Subject Code : SIG1:1

MATERIAL SCIENCE AND NDT.

Unit – I : Chemical Bonds and Crystallography.

Point defect and line defect – Plastic and elastic materials – edge dislocation and screw dislocation – Elements of crystal system Crystallography – Unit cell – Crystal directions – Crystal planes – Miller indices – Symmetry elements of a crystal – Crystal structures of important engineering materials.

Unit – II : Conducting Materials.

Atomic interpretation of Ohm's Law – Relaxation time – Collision time and mean free path – Heat developed in a current carrying conductor – Sources of resistivity of metals and alloys – Thermal conductivity – Wiedmann Franz's Law – Thermal expansion – Electrical conductivity at high frequencies.

Unit – III : Dielectric Materials.

Fundamental definitions in dielectrics – Different types of electric polarization – Frequency and temperature effects on polarization – Dielectric loss – Internal field Claussius Mosotti relation – Determination of dielectric constant – Dielectric breakdown – Properties and different types of insulating materials.

Unit – IV : Superconducting Materials.

Explanations for the occurrence of super conductivity –General properties of super conductors – types of super conductors – applications of superconductors.

Unit – V: Non- Destructive Testing (NDT).

Radiographic methods – Photographic method – Magnetic methods – Electrical methods – Ultrasonic methods – Visual and other optical methods – Thermal methods – Surface defect detection by NDT.

Equipments used in NDT: Metallurgical microscope – Electron microscope – Scanning electron microscope.

Books for Study:

1. Material Science – M. Arumugam, Anuradha Agencies Publishers, Kumbakonam – 1990.

Books for References:

1. Materials Science and Metallurgy – O.P. Khanna and M. Lal, Dhanpat Rai & Sons – 1986.
2. Materials science and processes – R.B. Gupta, Satyaprakashan Publication – 1980.
3. Material science and Engineering – V. Ragavan – Prentice Hall India – 1985.
4. Material Science - A Multimedia Approach (with CDROM), P.W.S. Boston, 1996 – J.C. Russ, P.W.
5. Handbook of Biomedical Instrumentation – R.S. Khandpur, Tata McGraw Hill.