Chemistry

(Course Code)

(B.Tech First Year)

Course File

(2020-21 Even/Odd Semester)

Department of Chemistry

Malaviya National Institute of Technology

Jaipur-302017

B. Tech First Year (ODD/EVEN Semester) for all students

Engineering Chemistry(CYT-101)			
Branch / Semester: All branches I/II Semester B.Tech.	L	T	P
Type: Core	3	1	0

Course Description:

- Students will learn the basic and advanced knowledge of chemistry concerning the applications of the basics of chemistry in different fields and branches of engineering.
- To function very efficiently and know how to build connections over the exploration/use of a modern work environment to run or lead those as professionals.

Lecture Plan (Hrs.)	**Course Content**
Unit 1 (10 L)	**Water and its treatment:** Introduction, Hardness, types of hardness, Units of hardness, disadvantages of hard water and methods of estimation of hardness. **Removal of Hardness (Softening Methods)**: Lime Soda process, Permutit or Zeolite process and Deionization or Demineralization process. **Municipal Water Supply**: Requisites of drinking water. Purification of water by various methods, Detailed study of methods of Disinfection.
Unit 2 (4 L)	**Lubricants**: Introduction of lubricants and lubrication. Types of mechanism of lubrication, Uses and properties of lubricants viz. Viscosity & Viscosity index, Flash & fire point and Cloud and pour point.
Unit 3 (4L)	**Fuels and Combustion:** Classification and Properties of fuels, Calorific value Petroleum:refining and fractional distillation of crude petroleum, Cracking, Synthetic petrol, Knocking, Anti-knocking Agents, octane and cetane number. Gaseous fuels, producer gas, syn gas, hydrogen gas.
Unit 4 (3 L)	**New Engineering Materials:** Organic/hybrid photovoltaic materials, Introduction to nanotechnology and nanomaterials (fullerenes and quantum dots).
Unit 5 (5 L)	**Introduction to solid state chemistry**: Bonding in solids, crystal structure and crystal systems, Bravais lattices, Miller indices. diffraction methods to characterize crystals, grain and grain boundary, solid state reactions, Band gaps: metals, insulators, and semiconductors, doping, and devices.

Unit 6 (5 L)	**Corrosion: Introduction**, theory of corrosion, **galvanic and differential aeration corrosion**, control of corrosion by protective coating, inhibitors, cathodic and anodic protection, stress corrosion, hydrogen embrittlement.
Unit 7 (4 L)	**Advanced electrochemical systems**: Li-ion batteries, metal air batteries, redox flow batteries, liquid metal batteries.
Unit 8 (7 L)	**Spectroscopy:** Introduction, Classification and Applications of spectroscopy: Ultra Violet-Visible, Infra-Red, Raman and Nuclear Magnetic Resonance Spectroscopy.
References	1. Engineering chemistry: A Text book by P.C. Jain, DhanpatRai& Sons. 2. A Text book of Engineering chemistry by Shashi Chawla, Dhanpat Rai and Sons. 3. Engineering chemistry: A Text book by S.S. Dara, S. Chand & Co. 4. Solid State Chemistry and its Applications by Anthony R. West, Wiley 2014 5. Modern Batteries by C.A. Vincent and B. Scrosati, Elsevier 1997. 6. P.S. Kalsi, Spectroscopy of Organic Compounds, New Age International (P) Ltd. Publishers 7. Fundamentals of molecular spectroscopy by Colin Banwell and Elaine McCash, Tata McGraw Hill Education Pvt. Ltd.
Course Outcomes	• They will be able to apply their theoretical and practical knowledge of natural sciences and engineering. • Have the ability to generate innovative ideas according to the demand of need and conduct and design the experiments, with the data interpretation based on spectroscopic techniques. • Able to identify and solve the problems related to engineering application with the fundamental concepts of applied chemistry. • Able to understand and design the process that meets most criteria, such as environmental and social criteria.

CUP-102 Chemistry Practicals

List of Experiments

1. To determine the percentage of available chlorine in given sample of bleaching Powder.
2. To determine hardness of Water by EDTA method.
3. To determine the total alkalinity of water.
4. To determine the amount of various oxidizing agents iodometrically.
5. Analysis of ores and alloys.

(i) Estimation of copper in brass.

(ii) Estimation of iron in plain carbon steel.

(iii)Estimation of iron in Hematite ore.

6. Preparation of Bakelite polymer.
7. Synthesis of Nylon 66
8. Preparation of Urea-Formaldehyde resin
9. Determination of Viscosity of oil by Redwood Viscometer.
10. To carry out Conductometric titration.
11. To estimate the iodine in iodized common salt using iodometry.
12. To synthesize Thiocol rubber.
13. To determine the flash point and fire point of given oil by Penskey – Marten's apparatus
14. To determine the dissolved oxygen content of given water sample by Winkler's method
15. To determine total moisture content, volatile matter, ash content and fixed carbon in a given coal sample byproximate analysis
16. Extraction of caffeine from Tea leaves
17. Determination of coefficient of viscosity of unknown liquid by Ostwald viscometer

Books recommended:

1. Laboratory Manual on engineering chemistry by S.K. Bhasin & Sudha Rani, Dhanpat Rai Publishing Company, New Delhi.
2. A text book of Practical chemistry by K.D. Gupta & K.K. Saxena University Press, Jaipur.