MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)

NAAC Accredited with A++ Grade

Flexible Scheme & Syllabus

2021-2022

B.Tech.

in

Electrical Engineering

(II Semester)

Madhav Institute of Technology & Science

Gwalior-474005

Engineering Materials:130211

Course Objectives:
The Objective is to familiarize the students with different types of Engineering materials and their use in the field of Electrical Engineering.

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Describe** the properties and applications of conducting materials.	Skill Development
2	**Explain** behavior of semiconductor materials, their classification and applications.	Skill Development
3	**Select** appropriate Magnetic materials for given applications**.**	Employability Development
4	**Explain** dielectric materials, their behavior in different fields, polarization and dielectric losses	Skill Development
5	**Select** appropriate insulating material depending upon specific requirement	Employability Development

Unit I. Conducting Materials: The conductivity of metals and alloys, Generals 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, Polaris ability, Frequency dependence of electronic polarization, permittivity, dielectric losses, significance of the loss tangent dipolar relaxation, Ferro electricity, 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.

Recommended Books:

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

Basic Civil Engineering & Mechanics: 100020

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: 100021

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 : 100021
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.

Basic Electrical & Electronics Engineering: 100022

Course Objectives:

- To impart the basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits and its terminology, the importance of transformers in transmission and distribution of electric power.
- To expose the students to the working of DC Machine, various electronic circuits and its importance.

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Solve** DC& AC circuits by applying fundamental laws & theorems	Skill Development
2	**Analyze** the response of linear electrical and magnetic circuits for given input	Skill Development
3	**Explain** the working principle, construction, applications of rotating electrical machines	Skill Development
4	**Explain** the working principle, constructional details, losses & applications of single phase transformer.	Skill Development
5	**Select** the logic gates for various applications in digital electronic circuits.	Skill Development
6	**Explain** characteristics of Diode and Transistor.	Skill Development

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

Basic Electrical & Electronics Engineering Lab (100022)

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Verify** circuit theorems.	Skill Development
2	**Perform** tests on transformer for determination of losses, efficiency & polarity.	Skill Development
3	**Demonstrate** the constructional features of electrical machines	Skill Development
4	**Acquire** teamwork skills for working effectively in groups	Skill Development

LIST OF EXPERIMENT

1. To verify Kirchhoff's Current Law & Kirchhoff'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.

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Engineering Physics: 100013

Course Objectives:

This course is designed to impart fundamental knowledge about some areas of physics which are to the core of emerging technologies. It is planned to provide knowledge about Quantum mechanics, Lasers, Fiber Optics, Hologhphy, Superconductor, Nano materials, Dielectric and piezoelectric materials. Laboratory sessions are also designed which are blended with experiments on the fundamental and advanced areas of physics.

Unit I
Quantum mechanics: Planck's quantum hypothesis, Wave-particle duality of radiation, de-Broglie matter waves, Davisson and Germen's electron diffraction experiment, Compton effect, Phase and group velocity, Heisenberg uncertainty principle and its applications, wave function and its significance, Eigen value and Eigen function, Schrödinger wave equations, particle in one dimensional potential box.

Unit II
Lasers: Properties of lasers, the basic process of lasers, Population- inversion, classification of lasers, working of He-Ne, Ruby, Nd: YAG and$CO2$ lasers, Applications of Lasers in Communication, Medical and Industry. Optical fibers: Light guidance through optical fibers, the qualitative idea of critical and acceptance angle, types of fibers, numerical aperture, V-Number, intermodal & material dispersions in fiber. Holography: Basic principle of holography, Construction and reconstruction of Image on hologram and applications of holography.

Unit III
Basic of semiconductors: Density of energy states, Energy-bandformations, direct and indirect band gap, Effective mass, Fermi energy levels. Mobility and carrier concentrations (intrinsic). Semiconductor Devices: Properties of PN junction and I-V diode equation, Photovoltaic cell, LED Materials for fabrication, LED Structures and Characteristics; Injection Laser Diode (ILD).

Unit IV
Superconductors: Free electrons theory of metals, Temperature dependence of resistivity in superconducting Metals, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High-temperature superconductors and Applications of superconductors. Nanomaterials: Basic principle of nanoscience and technology, structure, properties ad uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Unit V
Dielectrics Materials: Polar and Non-Polar Dielectrics, Dipole moment and Polarization, Dielectric constant& Polarization, Gauss law in Dielectric, the relation between electric field vector E, P and D. Piezoelectric materials- Ferroelectric materials, Piezoelectric effect direct and converse parameter definitions.

Course outcomes: Upon successful completion of the course, the student will be able to
CO1 Explain the basic knowledge of quantum physics and apply it to the behaviour of a system at the
microscopic level and solve the problems.
CO2 Interpret the requirements classification properties and application of laser and optical fibers.
CO3 Describe the basic concepts and theory of semiconductor for devices application.
CO4 Explain the principle, types, properties and application of superconductors and nanomaterials.
CO5 Apply the knowledge of characteristic of Dielectrics and Piezoelectric materials

Reference books

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Concepts of Modern Physics, Arthur Beiser, Tata McGraw-Hill,6th edition,2009.
1. Optics, A.Ghatak, McGraw Hill, 2012.
2. Engineering Physics , Hitendra K Malik& A.K. Singh, Mc Graw Hill Education Private Limited
3. Elements of Modern Physics, S.H. Patil
4. Kiruthiga Sivaprastha, Modern Physics, S. Chand
5. A Textbook of Engineering Physics, Gaur and Gupta, Dhanpat Rai Publishers, New Delhi,8th edition,.2011.
6. Electrical Engineering Materials by A.J. Dekker, PHI publication
7. Lasers and non-linear optics, B.B.Laud, New Age international,3rd edition,2011
8. Solid State Physics, S.O.Pillai , New Age International Ltd, publishers
9. Theory for Telecommunications, C.S.Liu and V.K.Tripathi, FoundationBooks, New Delhi,2007

Engineering Physics laboratory (100013)

1 To determine the specific charge (e/m) of an electron by Thomson method.
2 To determine the specific rotation of sugar solution with the help of Polari meter.
3 To measure the planks constant using light emitting diode.
4 To determine the energy band gap of a given sample material.
5 To measure the dielectric constant of a substance by resonance method.
6 To study and verify the outputs of various logic gates
7 To determine the wavelength of monochromatic light with the help of Newton's ring.
8 To study the V-I characteristics of semiconductor diode
9 To study V-I Characteristics of LED
10 To determine the dispersive power of the material prism for violet and yellow coolers of mercury light by spectrometer.
11 To study the working of halleffect device.
12 To study the working mechanism of spin coating unit.
13 To determine the prominent spectral lines of mercury spectrum by using a plane diffraction grating

Electrical Workshop: 130213

Course outcomes focused on employability/entrepreneurship and skill development

S No.	Course Outcome (CO)	Mapping
1	**Identify** different types of electrical loads	Skill Development
2	**Apply** illumination standards and safety practices for various applications	Skill Development
3	**Select** cables, switches and protective devices for specific applications	Employability Development
4	**Develop** teamwork skills for working effectively in groups	Skill Development
5	**Prepare** the technical report on experiments conducted in the lab	Employability Development

LIST OF EXPERIMENTS

1. To get familiarized with the testing bench
2. To identify and test different types of cables and connectors
3. To identify and use different types of Fuses, MCB, ELCB, MCCB, Insulators and relays with their ratings
4. To design basic electronic circuits using soldering and analyze their waveforms
5. To get familiarized with safety practices and maintenance techniques followed in Industries
6. To determine Realtime domestic and industrial electrical load
7. To understand and demonstrate process of electrical power generation, transmission and distribution in co-relation with real time power grid
8. To determine Lux for different applications as per illumination requirements (BEE Standards)
9. To measure phase and line parameters of a three phase AC circuit
10. To get familiarized with different types of earthing and earth resistance determination