Course Syllabi: UEE712 Electrical Engineering Materials (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UEE712; Electrical Engineering Materials

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

   - *Electrical Engineering Materials Adrianus J Dekker, Phi Learning Publishers.*
   - *Electrical Properties of Materials, 8th Edition by Solymar, L, Oxford University Press-New Delhi.*
   - *Introduction to Electrical EngineeringMaterials 4th Edn. 2004 Edition by Indulkar C, S. Chand & Company Ltd-New Delhi.*
   - *Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi.*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Elementary Materials Science Concepts: Bonding and types of solids, Crystalline state and their defects, Classical theory of electrical and thermal conduction in solids, temperature dependence of resistivity, skin effect, Hall effect.
   Dielectric Properties of Insulators in Static and Alternating field: Dielectric constant of mono-atomic gases, poly-atomic molecules and solids, Internal field in solids and liquids, Properties of Ferro-Electric materials, Polarization, Piezoelectricity, Frequency dependence of Electronic and Ionic Polarizability, Complex dielectric constant of non-dipolar solids, dielectric losses.
   Magnetic Properties and Superconductivity: Magnetization of matter, Magnetic Material Classification, Ferromagnetic Origin, Curie-Weiss Law, Soft and Hard Magnetic Materials, Superconductivity and its origin, Zero resistance and Meissner Effect, critical current density.
   Conductivity of metals: Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.
   Semiconductor Materials: Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:
   - Learn the basics of materials used in electrical engineering.
   - Realize the dielectric properties of insulators in static and alternating fields.
   - Explain the importance of magnetic properties and superconductivity.
   - Explain the behavior of conductivity of metals and classifications of semiconductor materials.

6. **Brief list of topics to be covered**
   - Elementary Materials Science Concepts

- Dielectric Properties of Insulators
- Magnetic Properties and Superconductivity
- Conductivity of metals
- Semiconductor materials