

(OPEN ELECTIVE -II)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Emphasize on AI and ML and understand their relationship with data in real-world problems.
- Understand different data wrangling techniques and their significance.
- Understand the Data Visualization Techniques.
- Understand different supervised learning algorithms.
- Understand different unsupervised learning algorithms
- Understand text mining and its applications.
- Understand the introduction to neural networks and deep learning types.
- Understand the different ensemble techniques.

Unit I

Introduction

Introduction to AI and Machine Learning. Emergence of AI. Relationship between AI, ML and Data Science. Types of Machine Learning with definitions and application areas. Data wrangling (Data Pre-processing, Data Cleaning, filling missing data) and manipulation using Numpy and Pandas in Python.

Unit II

Data Visualization : Data visualization types by using Matplotlib and Seaborn.

Regression : Linear Regression, Least Squares, Mean Square Error. Plotting regression line and predicting with Scikit Learn. Gradient Descent, Stochastic Gradient Descent. Learning rate. Higher Order curves, Higher order polynomial fitting. Over fitting, Under fitting. Regularization. Measures of accuracy. Train-Test-Split. k-fold Cross Validation. Hyper parameter tuning.

Unit III

Supervised Learning – Classification: Problem Definition, General Approaches to solving a classification problem, Classification techniques, Decision Trees- Decision Tree Construction, Measures for Selecting the Best Split, Algorithm for Decision tree Induction , Naive-Bayes Classifier, K- Nearest Neighbour classification-Algorithm and Support Vector Machines, Performance measures of classification.

Unit IV

Clustering: K-Means Algorithm, Strengths and weakness of K-Means Hierarchical clustering techniques, agglomerative methods and divisive methods, Dimensionality reduction using PCA. Association Rule Mining, Apriori algorithm.

Unit V

Text mining

NLP Sub problems. Components of Natural Language. Steps to get text data into workable format. Terms Frequency, Inverse Document Frequency, Bag of Words, ngram, One hot encoding. Notion of corpus.

Unit VI

Neural Networks and Ensemble Techniques

Neural Network representation problem, perceptrons, multilayer networks and back propagation algorithm and introduction to deep learning with applications, Ensemble learning with bagging , boosting and random forest and ada boost.

TEXT BOOKS:

1. Stuart J. Russell and Peter Norvig,Artificial Intelligence: A Modern Approach, Pearson, 3rd Edition, 2010.
2. Tom Mitchell, Machine Learning, McGraw Hill, 1st Edition, 1997.

REFERENCES BOOKS:

1. EthemAlpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press, 2nd Edition, 2004.
2. Tom Markiewicz& Josh Zheng,Getting started with Artificial Intelligence, O'Reilly Media, 1st Edition, 2019.

III B. Tech. I-Semester

GREEN BUILDING TECHNOLOGIES

(OPEN ELECTIVE -II)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Learn the principles of planning and orientation of buildings.
- Acquire knowledge on various aspects of green buildings
- Acquire Knowledge Environmental Impact on Green Buildings
- To know how to reduce embodied energy in building materials.

UNIT I

Introduction to Green Buildings: Definition of green buildings and sustainable development, typicalfeatures of green buildings, benefits of green buildings towards sustainable development. Green buildingrating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control,minimizing urban heat island effect, maximize comfort by proper orientation of building. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape-water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste watertreatment, recycle and reuse systems.

UNIT III

Energy Efficiency: Environmental impact of building constructions, Concepts of embodied energy,operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient buildingenvelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioningsystems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT IV

Building materials: Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials.

UNIT V

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation,exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to greenbuildings: NBC, ECBC, ASHRAE, UPC etc.

UNIT VI

Green Building Rating Systems: Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment - Modular wastewater treatment systems for built environment - Building automation and building management systems.

COURSE OUTCOMES:

Course Outcomes: After studying this course, students will be able to

1. Explain the principles of building planning, its bylaws and provide facilities for rainwater
1. harvesting
2. Understand the concepts of green buildings.
3. Impart knowledge on Green Building objectives, climate and environment
4. Impart the knowledge on active energy systems, utilities and services and O&M
5. Impart the knowledge on indoor air quality and building rating systems
6. Students understand the concepts of design of components of green Building

TEXT BOOKS:

1. Shahane, V. S, Planning and Designing Building, Poona, Allies Book Stall, 3rd Edition, 2004.
2. Michael Bauer, Peter Mösle and Michael Schwarz, Green Building – Guidebook for Sustainable Architecture, Springer, Rev Edition, 2010.

REFERENCES BOOKS:

1. MiliMajumdar, Energy-efficient buildings in India, Tata Energy Research Institute, 1st Edition, 2002.
2. TERI, Sustainable Building Design Manual- Volume I & II, Tata Energy Research Institute, Rev. Edition, 2009.

III B. Tech I Semester

MACHINE DRAWING

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Student can modelled in software by applying the basic knowledge of Engineering and machine drawing. It can improve an ability to Create Parametric 2-D Sketches, and create and Edit Parametric Dimensions. To develop an ability to Create Solid Models of machine components. Students will able to demonstrate an ability to design and conduct experiments, analyze and interpret data and assembly and disassembly drawings knowledge will be provided. Understanding of drawing, which includes clear visualization of objects and the proficiency in reading and interpreting a wide variety of production and assembly drawings.

PART 1

Sketch: Sketcher Introduction, plane selection, sketcher tools, constraining the sketch.

Part Modelling: Generation of various 3D models through pad, revolve, sweep Creation of various features.

Feature based and Boolean based modelling, Study of various standard transformations.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportion

Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

1. Keys, cotter joints and knuckle joint.
2. Riveted joints for plates
3. Shaft coupling, spigot and socket pipe joint.
4. Journal, pivot and collar and foot step bearings.

Note: Draw any four 2D figures from above topics.

PART II

Assembly modelling: top-down approach, bottom-up approach, applying constraints to parts in assembly, Explode & Manipulation.

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions

1. Engine parts – stuffing boxes, Steam engine cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
2. Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
3. Valves: Steam stop valve, spring loaded safety valve and feed check valve
4. Apply the knowledge of machine drawing as a system of Communication in which ideas are expressed clearly and all information fully conveyed.
5. Use IS convention in representing various machine components and materials.
6. Draw sectional views to represent the inner details of the machine components.

Note: Draw any six3D models from above topics.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

1. Draw complex geometries of machine components in sketcher mode.
2. Model a part and assembly using Computer-Aided Design software.
3. Create complex engineering assemblies using appropriate assembly constraints.
4. Developing different views to communicate effectively the geometry and intent of design features.

TEXT BOOKS:

1. N. Sidheshwar, Shastry, Kanhaiah, Machine Drawing, McGraw Hill Education, 1st Edition, 2017.
2. N.D.Bhatt, Machine Drawing, Charotar, 50th Edition, 2016.

REFERENCES BOOKS:

1. P.S.Gill, Machine Drawing, S.K. Kataria& Sons, 18th Edition, 2020.
2. K.L.Narayana, P.Kannaiah& K. Venkata Reddy, Machine Drawing, New Age International, 6thEdition, 2019.

III B. Tech I Semester

DYNAMICS OF MACHINERY LAB

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- Study of damped and undamped free and forced vibrations of spring mass system.
- Know about gyroscopic couple and static and dynamic balancing of reciprocating and rotating masses.
- Practically study about various governors, cams and followers, demonstration of various types of gears.
- Hands on experience of the concepts of friction and their applications.

EXPERIMENTS:

Any 10experiments are to be conducted.

1. To determine whirling speed of shaft theoretically and experimentally.
2. To determine the position of sleeve against controlling force and speed of a Hartnell governor andto plot the characteristic curve of radius of rotation.
3. To analyse the motion of a motorized gyroscope when the couple is applied along its spin axis
4. To determine the frequency of undamped free vibration of an equivalent spring mass system.
5. To determine the frequency of damped force vibration of a spring mass system
6. To study the static and dynamic balancing using rigid blocks.
7. To find the moment of inertia of a flywheel
8. To plot follower displacement vs cam rotation for various Cam Follower systems.
9. To plot slider displacement, velocity and acceleration against crank rotation for single slider crankmechanism/Four bar mechanism
10. To find coefficient of friction between belt and pulley.

11. To study simple and compound screw jack and determine the mechanical advantage , velocityratio and efficiency
12. To study various types of gears- Spur, Helical, Worm and Bevel Gears

COURSE OUTCOMES:

1. Experimental study of Undamped, damped free and forced vibrations and determine the whirling speed of the shaft.
2. Determine the controlling force of Hartnell Governor.
3. Identify the significance of friction in belt &pulley and study the efficiency of simple and compound screw jacks.
4. Know the application of Gyroscope and understand the concept of balancing of rotating masses by experiment.
5. Study of different types of Gears and Four bar mechanism with the help of functional models.
6. Practical determination of moment of inertia of the flywheel and know the relative motion between the cam & follower.

REFERENCE BOOKS:

1. Hamilton H. Mabie& Charles F. Reinholtz, Mechanisms and Dynamics of Machinery, Wiley Edition, 4th Edition, 1991.
2. Dr. V. P. Singh, Theory of Machines, DhanpatRai& Co., 6th Edition, 2017.

III B. Tech I Semester

MACHINE TOOLS LAB

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- The course provides students with fundamental knowledge and principles in material removal processes.
- To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
- To give an insight on conventional machining principles and operations.
- To get familiarity about CNC programming and about CNC machine tools mechanisms.

LIST OF EXPERIMENTS:

Perform any 10 experiments from the following list of experiments.

1. To perform plain turning & facing on a lathe machine.
2. To perform step turning and chamfering on lathe machine.
3. To perform taper turning and knurling on lathe machine.
4. To cut multi-start square/metric threads on lathe machine.
5. Performing drilling and tapping operations.
6. Machining a flat surface using a shaper.
7. Machining a key-way using a slotting machine.
8. Performing indexing operation on a milling machine.
9. Prepare and check the dimensions of the sample bysurface grinding machine.
10. Perform grinding of tool angles on a tool and cutter grinder.
11. Perform plain turning operation on a CNC lathe.
12. Perform step turning operation using a CNC lathe
13. Perform drilling operation on a CNC lathe.

COURSE OUTCOMES:

At the end of course, the students will be able to:

1. Demonstrate knowledge of different machine tools used in machine shop.
2. Perform step turning, taper turning, knurling and threading operations.
3. Produce flat and inclined surfaces using shaper, keyway using slotting, indexing using milling machine and finishing using grinding machine.
4. Understand geometry of single point cutting tool using tool & cutter grinder
5. Perform machining operations on a CNC lathe.

III B. Tech I Semester

COMPUTER AIDED SIMULATION AND ANALYSIS LAB

L	T	P	C
0	0	2	1

COURSE OBJECTIVE:

To give exposure to software tools needed to analyse engineering problems and expose to different applications of simulation and analysis tools.

Syllabus

A. SIMULATION

1. MATLAB basics, dealing with matrices, Graphing-Functions of one variable and two variables.
2. Loop operations in MATLAB.
3. Use of MATLABto solve differential and partial differential equations by using pre-defined functions and numerical methods.
4. Mechanism Simulation using the MATLAB.

B. ANALYSIS

1. Modelling.
2. Meshing /Discretization
3. Stress analysis of simple mechanical components.
4. Thermo-hydraulic analysis of simple mechanical systems.

LIST OF EXPERIMENTS:

any 10 experiments(at least 3 from each group) from the following list of experiments.

1. a. Find the roots of the equations $9x^5 - 82x^4 + 112x^3 - 85x^2 + 97x - 6$
   b. Find the values of x, y, z of the equations x+y+z=3, x+2y+3z=4, x+4y+9z=6.
   c. For f(x)=8x8 -7x7 +12x6 -5 x5 +8 x4 +13 x3 -12x+9 compute f(2), roots of f(x) and plot for $0 \leq x \leq 20$
2. a. Verification of basic properties of limits for the functions f(x) = (3x + 5)/(x - 3) and g(x) = x2 + 1as x ends to 4.
   b. Find the derivative of (x+2)(x^2+3)
   c. Calculate the area enclosed between the x-axis, and the curve y=x3 -2x+5 and the

ordinates x = 1 and x = 2.

3. a. Solve $(D^2 + 5D + 6)y = e^x$

   b. Solve $\int_0^5 \int_0^{x^2} \left(x(x^2 + y^2)\right) dxdy$

   c. Solve $\int_0^3 \int_0^{3-x} \int_0^{3-y} xyzdxdydz$

4.

   a. Find the characteristics equation of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{bmatrix}$

   b. Find the Eigen values of the matrix $\begin{bmatrix} 1 & 8 & -10 \\ -4 & 2 & 4 \\ -5 & 2 & 8 \end{bmatrix}$

   c. Find the Eigen vector of the matrix $\begin{bmatrix} 3 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$

5. Write a programme for the position analysis of a slider crank mechanism, Euler method to solve a 1st order differential equation of $\boldsymbol{y}\,(\boldsymbol{t}) = \mathbf{1} - \boldsymbol{e}^{-at}$
6. Write a Program for Forward kinematics of Robotics arm manipulator.
7. Write a Program for four bar mechanism simulation..
9. Develop a model of simple pendulum.
10. Mesh the given model of rectangular bar fixed at both the ends.
11. Stress analysis of given rod subjected to torsion.
12. One dimensional thermal analysis of fin.

COURSE OUTCOME:

Upon the completion of this course, the students will be able to

1. Simulate the working principle of mechanisms using MATLAB.
2. Students should be able to apply various numerical tools like finite volume and finite difference for solving the different fluid flow problems.
3. Analyse the stresses and strains induced in plates, brackets, and beams, and heat transfer problems.
4. Calculate the natural frequency and mode shape analysis of 2D components and beams.
5. Students must be able to validate the numerical result by comparison with known analytical results.

TEXT BOOKS:

1. RudraPratap, Getting started with MATLAB, 7th Edition, Oxford University Press, 2019.