HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.E. FIRST YEAR (EC / CE / IT)

ELECTRONICS & COMMUNICATION

(In Force June 2006)

EC 104: MATERIAL SCIENCE

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Theory Hrs.	Theory Marks	Pract./ Viva Marks	Term Work Marks	Total Marks
2	---	3	100	---	---	100

1. **Introduction to Material Science:** Importance, Engineering requirement of materials, important properties of engineering materials, type.
2. **Crystal Geometry:** Atoms and atomic co-ordination, atomic structure, bonds in solids, crystal structure, Space lattice, unit cell, crystal systems, atomic packing, co-ordination number, crystal structure for metallic elements, crystal direction and planes, miller indices, inter-planer spacing, Bragg's law, X-ray diffraction.
3. **Crystal Imperfections:** Types, Frank-read source, Dislocations, Geometry and effect of dislocations, ordered & disordered structures, Stacking sequences & faults.
4. **Metals:** Ferrous metals - types, non-ferrous metals, alloys, composition, properties & uses of metals and alloys.
5. **Corrosion:** Types, factors, Mechanism and control.
6. **Miscellaneous Engineering Materials:** Introduction to HDPE, LDPE, thermoses, foam, resins, Teflon, PUF, glass wool, fiber glass, acrylic, silicon chips, fern, magnetic tapes, solar cells, neoprene, polyurethane, polyester fibers, high tensile steel etc. general and specific applications.
7. **Conductive Materials:** Electrical conductivity, Free electron theory of metals, relaxation time, collision time and mean free path, Joule's law, factors affecting resistively of conducting materials, Electrical conductivity of pure & impure metals, Thermal conductivity of metals, Conductor materials, High conductive & resistive materials, carbon & graphite, fuses, superconductivity.
8. **Magnetic Materials:** Magnetic properties, Classification of magnetic materials, field theory, diamagnetism, paramagnetic, Ferromagnetism, dipole moment, Ferromagnetic behavior at high & low temperature, Spontaneous magnetization, Magnetic anisotropy, Magnetostriction, Antiferromagnetism, Ferrites, Soft magnetic materials, hard magnetic materials, applications of magnetic materials.
9. **Insulators:** Dielectric gases, Liquid & Solid insulating materials, Films, Electrical Insulations, Insulating materials for electrical devices, Insulation measurements, Electrical strength, Factors affecting characteristics of insulating systems and effect of moisture.
10. **Semiconductors:** Energy bands, Bonds in semiconductors, Intrinsic & Extrinsic semiconductors, Hall effect, Drift & Diffusion mechanism for current flow, Semiconductor materials - properties, applications.
11. **Optical properties of Materials:** Light, Electromagnetic spectrum of visible radiation, Optical properties, Refractive Index, Birefringeness, dispersion, absorption, Excitons, Reflections, Phot-electri emission, photoconductivity, Materials for photo-voltaic cells, Luminescence, Lasers.

REFERENCE BOOKS:

1. Elements of material science by Van Vlack
2. Material science & processes by Zha & Zha
3. Material science & processes by R.B.Gupta
4. Material science & processes by Narula & Narula & Gupta
5. Material science & processes by Hajra Chaudhari
6. A course in Electrical Engineering Materials by Seth & Gupta