

# Flexible Scheme & Syllabus

2022-2023

## B.Tech.

in

# Electrical Engineering



**Madhav Institute of Technology & Science**  
Gwalior-474005

## **Engineering Mathematics –I :100011**

### **Course Objectives:**

- To understand the techniques of differential and integral calculus in engineering problems
- To expose to the concept of ordinary and partial differentiation
- To explore with matrix and its applications
- To understand Boolean algebra and graph theory

### **Unit 1:**

**Maclaurin's and Taylor's theorem, Partial differentiation, Euler's theorem, Jacobian, Maxima and Minima of one and two variables, Convergence of Sequence and series Test.**

### **Unit 2:**

**Definite integral as limit of a sum, application in summation of series, Beta and Gamma function and its properties, transformation of Beta function, Gamma functions, transformation of Gamma function, relation between Beta and Gamma function, Legendre's duplication formula, double & triple integral, Change of order of integration, Length of the curves, Volumes and surfaces.**

### **Unit 3:**

**Ordinary differential equations of first and higher order, Linear higher order differential equation with constant coefficients, Homogeneous linear differential equation and Simultaneous differential equations.**

### **Unit 4:**

**Matrix, Rank of Matrix, Echelon form, Normal form of matrix, Solution of simultaneous equation by elementary transformation, Consistency of equation, Eigen values and Eigenvectors, Normalized eigenvector, Cayley Hamilton theorem and its application to finding inverse of matrix.**

### **Unit 5:**

**Introduction to Algebra of Logic, statement, Logical connector, Types of Conditional statement, Logical equivalence, CNF and DNF, Algebraic laws, De Morgan's laws, Boolean algebra, Principle of duality basic theorems, Boolean expressions and function, DNF and CNF form and Switching circuit.  
Graph Theory, graph, Types of graphs, walk, path, circuit, Hamiltonian graph, Euler graph and its applications, Tree, Spanning tree and its properties.**

### **Course Outcomes**

After completing this course, student will be able to:

- CO1 Apply differential calculus in solving basic engineering problems
- CO2 Use integration techniques to determine the solution of various complex problems
- CO3 Solve linear higher order differential equation with constant coefficients
- CO4 Apply the concepts, terminology, methods and conventions of Matrix to solve the mathematical problems.
- CO5 Concept of Boolean algebra and graph theory

### **Recommended Books:**

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10<sup>th</sup> Edition (2011).
2. C.L Liu: Discrete Mathematics, 4<sup>th</sup> Edition 2012.
3. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt.Ltd, 5<sup>th</sup> Edition (2016).
4. F. B .Hildebrand: Advanced Calculus for application, Englewood Cliffs, N. J. Prentice- Hall, 2<sup>nd</sup> Edition (1980).
5. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43<sup>rd</sup> Edition (2015).
6. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1<sup>st</sup> Edition (2017).

## **Engineering Graphics**

### **Course Objectives:**

- To inculcate the imagination and mental visualization capabilities for interpreting the geometrical details of common engineering objects.
- To impart knowledge about principles/methods related to projections of one, two, and three-dimensional objects.

### **Unit - 1**

**Introduction and scale: Basics of instruments, Lettering and dimensioning, Plane geometrical constructions. Plain and diagonal scale - Representative fraction, Unit conversion and Exercises based on linear, area, volume and speed. Scale of chord.**

**Engineering curves: Cycloidal curves - cycloid, epicycloid and hypocycloid curve, tangent and normal.**

**Spiral curves - Archimedean and logarithmic spiral curves. Tangent & normal on the curves. Involute curve.**

### **Unit - 2**

**Projection of points: Introduction, types of projections, quadrant system, positions of points and Exercise.**

**Projection of straight line: Introduction, Orientation of a straight line, Traces of a line and Exercise.**

### **Unit - 3**

**Projection of planes: Introduction, Types of planes, Traces of planes, Position of planes and Exercise.**

**Projection of solids: Introduction, Types of solids, Positions of solids and Exercise.**

### **Unit - 4**

**Section of solids: introduction, Types of section planes and Anti-section and Exercise.**

**Development of surfaces of right solids: Introduction, Methods of development & anti-development and exercise.**

**Intersection of cylinders: Introduction, methods of developments, intersection of cylinder by another cylinder and exercise.**

### **Unit - 5**

**Isometric projections: Introduction, isometric scale, isometric axis, isometric view and isometric projections from orthographic views, orthographic views from pictorial view and exercise.**

**Computer Aided Drafting using Auto CAD: Introduction, software's basic commands, transformation and editing commands.**

### **Course Outcomes:**

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

- CO1. **Visualize** the geometric details of engineering objects.
- CO2. **Translate** the geometric information of engineering objects into engineering drawings.
- CO3. **Draw** orthographic projections and sections.
- CO4. **Develop** knowledge to read, understand and explain drawing.
- CO5. **Improve** their skills so that they can apply these skills in developing new products.
- CO6. **Prepare** simple layout of factory, machine and buildings.

### **Text books:**

1. Engineering Drawing by N. D. Bhatt, Charotar Publication Pvt. Ltd.
2. Engineering Drawing by P.S. Gill, S. K. kataria& sons, Delhi
3. Engineering Drawing by BasantAgrawal& C. M. Agrawal, Tata McGraw Hill Education Pvt. Ltd.
4. Engineering Graphics by K. Venugopal, New Age International Publication, India

### **NPTEL Link for Engineering Graphics:**

<http://nptel.ac.in/courses/112103019/>

## **Basic Electrical & Electronics Engineering: 100022**

### **Course Objectives:**

- To impart basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer, and its terminology.
- To make familiarize the students about the working of rotating electrical machine, various electronic circuits and its importance.

### **Unit I - D.C. Circuits Analysis:**

**Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.**

### **Unit II –Single-phase AC Circuits:**

**Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.**

### **Unit III- Magnetic Circuits:**

**Basic definitions, AC excitation in magnetic circuits, self-inductance and mutual inductance, Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Flux,MMF and their relation, analysis of magnetic circuits.**

### **Unit IV- Single-phase Transformer & Rotating Electrical Machines:**

**Single phase transformer, Basic concepts, construction and working principle, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.**

### **Unit V - Digital Electronics, Devices & Circuits:**

**Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates- symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations**

### **Recommended Books:**

1. Basic Electrical and Electronics Engineering, D.P. Kothari & I.J. Nagrath-Tata McGraw Hill
2. Basic Electrical and Electronics Engineering, V N Mittle & Arvind Mittal -Tata McGraw Hill
3. Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
4. Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
5. Principles of Electrical Engineering- Vincent Del Toro- Prentice Hall.
6. Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH
7. Integrated Electronics- Millmann & Halkias
8. Electronics Devices & circuits- Sanjeev Gupta, Dhanpat Rai Publication
9. Basic Electrical and Electronics Engineering, D.C Kulshreshtha-Tata McGraw Hill

### **Course Outcomes**

After the completion of the course, the student will be able to –

**CO 1. Solve dc & ac circuits by applying fundamental laws & theorems**

**CO 2. Compare** the behavior of electrical and magnetic circuits for given input

**CO 3. Explain** the working principle, construction, applications of rotating electrical machines

**CO 4. Explain** the working principle, constructional details, losses & applications of single phase transformer.

**CO 5. Select** the logic gates for various applications in digital electronic circuits.

**CO 6. Explain** characteristics of Diode and Transistor.

## Basic Electrical & Electronics Engineering Lab

### LIST OF EXPERIMENT

1. To verify Kirchoff's Current Law & Kirchoff's Voltage Law.
2. To verify Superposition Theorem
3. To determine resistance & inductance of a choke coil.
4. To determine active & reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter & measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.

### Course Outcomes:

After the completion of the lab, the student will be able to –

- CO 1. **Verify** circuit theorems.
- CO 2. **Perform** tests on transformer for determination of losses, efficiency & polarity.
- CO 3. **Acquire** teamwork skills for working effectively in groups
- CO 4. **Prepare** an organized technical report on experiments conducted in the laboratory

## Skill-Based Mini Project Basic Electrical & Electronics Engineering

1. Enlist the different electrical loads available in your home and prepare their rating chart.
2. Design the residential house wiring using fuse, switch, and indicator, lamp and energy meter. Also apply the Thevenin's theorem for finding the current in a particular branch of the circuit.
3. If one FTL (Fluorescent Tube Light) is replaced by LED bulb.
  - A. Calculate the Monthly electrical energy saving?
  - B. Calculate the monthly savings in electricity bill?Note: LUX level of FTL and LED bulbs must be the same (follow BEE Guide lines). Consider electricity bill charges from MP Vidyut Vitran company website.
4. What is the use of condenser in a ceiling fan? Draw a wiring diagram for the testing of motor winding.
5. Find the different ways/ Methodologies/ Guidelines, by which energy can be conserved in domestic applications?
6. Design a working model for controlling one lamp by two 2-way switch.
7. Visit the electrical machine lab and enlist different types of AC and DC motors along with their ratings. Also mention their industrial applications.
8. Visit the panel room and identify the different safety practices followed by electrical engineer.
9. Enlist different measuring instruments available in electrical workshop lab. Also prepare a comparison chart for Analog and digital measuring instruments.

## **Computer Programming**

### **Course Objectives:**

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To study the concepts of procedural and object oriented programming.
- To design and implement basic programming solutions using programming constructs.

### **Unit I**

**Introduction to Programming, types of computer programming languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, variables, input/output, Operators & Expressions, Precedence of operators.**

### **Unit II**

**Control Statements and Decision Making: goto statement, if statement, if-else statement, nesting of if statements, The switch statement, while loop, do...while loop, for loop, nesting of for loops, break and continue statement. Function Basics, Function Prototypes, Passing Parameter by value and by reference, Default Arguments, Recursion. Arrays: One-dimensional Arrays, Multidimensional Arrays, Passing Arrays to Functions.**

### **Unit III**

**Strings, Pointers, Structures and File handling:, operations on Strings, Basics of Pointers & Addresses, reference variable, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings. Dynamic memory allocation using new and delete operators. Structures & Union, Pointer to Structure, Self-Referential Structures. File Concepts, Study of Various Files and Streams, operations on files.**

### **Unit IV**

**Object Oriented Paradigm, Features of OOPS, Comparison of Procedural Oriented Programming with Object Oriented Programming, Abstract Data Types, Specification of Class, Visibility Modes, Defining Member Functions, Scope Resolution Operator, Constructors, its types, and Destructors, Creating of Objects, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Friend Function.**

### **Unit V**

**Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading. Inheritance: Introduction, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath.**

### **Recommended Books:**

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusamy.
- Fundamentals of Programming C++, Richard L. Halterman.

### **Course Outcomes:**

After completing this, the students will be able to:

CO1: identify situations where computational methods and computers would be useful.

CO2: develop algorithms and flowchart for a given problem.

CO3: describe the concepts of procedural programming.

CO4: explain the concepts of object oriented programming and its significance in the real world.

CO5: analyze the problems and choose suitable programming techniques to develop solutions.

CO6: develop computer programs to solve real world problems.

## Electrical Engineering Materials:130121

### Course Objectives:

- The objective is to familiarize the students with different types of Engineering materials and their use in the field of Electrical Engineering.

**Unit I. Conducting Materials:** The conductivity of metals and alloys, General properties, Classification of conducting materials, Low resistivity and high resistivity materials, their properties and applications, Electrical and mechanical properties and applications of Cu, Al, Steel, ACSR conductor, AAAC conductor, Tungsten, Molybdenum, Platinum, mercury, lead, manganin, metals and Alloys for fuses, superconductivity and its applications.

**Unit II. Semiconductor Materials:** Classification of materials based on atomic structure, conductors, insulators and semiconductors, Electron energy and energy band theory, Semiconductor materials, Intrinsic semiconductors, Extrinsic semiconductor, N type materials, P type materials, minority and majority carriers. Formation of PN junction by alloying, Merits of semiconductor materials for use in electrical Engg., Factors affecting semiconductors, application of semiconductor materials, Hall effect with mathematical treatment.

**Unit III. Magnetic Materials:** Different terms associated with magnetic materials. Classification of magnetic materials, Diamagnetic, Paramagnetic and ferromagnetic materials, Curie point, Magnetostriction, electromagnet and its uses, Magnetization curve, Hysteresis and eddy current loss, Soft and hard magnetic materials, their properties and applications, its advantage and disadvantages, requirements of magnetic materials for use in Electrical machines, Magnetic anisotropy, Spontaneous magnetization.

**Unit IV. Dielectric materials:** Behavior of dielectrics in static and alternating fields, polarization, Dielectric constant of mono atomic gases, ionic polarization, Dipolar polarization, internal fields in solids and liquids, Polarizability, Frequency dependence of dielectric polarization, permittivity, dielectric losses, significance of the loss tangent dipolar relaxation, Ferroelectricity, piezoelectricity.

**Unit V. Insulating materials:** General electrical, mechanical, thermal and chemical properties of insulating materials, classification of insulating materials on the basis of temperature rise. Gaseous insulating materials properties and application of nitrogen, liquid insulating materials, their main features, Transformer oil, testing the dielectric strength of transformer oil. Ferrous metals and non ferrous metals.

**Introduction to nano material.**

### Recommended Books:

- Science of Engineering Materials By C.M.Srivastava & C.Srinivasan, New Age International Publisher, 2010.
- A Text Book Of Electrical Engineering Materials By P.L. Kapoor, Khanna Publication, 2016
- Electrical Engineering Materials By A.J. Dekker, PHI, 2015
- An Introduction To Electrical Engineering Materials By C.L. Indulkar, S. Thiravengadam, S. Chand & Co, 2006

### Course Outcomes

After completing this course, the student will be able to:

**CO1: Describe** the properties and applications of conducting materials.

**CO2 : Explain** behavior of semiconductor materials, their classification and applications.

**CO3: Select** appropriate Magnetic materials for given applications.

**CO4 : Explain** dielectric materials, their behavior in different fields, polarization and dielectric losses

**CO5: Select** appropriate insulating material depending upon specific requirement

## **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: Multilateral 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. Sulphery, M.M. Safer, 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.