Flexible Scheme & Syllabus

2022-2023

B.Tech.

in

Electrical Engineering

(II Semester)

Madhav Institute of Technology & Science
Gwalior-474005

Basic Civil Engineering & Mechanics: 2100020

Course Objectives:

1. To understand the utility, location, construction detail and suitability of various building elements.
2. To determine the location of object on ground surface.
3. To stabilize the position of various object.
4. To understand the effects of system of forces on rigid body in static conditions.
5. Analysis of determinate structure (beam & truss)

Unit- I Building Materials: Stones, bricks, cement, timber - types, properties, test & uses, Introduction of concrete properties & Laboratory tests on concrete, curing of concrete and mortar Materials.
Unit- II Surveying & Positioning: Introduction to surveying, Survey stations, Measurement of distances conventional and EDM methods, Measurement of directions by different methods, Measurement of elevations by different methods, reciprocal leveling.
Unit- III Mapping & Sensing: Mapping details and contouring, Plane tables and related devices. Introduction of theodolite. Measurement of areas and volumes, application of measurements in quantity computations, Introduction of remote sensing and its applications.
Unit- IV Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent coplanner forces, free body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses, method of joints, method of Sections. Frictional force in equilibrium problems.
Unit –V Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment of Inertia of Composite section, Radius of Gyration, Introduction to product of Inertia and Principle Axes.
Support Reactions, Shear force and bending moment diagram for cantilever & simply supported beam with concentrated, distributed load and Couple.

Text Books:
1. Surveying, Vol. – 1, Punmia B.C., Laxmi Publications, 17th edition, 2016
2. Building Material, B. C. Punmia, Laxmi Publications, 2016
3. A textbook of Engineering Mechanics, D. S. Kumar, Katsons Publications, 2013

Reference Books:
1. Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3rd edition, 2013
2. Applied Mechanics, Prasad I.B., Khanna Publication 17th edition, 1996
3. Surveying, Duggal, Tata McGraw Hill New Delhi, 4th edition, 2013
4. Applied Mechanics, R.K. Rajput, Laxmi Publications, 3rd edition, 2016

Course Outcomes:

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

CO 1. Explain concepts and terminologies of building materials, surveying and mechanics.
CO 2. Apply various methods for surveying and mechanics.
CO 3. Determine the location, area and volume of objects on ground surface.
CO 4. Solve the problems of surveying and mechanics by using various methods.
CO 5. Analyse the effects of system of forces on rigid bodies in static conditions

Basic Mechanical Engineering: 2100021

Course Objectives:

1. Develop the fundamentals of Engineering materials, measurement and reciprocating machines.
2. Develop an ability to understand the Thermodynamic laws, steam generator and reciprocating machines for solving engineering problems.
3. Demonstrate Engines and Boiler fundamentals using models.

Unit-I:
Materials: Classification of engineering material, composition of cast iron and carbon steels on iron carbon diagram and their mechanical properties; Alloy steel and their applications; Stress Strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness and fatigue testing of materials.

Unit-II:
Measurement: Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainty analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lathe drilling, milling and shaping machines.

Unit-III
Fluids: Fluid properties, pressure, density and viscosity; pressure variation with depth, static and kinetic energy; Bernoulli's equation for incompressible fluids, viscous and turbulent flow, working principle of fluid coupling, pumps, compressors, turbines, positive displacement machines and pneumatic machines. Hydraulic power & pumped storage plants for peak load management as compared to base load plants.

Unit-IV
Thermodynamics: Zeroth, First, second and third law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, classification and working of boilers, efficiency & performance analysis, natural and induced draught, calculation of chimney height. Refrigeration, vapour absorption and compression cycles, coefficient of performance (COP).

Unit-V
Reciprocating Machines: Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol and diesel IC engines.

Text Books:

1. Narula; Material Science; TMH
2. Agrawal B & CM; Basic Mechanical Engineering; TMH
3. Nag PK, Tripathi et al; Basic Mechanical Engineering; TMH
4. Rajput; Basic Mechanical Engineering;
5. Sawhney GS; Fundamentals of Mechanical Engibneering; PHI
6. Nakra and Chaudhary; Instrumentation and Measurement; TMH
7. Nag PK; Engineering Thermodynamics; TMH
8. Ganesan; Combustion Engines; TMH

Course Outcomes: After successful completion of this course students will be able to:

CO 1. Define the essential concepts of thermal, design and production used in Mechanical Engineering.
CO 2. Summarize fundamental techniques and process used in power generating machines
CO 3. Solve the various problems based on basic concepts of Mechanical Engineering.
CO 4. Analyze the various gas, steam and air cycles
CO 5. Evaluate the problems of Steam Generator, Thermodynamics, Steam and I.C. engines
CO 6. Generate the skills to demonstrate steam Generator and reciprocating machine in depth.

Lists of Experiments : 2100021

1. Study of simple vertical boilers.
2. Study of Locomotive boilers.
3. Study of Babcock and Wilcox boilers.
4. Study of Lancashire, Cornish and Cochran boilers.
5. Study of boiler mounting and accessories.
6. Study of 2 stroke diesel and petrol engines.
7. Study of 4 stroke diesel and petrol engines.
8. Study of simple steam engines.
9. Study of Lathe machine.
10. Study of Vernier and Micrometer.
11. Study of Internal Combustion Engine Parts.

Python Programming :2130221

Course Objectives

- To understand the structure and components of a Python program.
- To learn the basic construct of python programming for implementing interdisciplinary research-based problems.
- To plot data using appropriate Python visualization libraries for analysis.

Unit I

Python Installation: Setting up a programming environment, basic understanding of different platforms for python coding, and Python Versions.
Basics of python programming: Running a Hello World Program,Running Python Programs from a Terminal, variables, strings, numbers, comments,Zen of Python, working of the input function.

Unit II

Tuples and Lists: Tuples, lists, list operations, using if statements with lists, organizing a list,working with lists: looping through an entire list, making numeric lists, working with part of a list.Dictionaries and sets: simple dictionary, looping through a dictionary, nesting, example with adictionary, Fibonacci and dictionaries, global variables, defining a set, set operations.

Unit III

Functions: Defining a function, passing arguments, return values, passing a list, passing anarbitrary number of arguments, storing your functions in module, inbuilt functions, and lambdafunctions. Classes and inheritance: object-oriented programming, creating and using a class,working with class instances, methods, inheritance, importing classes, python standard library.

Unit IV

Files and Exceptions: Reading from a file, writing to a file, file operations, assertions, exceptions,and exception examples. Debugging: programming challenges, classes of tests, bugs, and debugging,debugging examples.

Unit V

Plotting a simple line graph, random walks makinghistogram. Graphical user interfaces: event-driven programming paradigm; tkinter module, creatingsimple gui; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors, layouts,nested frames.

Recommended Books

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes
2. Learn Python the Hard Way: 3rd Edition
3. T.R. Padmanabhan, Programming with Python, Springer, 1st Ed., 2016.
4. Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, 1st Ed.,2012.
5. A.N. Kamthane and A.A. Kamthane, Programming and Python Solving with Python, McGrawHill, 2nd Ed., 2020.

Course Outcomes

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

CO 1. Develop the understanding of the basic python programming constructs

CO 2. Analyze various data structures available in python

CO 3. Implement the Object-oriented programming paradigm in Python

CO 4. Apply the different File handling operations

CO 5. Design GUI Applications in Python

CO 6. Construct graphical representation of data using python packages

List of Program:2130221

1. Python program to take input from user and display "Hello MITS Gwalior".
2. Python program to do arithmetic operations.
3. Python program to find area of rectangle, circle and triangle.
4. Python program to check number is even or odd, prime not prime.
5. Python program find factorial of a number.
6. Python program to check year is leap year or not.
7. Python Program to implement the operation on List, Tuple, Set and Dictionary.
8. Python Program to handle the exception and file handling operation.
9. Python Program to create and use of user defined function.
10. Python Program to solve a problem using Lambda function
11. Python Program for creating an object with and without inheritance.

Skill Based Project:2130221

1. Visualize the Publically available real world data set using various function and identify the suitable plot for better representation.
2. Handle the missing data and categorical value in a real world Data Set.
3. Build a prediction model based on Classification Data Set.
4. Build a prediction model based on Regression Data Set.
5. Build a prediction model based on Clustering Data Set.

Network Analysis: 2130222

Course Objectives:

To make the students capable of analyzing any given electrical network, understand the graph theory and the concepts of transients and relate two port parameters.

Unit I: Overview of DC and AC Circuits: Kirchhoff's voltage and current laws, network theorems viz. Thevenin's, Norton's, Superposition, Maximum power Transfer, Reciprocity, Substitution, Compensation, Miliman's and Tellegen's Theorem.

Unit II: Coupled Circuit and Resonance: Magnetic coupling, mutual inductance and its sign convention, coefficient of mutual inductance, transformer as a coupled circuit, singly and doubly tuned circuit, critical coupling, series and parallel resonance, bandwidth selectivity and half power points, Analysis of series and parallel circuit.

Unit III: Two Port Network: The concept of complex frequency, Concept of Ports. Two port parameterse.g. z-parameter, y-parameters, ABCD and inverse ABCD parameters, h and g parameters and their determination, Ladder network, condition for reciprocity and Symmetry in two port parameter representation, Inter-relationships between parameters of two port network, Interconnections of two port networks.

Unit IV: Three Phase Circuit: Unbalanced 3 phase circuit, balanced and unbalanced star (with or without neutral) and delta connected load. **Introduction to Graph theory**: Concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrix.

Unit V: Transient: Initial condition, Laplace analysis, Theorem shifting, scaling, initial and final value and convolution theorem. Transient response of RL, RC and RLC circuit, time constant, Equivalents of charged inductor and capacitor, discharge of condenser, damped and oscillatory circuit Response of the network with impulse, Unit step and Ramp excitation, wave form synthesis, AC transients (RLC circuit response to sinusoidal voltage)

Text and Reference Books:

1. Network Analysis by ME Van Valkenburg , PHI Publication.
2. Circuit Analysis by A. Chakrawarti, Dhanpat Rai Publication.
3. Network Analysis and Synthesis by C.L. Wadhwa, New Age International Publication.
4. Network Analysis and Synthesis Pankaj Swarnkar, Tech India Publication.

Course Outcomes:

After the completion of this course students will be able to:

CO 1. Apply different networks laws & theorems for solving AC and DC electric networks.
CO 2. Compute the two-port parameters for given two port networks
CO 3. Solve series/parallel resonant and magnetically coupled circuits
CO 4. Solve three-phase circuits under balanced & unbalanced conditions
CO 5. Evaluate transient response behavior of a network for given initial conditions

Electrical and Electronic Measurement: 2130223

Course Objectives

- To give an overview of current, voltage and power measuring electrical, electronics and digital instruments.
- To expose the students to the design of bridges for the measurement of resistance, capacitance and inductance.
- To provide the working knowledge of various waveform generators, analyzers and display devices.

Unit I Basic Measurement Concepts Static and dynamic characteristics, units and standards of measurements, error analysis, Statistical evaluation of measurement data, Standards and calibration

Unit II Electrical measurements General features and Classification of electromechanical instruments. Principles of Moving coil, moving iron, dynamometer type, rectifier type, thermal instruments. Extension of instrument range: shunt and multipliers, CT and PT. Measurement of Power: Electrodynamic wattmeter's, Low Power Factor (LPF) wattmeter, errors, calibration of wattmeter. Single and three phase power measurement

Unit III Measurement of resistance, inductance and capacitance Low, high and precise resistance measurement, Megger, Ohmmeters, Classical AC bridges: Inductance and capacitance measurements. Detectors in bridge measurement, Measurement of Frequency: Wien's Bridge

Unit IV Electronic and digital measurements ADC and DAC, Electronic voltmeter, Digital instruments: current, Digital voltmeter, Digital LCR meter, Q-Meter, Digital wattmeter and energy meters. Function generators, Signal generators, Waveform analyzers, Spectrum analyzers, Distortion analyzers, LED, LCD and Organic LED displays, Oscilloscope.

Unit V Principle of Sensing & Transduction Mechanical and Electromechanical Transducer, Resistive (potentiometric type), Strain gauge, Inductive Transducer: common types- Reluctance change type, LVDT, Capacitive Sensors, Thermal Sensors, Magnetic Sensors, Proximity Sensor, Piezoelectric Effect

Text and Reference Books:

1. A.K. Sawhney, "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai & Sons, Jan 2015.
2. J.B. Gupta, "A Course in Electronics & Electrical Measurements & Instrumentation", S.K. Kataria& Sons, 2008.
3. David A. Bell, Electronic Instrumentation and Measurements, Oxford University Press India; 3rd Edition, 2013
4. E. W. Golding's &F. C.Widdis, Electrical Measurements and Measuring Instruments, 6th Edition, (Revised & Enlarged): With Solved Examples & MCQ's (In M.K.S. Units), Medtech, Jan 2019.
5. Ernest O Doebelin and Dhanesh N Manik," Measurements systems Application and design", McGraw Hill publication, 5th Edition, 2015.
6. Albert D.Helfrick and William D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2003.
7. PrithwirajPurkait, Budhaditya Biswas, Santanu Das, ChiranjibKoley, Electrical and Electronics Measurements and Instrumentation, by McGraw Hill Education (India) Private Limited, 2013
8. H. S. Kalsi, Electronic Instrumentation, McGraw Hill Education; 3rd Edition, 2017

Course Outcomes:

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

CO 1. **Explain** the basic concepts of electrical and electronic measurement and measuring instruments.
CO 2. **Compute** errors in a measurement system
CO 3. **Describe** the construction and working of AC and DC bridges and their applications
CO 4. **Describe** digital measuring instrument, signal Generator,CRO for appropriate measurement
CO 5. **Select** appropriate transducers and A/D & D/A converters for measurement of physical quantity

LIST OF EXPERIMENTS: 2130223

1. Study of different types of multimeter and measurements of various electrical quantities using them.
2. Handling of CRO and function generator
3. Measurement of low resistance using Kelvin's Double Bridge method
4. Measurement of inductance by Hay's bridge.
5. Measurement of capacitance using De Sauty's Bridge.
6. Measurement of medium resistance using Wheatstone Bridge.
7. Measurement of earth resistance using earth tester.
8. Determination of characteristics of Thermistor using VCL and transducer trainer.
9. Determination of characteristics of RTD using VCL and transducer trainer.
10. Calibration of single-phase AC energy meter by direct loading method.

Course Outcomes:

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

CO 1. Handle an instrument and perform basic calibration
CO 2. Estimate the deviations in measurements due to possible errors and measures to minimize them based on their characteristics.
CO 3. Measure unknown resistance, inductance and capacitance
CO 4. Acquire teamwork skills for working effectively in groups
CO 5. Prepare technical report on experiments conducted in the lab

Environmental Engineering: 3000003

Course Objectives:

- To create awareness about various sources of energy and their applications.
- To create awareness about various environmental issues and how to deal with those environmental issues.
- To impart fundamental concepts in environmental engineering dealing with air, water and waste management.
- To create awareness about sustainability concepts and need of sustainable development for development of society.
- To create awareness about various environmental policies.

Unit 1: Energy: Various forms of Renewable and non-renewable energy and their applications, Solar Energy, Hydro, wind, biomass, geothermal, tidal and nuclear energy, green energy, clean energy, role of energy in economic and social development.

Unit 2: Water Environment: Ecosystems & its components, Water Cycle, Water availability & uses, Water resources problems and its solutions, Water pollution problems, Water quality characteristics & standards, Introduction to water treatment mechanisms.

Unit 3: Air Environment: Air pollution, causes, global effects, climate change and its impact, Introduction to air pollution control measures, Carbon credit, Carbon trading, Clean Development Mechanism (CDM).

Unit 4: Waste Management: Introduction to management of municipal solid waste, Ewaste and plastic waste, various initiatives in the management of waste.

Unit 5: Sustainability: Introduction to the concept of sustainability & sustainable development, Sustainable development goals, TBM, Challenges for sustainable development. Policies: Multi1atcral environmental agreements and Protocols – Kyoto Protocol, Montreal Protocol, Indian policies - Environment Protection Act 1986, Waste Management rules 2000.

Course Outcomes:

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

CO 1. Explain the fundamental concepts of energy, ecosystems & environment.
CO 2. Recognize various environmental problems and their effects.
CO 3. Apply various air & water remediation methods.
CO 4. Apply waste management techniques.
CO 5. Apply the concepts of sustainability

Text Books:

- K. Asthana, Meera Asthana, A Text Book of Environmental Studies, S Chand & Co., New Delhi.
- P. Meenakshi, Elements of Environmental Science & Engineering, PHI, New Delhi
- M.M. Sulphey, M.M. Safeer, Introduction to Environment Management, PHI, New Delhi
- S K Dhameja, Environmental Engineering & Management, S K Kataria& Sons, New Delhi

Lab Work:

Basic Analysis of Water Quality Parameters: pH, Acidity, Alkalinity, Solids.

Skill Based Mini Project: Students have to deliver a presentation in class preferably on power point and submit a write up of the same on following topics (preferably group project wherein students divided into group of 4):

1. Identification of potential water related problems in the vicinity of their residence and propose solutions for these problems.
2. Identification of potential air pollution issues in the vicinity of their residence and propose solutions for these problems.
3. Identify waste related issues in the vicinity of their residence and propose solutions for these issues.
4. Study of Solar Energy Panel in the Institute.
5. Study of Wind Mill in the Institute.