

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75a- ELECTRICAL ENGINEERING MATERIALS

(Open Elective-III)

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Course Objectives: The objectives of the course are to make the students learn about

- Classification of materials.
- Properties of materials and its applications.
- Domestic wiring and earthing
- Concept of polarization and dipolar polarization
- Classification of materials.

UNIT – I: Conducting Materials**10 Hrs**

Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials–classification of electrical materials–concept of atom – electron configuration of atom, conductors, general properties of conductors, factors effecting resistivity of electrical materials–electrical / mechanical / thermal properties of copper, aluminum, iron, steel, lead, tin and their alloys–applications.

Learning Outcomes:

At the end of this unit, the student will be able to

1. Understand the classification of conducting materials. **L1**
2. Analyze the properties of different conducting materials **L2**

UNIT – II: Dielectric and High Resistivity Materials**10 Hrs**

Introduction–solid, liquid and gaseous di electrics, leakage current, permittivity, dielectric constant, dielectric loss –loss angle –loss constant, Breakdown voltage and di electric strength of –solid, liquid and gaseous dielectrics, effect of break down–electrical and thermal effects, Polarization – electric, ionic and dipolar polarization. Effect of temperature and Frequency on dielectric constant of polar dielectrics. High Resistivity materials – electrical / thermal /mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite and their applications in electrical equipment.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the classification of di electric and high resistivity materials. **L1**
- Analyze the properties of di electric and high resistivity materials **L2**

UNIT – III: Solid Insulating Materials**10 Hrs**

Introduction–characteristics of a good electrical insulating materials–classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials-Asbestos, Bakelite, rubber, plastics, thermoplastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand about various characteristics of solid insulating materials **L1**
- Understand the classification of solid insulating materials. **L2**

UNIT – IV: Liquid & Gas Insulating Materials**10 Hrs**

Liquid insulating materials – Mineral oils, synthetic liquids, fluorinated liquids– Electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties Gaseous insulators– classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the classification of liquid insulating materials. L1
- Analyze the properties of liquid insulating materials L2

UNIT – V: Domestic Wiring**10 Hrs**

Wiring materials and accessories–Types of wiring–Types of Switches–Specification of Wiring–Staircase wiring- Fluorescent lamp wiring–God own wiring–Basics of earthing–single phase wiring layout for residential building.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand about wiring materials and accessories L1
- Understand about earthing and wiring layout of domestic buildings L2

Text Books:

1. Electrical Engineering Materials by G.K. Mithal, Khanna publishers, 2nd edition, 1991.
2. A course in Electrical Engineering Materials by R.K. Rajput, Laxmi publications, 2009.

Reference Books:

1. An Introduction to Electrical Engineering Materials by C.S. Indulkar and S. Thiruvengadam, S Chand & Company, 2008.
2. Electrical engineering Materials by Technical Teachers Training Institute, Madras, McGraw Hill Education, 1st Edition, 2004.
3. A course in Electrical Engineering Materials Physics Properties & Applications by S P. Seth, Dhanapat Rai & Sons Publications, 2018.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the classification of materials, domestic wiring materials and earthing. L1
- Analyze the properties of different electrical materials L2
- Apply where the materials are applicable based on properties of materials L3
- Design and develop Residential wiring, go down wiring and earthing. L4
- Understand the characteristics of materials L5

