

APPLIED CHEMISTRY**Course Code: CHE 101****Credit****Units: 04****Total Hours: 40****Course Objective:**

The course aims to train the students in basic and applied principles of Chemistry. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply the knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields. The makeup of substances is always a key factor, which must be known. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject starting from the very basic bonding mechanism to the application of materials.

Course Contents:**Module I: Chemical Bonding (6 Hours)**

Fajan's rule; Hybridization. Valence bond and Molecular orbital theory for diatomic molecule (H_2 , N_2 & O_2); Bond order & magnetic characters of these molecules.

Module II: Thermodynamics & Chemical Equilibrium (Use of free energy in chemical equilibria) (8 Hours)

Le Chatelier's Principle; Equilibrium constant from Thermodynamic Constants; pH and pOH, Buffer Solution, Buffer Action

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Corrosion: Prevention and corrosion control.

Module III: Stereochemistry (6 Hours)

Symmetry and chirality, Isomerism; diastereomers, enantiomers, optical activity, absolute configurations of one chiral carbons and conformational analysis of ethane.

Module IV: Polymers (6 Hours)

Introduction; Polymerization; Addition and Condensation Polymerization. Thermosetting and Thermoplastic Polymers. Molecular Weight of Polymer; Rubber, Plastic and Fiber; Preparation, Properties and uses of PMMA, Polyester, Epoxy Resins and Bakelite, Silicone Polymers.

Module V: Water Chemistry (6 Hours)

Introduction and specifications of water, Hardness and its determination (EDTA method only), Alkalinity, Caustic embrittlement, Boiler feed water, boiler problems; scale, sludge, Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment, Water softening processes; Lime – soda process, Ion exchange method. Water for domestic use.

Module VI: Instrumental Methods of analysis (8 Hours)

Introduction; Principles of spectroscopy; Laws of absorbance,

IR: Principle, Instrumentation and Application

UV: Principle, Instrumentation and Application

NMR: Principle, Instrumentation and Application

Course Outcomes:

After successful completion of the course students will have the knowledge and skill to:

- Apply the principles of chemical sciences to understand the very basic bonding mechanism, thermodynamic requisites and energetic consideration of reactions. Application of engineering materials in different situations such as boiler corrosion, polymer science etc.

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

A: Attendance CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

Text & References:

1. Keeler, J., De Paula, J., Atkins, P. W. (2018). Atkins' Physical Chemistry. United Kingdom: Oxford University Press. ISBN 9780198814740
2. Rattan, S. Engineering Chemistry, Arihant Publication. ISBN: 8190691910
3. Plane, R. A., Sienko, M. J. (1979). Chemistry: Principles and Applications. Japan: McGraw-Hill. ISBN 9780070573215
4. Mohan, J. (2004). Organic Spectroscopy: Principles and Applications. United Kingdom: Alpha Science. ISBN 9780849339523
5. Jain, P.; Jain. Engineering Chemistry. (2020). India: Dhanpat Rai Publishing Company (P) Limited. ISBN 978-9352165728
6. Vollhardt, P., Schore, N., Vollhardt, K. P. C. (2018). Organic Chemistry: Structure and Function. United Kingdom: Macmillan Learning. ISBN 9781319187712