

Electrical Materials
(Open Elective - I, Offered by EEE Dept.)

Pre-requisites: NIL

Course Objectives:

1. To impart knowledge on the concepts of Dielectric electric materials in comparison with magnetic materials.
2. To introduce special purpose materials.
3. To make students familiar with the concepts of different materials for electrical applications.
4. To familiarize students with the internal concepts of electrical materials.

UNIT- I: Dielectric and Semiconductor Materials:(~10 Lecture Hours)

Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials,

Semiconductors: Intrinsic, Extrinsic types, Current carriers in semiconductor, Thermistors, Photoconductors, P-N junction Diode, Evolution of transistor.

UNIT - II: Magnetic Materials:(~8 Lecture Hours)

Classification of magnetic materials, properties of ferromagnetic materials, curie point, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials.

Special Purpose Materials - feebly magnetic materials, Ferrites, cast and cermet permanent magnets,

Ageing of magnets. Factors effecting permeability and hysteresis.

UNIT - III: Special Purpose Materials: (~8 Lecture Hours)

Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

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16) R. S. Lalitha Subramanian
13) S. R. Reddy
14) R. M. Jeyaraj
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12) G. S. Jeyaraj

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| 1) N. M. Kalyan | 4) S. S. Kumar | 7) M. S. Jeyaraj |
| 2) S. S. Jeyaraj | 5) | 8) S. S. Jeyaraj |
| 3) S. S. Jeyaraj | 6) S. S. Jeyaraj | 9) S. S. Jeyaraj |
| | | 10) S. S. Jeyaraj |

UNIT - IV: Materials for Electrical Applications:(~8 Lecture Hours)

Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetallic fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation. Piezoelectric materials, Pyroelectric materials.

UNIT - V: Materials for Specific Applications:(~8 Lecture Hours)

Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings. Sintered alloys for breaker and switch contacts.

Text Books:

1. R K Rajput, "A course in Electrical Engineering Materials", Laxmi Publications, 2009.
2. C S Indulkar, S Thiruvengadam, "An introduction to Electrical Engineering Materials", Revised Edition, S. Chand & Company, 2013.
3. T K Basak, "A course in Electrical Engineering Materials", New Age Science Publications 2009.



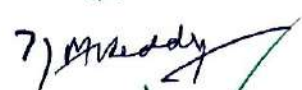



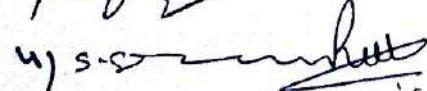

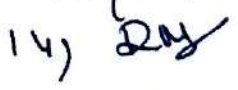



Reference Books:

- A.J. Dekker, "Electrical Engineering Materials", PHI Publication, 2006.
- TTTI Madras, "Electrical Engineering Materials", McGraw Hill Education, 2004.

Course Outcomes:

At the end of the course the students will be able to:

1. distinguish between magnetic and non-magnetic materials by acquiring the knowledge of their atomic structures.
2. analyze Dielectric and semiconductor materials.
3. analyze the magnetic materials using their properties.
4. identify special purpose materials for different applications.
5. analyze the working of different materials from the point of view of their applications in electrical industry.
6. analyze the working of special purpose materials from the point of view of their possible applications electrical & other fields.

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| 1) N. Mallik Reddy | 6)  | 11)  |
| 2) N. Suby Reddy | 7)  | 12) G. Anand |
| 3)  | 8)  | 13)  |
| 4) S. S.  | 9)  | 14)  |
| 5)  | 10)  | 15)  |
| | | 16) R. Balasubramanian |