



माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर  
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR  
Deemed University

(Declared under Distinct Category by Ministry of Education, Government of India)

NAAC ACCREDITED WITH A++ Grade

Gola Ka Mandir, Gwalior (M.P.)- 474005, INDIA

Ph.:+91-751-2409300, E-mail: vicechancellor@mitsgwalior.in, Website: www.mitsgwalior.in



# Syllabus

*Effective for Academic Year 2024-25*

## B.Tech. Program

in

## Electrical Engineering

(I Semester)



**Department of Electrical Engineering**



DC	13241101	Electrical Engineering Material	3-0-0
----	----------	---------------------------------	-------

**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, AACR conductor, Tungsten, Molybdenum, Platinum, mercury, lead, manganese, 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., Merits of semiconductor materials, Factors affecting semiconductors, application of semiconductor materials, Hall Effect.

**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 & Insulating 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, permittivity, dielectric losses, significance of the loss tangent dipolar relaxation, Ferroelectricity, piezoelectricity. 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

**Unit-V. Nanomaterials & Energy Efficient Materials: Introduction to nanomaterials, general properties of nanomaterials, applications of nanomaterials in science, engineering and technology. Energy Efficient Materials: Green Materials, Biomaterials, Natural and Synthetic Polymers, Photovoltaic (PV) thin films for solar cells.**

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

**CO5: Discuss** the merits and demerits of nanomaterials in green technology

**Course Articulation Matrix**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	-
<b>CO2</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	-
<b>CO3</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	-
<b>CO4</b>	3	3	2	3	3	-	-	-	-	-	-	3	2	-
<b>CO5</b>	3	3	2	2	2	-	-	-	-	-	-	3	2	-



ESC	13241102	Computer Programming	2-0-2
-----	----------	----------------------	-------

**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:**

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

**Course Outcomes:**

After completing this, the students will be able to:

CO1: Develop algorithms and flowchart for a given problem

CO2: Describe the concepts of procedural programming

CO3: Explain the concepts of object oriented programming and its significance in the real world

CO4: Develop computer programs to solve real world problems

CO5: Debug & test program effectively



**Course Articulation Matrix**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	3	2	3	-	-	2	1	1	1	2	-	2
<b>CO2</b>	3	3	3	3	3	-	-	2	2	2	1	2	-	2
<b>CO3</b>	3	3	3	3	3	-	-	2	1	1	1	3	-	2
<b>CO4</b>	3	3	3	2	3	-	-	2	2	2	2	2	-	2
<b>CO5</b>	2	2	2	3	3	-	-	2	2	2	2	2	-	2



ESC	13241103	Basic Civil Engineering & Mechanics	3-0-0
-----	----------	-------------------------------------	-------

**Course Objectives:**

To develop a thorough understanding of building materials and construction elements, including their properties, placement, and stabilization on site, while applying principles of statics to analyze forces on rigid bodies and determinate structures, such as beams and trusses, ensuring safe and efficient construction practices.

**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 levelling.

**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 co-planer 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 inequilibrium 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.

**Recommended Books:**

1. Surveying, Vol.-1, Punmia B.C., Laxmi Publications, 17<sup>th</sup> edition, 2016
2. Building Material, B.C. Punmia, Laxmi Publications, 2016
3. A text book of Engineering Mechanics, D.S. Kumar, Katsons Publications, 2013
4. Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3<sup>rd</sup> edition, 2013

**Courses Outcomes**

Upon completion of the course, a student will be able to

CO1: Explain concepts and terminologies of building materials, surveying and mechanics.

CO2: Apply various methods for surveying and mechanics.

CO3: Determine the location, area and volume of objects on ground surface.

CO4: Solve the problems of surveying and mechanics by using various methods.

CO5: Analyse the effects of system of forces on rigid bodies in static conditions

**Course Articulation Matrix**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1	1	1	1	1	-	2	-	-
CO2	2	1	2	2	2	1	1	1	1	1	-	2	-	-
CO3	2	2	2	2	2	2	1	1	1	1	2	2	-	-
CO4	2	2	2	2	2	1	2	1	1	1	2	2	-	-
CO5	2	2	2	3	2	2	1	1	1	1	2	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantially



ESC	13241104	Basic Mechanical Engineering	3-0-0
-----	----------	------------------------------	-------

### Course Objectives:

To develop the fundamentals of Engineering materials, measurement and reciprocating machines and to understand the Thermodynamic laws, steam generator and reciprocating machines for solving engineering problems.

**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.

**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, Refrigeration, vapour 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.

### Recommended 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:

CO1: Select appropriate material for specific engineering applications

CO2: Develop a foundational understanding of measurement principles, focusing on the accurate and precise measurement of physical quantities such as temperature, pressure, velocity, flow, strain, force, and torque

CO3: Describe the principles of fluid motion, including the concepts of static and kinetic energy in fluid systems.



CO4: Apply thermodynamics laws to analyze energy exchanges and transformations in various thermodynamic systems.

CO5: Study the Otto and Diesel cycles in detail, learning how these cycles govern the operation of internal combustion (IC) engines and influence their efficiency and performance.

**Course Articulation Matrix**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	1	2	1	2	1	1	1	1	1	-	2	-	-
<b>CO2</b>	3	1	2	2	2	1	1	1	1	1	-	2	-	-
<b>CO3</b>	3	3	3	2	2	2	1	1	1	1	2	2	-	-
<b>CO4</b>	3	3	3	2	2	1	2	1	1	1	2	2	-	-
<b>CO5</b>	3	3	3	3	2	2	1	1	1	1	2	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantially





ESC	13241105	Basic Electrical & Electronics Engineering	2-0-0
-----	----------	--------------------------------------------	-------

**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, rotating electrical machine and its terminology.
- To make familiarize the students about the working of, 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 & Resonance:** Magnetic Circuits: Concept of MMF, flux and magnetic reluctance, Self and mutual inductances, Dot convention, coefficient of coupling and coupled circuits. Resonance: Series and Parallel resonance, Bandwidth, Q-factor and selectivity.

**Unit IV- Single-phase Transformer & Rotating Electrical Machines:** Single phase transformer, Basic concepts, construction and working principal, 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



### Course Outcomes: Basic Electrical & Electronics Engineering

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

- CO 1.** Solve dc & ac circuits by applying fundamental laws & theorems
- CO 2.** Analyze magnetic circuits and resonance characteristics of ac electric circuits
- CO 3.** Describe the working principle, construction, applications of single phase transformer & rotating electrical machines
- CO 4.** Select the logic gates for various applications in digital electronic circuits
- CO 5.** Explain the characteristics and parameters of Diode and Transistor

### Course Articulation Matrix

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	-
<b>CO2</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	-
<b>CO3</b>	3	3	3	3	2	-	-	-	-	-	-	3	2	-
<b>CO4</b>	3	3	2	3	3	-	-	-	-	-	-	3	2	-
<b>CO5</b>	3	3	2	2	2	-	-	-	-	-	-	3	2	-

1 - Slightly; 2 - Moderately; 3 – Substantially