

COURSE TITLE : ELECTRICAL ENGINEERING MATERIALS
COURSE CODE : 5034
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Conducting Materials	13
2	Semiconducting Materials.	13
3	Magnetic Materials.	13
4	Insulating Materials	13
Total		52

Course Outcome:

Sl.	Sub	On completion of this course the student will be able:
1	1	To comprehend different types of conducting materials.
2	1	To comprehend different types of semi conducting materials.
3	1	To comprehend different types of magnetic materials
4	1	To comprehend different types of insulating materials.

Specific Outcome:

MODULE I Conducting Materials

- 1.1.1 To list the electrical properties of conducting materials.
- 1.1.2 To list the mechanical properties of conducting materials.
- 1.1.3 To list the specifications of conducting materials.

- 1.1.4 To list out the properties of ;
 - i. Silver.
 - ii. Copper.
 - iii. Aluminum.
- 1.1.5 To identify the materials and alloys for high conductivity.
- 1.1.6 To explain the application of conducting materials.
- 1.1.7 To identify the materials of high resistivity.
- 1.1.8 To describe the application of high resistivity materials.
- 1.1.9 To identify the metals used for heavy duty metal contacts and fuses.
- 1.1.10 To identify the trade names of commonly used conductors.
- 1.1.11 To describe various types of resistors used in electronics.

MODULE II Semiconducting Materials.

- 2.1.1 To list the general properties of semiconducting materials.
- 2.1.2 To explain various types of semiconducting materials.
- 2.1.3 To describe the energy band diagram.
- 2.1.4 To describe covalent band.
- 2.1.5 To explain intrinsic and extrinsic semi conductor.
- 2.1.6 To explain majority and minority carriers.
- 2.1.7 To describe the doping process.
- 2.1.8 To identify P type, N type semiconductor.
- 2.1.9 To illustrate PN junction and its characteristics.
- 2.1.10 To give the application of semiconducting materials.
- 2.1.11 To identify the various types of diodes, transistors, IC etc.

MODULE III Magnetic Materials.

- 3.1.1 To state definitions of terms in magnetism.
- 3.1.2 To distinguish classifications of magnetic materials.
- 3.1.3 To explain BH curve.
- 3.1.4 To list out applications of magnetic materials.
- 3.1.5 To describe cyclic magnetization and magnetostriction.
- 3.1.6 To identify ferro-magnetic materials.
- 3.1.7 To identify soft magnetic materials.
- 3.1.8 To differentiate hard and soft magnetic materials.
- 3.1.9 To illustrate the properties of low carbon steel.
- 3.1.10 To illustrate the properties of CRGO.
- 3.1.11 To illustrate the properties of ferrites.

- 3.1.12 To list out applications of ferrites.
- 3.1.13 To identify the various types of inductors used in electronics.
- 3.1.14 To identify the various types of small transformers used in electronics.

MODULE IV Insulating Materials

- 4.1.1 To list the general properties of insulating materials.
- 4.1.2 To list out the classification of insulating material
- 4.1.3 To identify the structure composition and application of fibrous insulating materials.
- 4.1.4 To describe the effect of temperature and moisture on insulating materials.
- 4.1.5 To explain impregnating materials.
- 4.1.6 To describe the properties and application of ;
 - i. Ceramics and mica.
 - ii. Glass.
 - iii. Asbestos.
 - iv. Synthetic insulating material.
 - v. Liquid insulating materials.
 - vi. Transformer oil.
 - vii. Gas insulating materials.
- 4.1.7 To describe dielectric materials.
- 4.1.8 To explain polarization techniques.
- 4.1.9 To explain the application of dielectric materials.
- 4.1.10 To identify the various types of capacitors used in electrical and electronics engineering fields.

CONTENT DETAILS

MODULE- I

Conductors-electrical properties – resistivity – conductivity - temp. coefficient-dielectric strength, Mechanical properties-ductility, malleability, tensile strength-properties of silver, copper, aluminum and alloys(brass, bronze)-applications - Properties of High resistivity materials-low temperature co-efficient ,high melting point ,no tendency for oxidization , ductility - high mechanical strength – Tungsten – Carbon - Mercury – Nichrome – Eureka – Constantan – Platinum - applications - Materials used for heavy duty contacts-silver copper - copper cadmium. Trade names of commonly used conductors-ACSR, AAA etc.

MODULE- II

Semiconductors-general properties of semi conducting materials-Energy band diagram-covalent bond-intrinsic and extrinsic semi conductor- P and N type semi conducting materials-majority and minority

carriers-PN junction-applications -thermistors, photo conductive cells-photo voltaic cells- varistors-LED-LDR-Strain gauge- solar cells - components like diode – transistor – IC.

MODULE – III

Magnetic materials-General terms- permeability – absolute & relative permeability - flux , flux density, BH curve-curie point-classification- dia – para - ferro magnetic materials - examples-applications - magnetostriction-soft and hard magnetic materials, properties of - iron – silicon - CRGO – permalloy - ferrites-applications-components like inductors - transformers

MODULE- IV

Insulators-properties – visual – electrical – mechanical- thermal - chemical properties - Classification – based on operating temperature as per IS. Properties and application of fibrous material-impregnated fibrous-bitumen-wax-insulating liquid-enamel-varnish-ceramics-mica-asbestos-glass-rubber-synthetic resin-thermo-plast resin-Polyethylene-Teflon-PVC-Gas Insulating materials- air-Nitrogen-SF₆ - Dielectric materials - Polarization-applications-capacitors.

REFERENCES

1. P L Kapoor. A Textbook Of Electrical And Electronics Engineering Materials: Khanna publishers.
2. BASAK T K. Electrical engineering materials: Newage science.
3. S K BHATTACHARYA. Electrical and Electronic Engineering Materials: Khanna Publishers.