

Department of Applied Chemistry & Chemical Technology

SGS Institute of Technology and Science, Indore

BE 1<sup>st</sup> YEAR

CH 10502: CHEMISTRY

**UNIT I**

**Water**

Source, Types of impurities and their effects, Hardness, its expression and determination, Boiler troubles and their causes, treatment of water industrial and domestic purposes. Alkalinity and its determination, Numerical problems.

**UNIT II**

**(a) Lubricants**

Types of lubricants and principles of lubrications, properties (test) of lubricants, greases, graphite, cooling liquids and cutting fluids.

**(b) Corrosion**

Principle of corrosion, types of corrosion and methods of protection.

**UNIT III**

**Use of Free Energy in Chemical Equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT IV**

**Materials Chemistry**

**(a) Polymers and Polymerization**

Introduction, Classification, Types, mechanism, methods of polymerization. Structure-property relationships, compounding, general applications of polymer materials of industrial importance: PVC, Nylon66, Poly-ester, Bakelite, Kevlar, Teflon, Synthetic and natural rubbers. Concept of Biodegradable polymers.

**(b) Nanomaterials**

Introduction, synthesis, properties, nano-structured materials and their application.

**UNIT V**

**Spectroscopic Techniques and Applications**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques: Diffraction and scattering.

### Books and References recommended:

#### Text Books:

1. Palanna O.P., Engineering Chemistry (Mc Graw Hill)
2. Dara S.S., Engineering Chemistry (S. Chand publishing)
3. Maheswaramma K.S., Engineering chemistry (Pearson Education)
4. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices (Capital Pub)

#### Reference Books:

1. Rajaram & Kuriacose, Chemistry in Engineering and Technology Vol. -II (McGraw Hill)
2. Agrawal C.V., Chemistry of Engineering Materials. (B.S. Publications)
3. C. N. Banwell, Fundamentals of Molecular Spectroscopy (McGraw Hill)
4. T. Pradeep, Nano: The Essentials (Tata McGraw Hill Education)
5. D. Braun, Polymer Synthesis: Theory and Practice: Fundamentals, Methods, Experiments (Springer)

**Course Outcomes:** This course aims at imparting extensive knowledge of the subject to the students for making them understand the role of chemistry in the field of engineering. The focus is on developing analytical capabilities of students for the characterization and application of various materials in engineering. The course will enable student to

1. Understand the implications of hard water in industry and its treatment.
2. Conceptualize the applications of different types of industrially important materials such as polymers, lubricants, nano materials.
3. Rationalize bulk properties and processes using thermodynamic considerations.
4. Consider the chemical aspects of corrosion.
5. Understand the ranges of the electromagnetic spectrum, and principle & applications of spectroscopic techniques in engineering.