Engineering Chemistry (BCHS 0101)

Course: B. Tech **Branch: All**

Credit: 4 **Semester: I/II** **L-T-P: 3-1-2**

Objective:

1. This course aims to expose the students to the various methods of fabricating commercially useful polymers, Nanomaterials and other materials and lubricants used in machinery parts
2. The course intends to provide integrate concepts, mechanism and control of corrosion, processes of treatment of water and to provide basic knowledge of various spectroscopic techniques like IR, UV, MS, and NMR.

Module No.	Content	Teaching Hours
I	**Chemical Bonding:** M.O. theory and its applications in homo & hetero diatomic molecules. Hydrogen bond, metallic bond and their applications. Semi-conductors. **Polymers:** Polymerization and its classification. Preparation, properties and uses of polymers: Thermoplastics (Polystyrene, Teflon and Nylon 66), Thermosetting polymer (Bakelite). Biodegradable polymers (PLA, poly β-hydroxy butyrate), molecular weights of polymers, natural rubber and its vulcanization, synthetic rubber (neoprene, Buna-S, Buna-N). **Fuels**: Definition and classification of fuels. Analysis of coal and determination of calorific value by bomb calorimeter. **Synthetic petrol**: Bergius and Fischer -Tropschs methods **Lubrication:** Introduction, classification, properties & uses of lubricants. **Ceramics:** Introduction, classification, scope & applications. **Glass:** Preparation, varieties & uses. **Functional materials:** Biomaterials, smart materials (piezoelectric, pyroelectrics & ferroelectrics) and advanced materials	24
II	**Water Treatment:** Introduction, hardness and its units, L-S Process, calgon process, zeolite and ion-exchange processes, reverse osmosis, treatment of municipal water, impurities in water, boiler feed water, boiler troubles and remedial measures **Corrosion**: Introduction, consequences, types, theories of corrosion, (galvanic, pitting, stress, water line, intergranular & soil corrosion) and protection of corrosion. **Spectroscopy:** Elementary ideas and simple applications of UV, visible, infrared and NMR spectral techniques **Chemical Kinetics:** Order and molecularity of reactions, zero order, first and second order reactions. Integrated rate equations. Theories of reaction rates, factors affecting rate of reaction. pH, buffer solution (Henderson-Hasselbalch equation).	24

	Introduction to Nanoscience & Nanotechnology: Basic concepts of nanoscience and nanotechnology, fullerenes, graphenes, carbonnanotubes, principle and uses of SEM & TEM techniques. Applications of nanomaterials. **Stereochemistry:** Types of isomerism (optical and geometrical) chirality, elements of symmetry, diastereomers, optically active compounds, R-S configuration and E-Z geometrical isomers, conformation of ethane and *n*-butane	

Learning Outcomes:

By learning this course, students will able to: -

1. Compute calorific value of a fuel by Bomb calorimeter and Dulong's formula.
2. Identified the use of polymer, glass, ceramic, lubricants in various Engineering applications.
3. Apply various method for removal of hardness of water for both industrial and domestic applications.
4. Interpret molecular structure based on spectroscopic analysis.
5. Conceptual understanding of Nanomaterial and their applications in the field of Engineering and medical sciences.

Reference Books:

- Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing,
- Shashi Chawala, "Theory and practical of engineering chemistry", 4th edition, Dhanpat Rai & Co. pvt Ltd.
- S.S.Dara, "Text book of engineering chemistry and pollution control", 2nd edition, S. Chand and Co.ltd.
- Nanotechnology: Fundamentals and Applications by Manasi Karkare
- Essentials of Nanotechnology by Jeremy Ramsden; http://bookboon.com/en/nano-technology-ebook
- Handbook of Corrosion Engineering, Second Edition; http://www.cntq.gob.ve/cdb/documentos/quimica/197.pdf
- Marsh G Fontana, "Corrosion Engineering" 3rd edition, Tata McGraw hill publishing Co ltd.

- Polymer science and technology by Robert O. Ebewele, http://www.pdfdrive.net/polymer-science-and-technology-d2131284.html
- Introduction to Spectroscopy by Donald L. Pavia, Gary M. Lampman, and George S. Kriz
- Y.R. Sharma, "Elementary organic spectroscopy: principles and chemical application ",1st edition, S. Chand and Co.ltd.
- Physical Chemsitry, Puri Sharma Pathania, S. Nagin chand and Co.