

LNCT University
Diploma EX, III Semester Syllabus

ELECTRICAL ENGINEERING MATERIALS (DEX-304)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO-1	Explain the classification, characteristics and behavior of conducting materials including their thermoelectric effects and factors affecting conductivity and resistivity.
CO-2	Analyze the electrical, mechanical and thermal properties of dielectric insulating materials and their behavior under different conditions including breakdown mechanisms.
CO-3	Differentiate various types of magnetic materials based on their properties, hysteresis behavior and magnetic performance indicators such as Curie temperature and coercive force.
CO-4	Evaluate the characteristics of semiconductors including types, energy band structure, carrier transport phenomena and their applications in electronic devices.
CO-5	Identify and assess the applications, properties and limitations of special-purpose materials such as permanent magnets, structural and refractory materials and radioactive materials.

COURSE CONTENTS

UNIT I: CONDUCTORS CLASSIFICATION

High conductivity, high resistivity materials, fundamental requirements of high conductivity materials and high resistivity materials, mobility of electron in metals, factors affecting conductivity and resistivity of electrical material, thermoelectric Effect: Seeback effect, Peltier effect.

UNIT II: DIELECTRIC MATERIALS AND INSULATORS

Properties of gaseous, liquid and solid dielectric, dielectric as a field medium, electric conduction in gaseous, liquid and solid dielectric, breakdown in dielectric materials, mechanical and electrical properties of dielectric materials, effect of temperature on dielectric materials, polarization, loss angle and dielectric loss. Petroleum based insulating oils, transformer oil, capacitor oils and its properties,

UNIT III: MAGNETIC MATERIALS

Basic terms, classification of magnetic material: diamagnetic, paramagnetic, ferromagnetic, anti-ferromagnetic and amorphous material, hysteresis loop, magnetic susceptibility. coercive force, curie temperature, magneto-striction, factors affecting permeability and hysteresis loss.

UNIT IV: SEMI-CONDUCTORS

General concepts, energy bands, types of semiconductors: intrinsic semiconductors, extrinsic semi-conductors, compound semiconductor, amorphous semiconductor, Hall Effect, drift mobility, diffusion in semiconductors, semi-conductors and their applications.

UNIT V: SPECIAL PURPOSE MATERIALS

Nickel iron alloys, high frequency materials, permanent magnet materials, feebly magnetic materials, ageing of a permanent magnet, effect of impurities, Losses in Magnetic materials, Refractory Materials, Structural Materials and Radioactive Materials.

Reference Books: -

1. Electrical Engineering Materials, A.J. Dekker.
2. An Introduction to Electrical Engineering Materials, C. S. Indulkar and S. Thiruvengadam.
3. Material Science for Electrical & Electronics Engineers, Ian P. Hones.
4. Electrical Properties of Materials, L. Solymar and D. Walsh.