

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
New Scheme Based On AICTE Flexible Curricula
B.Tech. First Year

Branch- Common to All Disciplines

BT101	Engineering Chemistry	3L-0T-2P	4 Credits
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Course Contents:

- (i) **Water – Analysis, Treatments and Industrial Applications (4 Lectures)**
 Sources, Impurities, Hardness & its units, Determination of hardness by EDTA method, Alkalinity & Its determination and related numerical problems.
- (ii) **Boiler problem & softening methods (4 Lectures)**
 Boiler troubles (Sludge & Scale, Priming & Foaming, Boiler Corrosion, Caustic Embrittlement), Softening methods (Lime-Soda, Zeolite and Ion Exchange Methods) and related numerical problems.
- (iii) **Lubricants and Lubrication (4 Lectures)**
 Introduction, Mechanism of lubrication, Classification of lubricants, significance & determination of Viscosity and Viscosity Index, Flash & Fire Points, Cloud & Pour Points, Aniline Point, Acid Number, Saponification Number, Steam Emulsification Number and related numerical problems.
- (iv) **Polymer & polymerization (4 Lectures)**
 Introduction, types of polymerisation, Classification, mechanism of polymerisation (Free radical & Ionic polymerization). Thermoplastic & Thermosetting polymers Elementary idea of Biodegradable polymers, preparation, properties & uses of the following polymers- PVC, PMMA, Teflon, Nylon 6, Nylon 6:6, Polyester phenol formaldehyde, Urea- Formaldehyde, Buna N, Buna S, Vulcanization of Rubber.
- (v) **Phase equilibrium and Corrosion (5 Lectures)**
 Phase diagram of single component system (Water) Phase diagram of binary Eutectic System (Cu-Ag.) Corrosion: Types, Mechanisms & prevention.
- (vi) **Spectroscopic techniques and application (6 Lectures)**
 Principle, Instrumentation & Applications, electronics spectroscopy, Vibrational & Rotational Spectroscopy of diatomic molecules.
- (vii) **Periodic properties (4 Lectures)**
 Effective Nuclear Charge, Variations: S, P, d & f Orbital energies of atoms in periodic table, Electronics Configuration, atomic & Ionic sizes, electron affinity & electro negativity, Polarizability & Oxidation States.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular

- energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Practical List

NOTE: At least 8 of the following core experiments must be performed during the session.

- 1. Water testing**
 - (i) Determination of Total hardness by Complexometric titration method.
 - (ii) Determination of mixed alkalinity
 - a) **OH & CO₃**
 - b) **CO₃ & HCO₃**
 - (iii) Chloride ion estimation by Argentometric method.
- 2. Fuels & Lubricant testing:**
 - (i) Flash & fire points determination by
 - a) Pensky Martin Apparatus,
 - b) Abel's Apparatus
 - c) Cleveland's open cup Apparatus
 - d) Calorific value by bomb calorimeter.
 - (ii) Viscosity and Viscosity index determination by
 - a) Redwood viscometer No.1
 - b) Redwood viscometer No.2
 - (iii) Proximate analysis of coal
 - a) Moisture content
 - b) Ash content
 - c) Volatile matter content
 - d) Carbon residue
 - (iv) Steam emulsification No & Anline point determination
 - (v) Cloud and Pour point determination of lubricating oil
- 3. Alloy Analysis**
 - (i) Determination of percentage of Fe in an iron alloy by redox titration using N-Phenyl anthranilic acid as internal indicator.
 - (ii) Determination of Cu and or Cr in alloy by Iodometric Titration.
 - (iii) Determination of % purity of Ferrous Ammonium Sulphate & Copper Sulphate.

Reference Books :

- 1 Chemistry in Engineering and Technology - Vol.1 &2 Kuriacose and Rajaram , McGraw Hill Education
- 2 Fundamental of Molecular Spectroscopy C.N. Banwell , McGraw Hill Education
- 3 Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
- 4 Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand &Company Ltd., Delhi.
- 5 Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
- 6 Elementary Spectroscopy ,Y .R. Sharma , S. Chand Publishing
- 7 Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International Pvt. Ltd
- 8 Advanced Inorganic Chemistry, G.R. Chatwal, Goal Publishing house
- 9 Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna