**Graphic Era University**

**First semester 2016-17**

**Course Handout**

**Course No*.* : TCH 101/201**

**Course Title : Engineering Chemistry**

**Instructor-in-Charge : Dr Bhawna**

**Instructor(s) :**

1. **Dr. R.G. Sharma**
2. **Dr. C.K. saini**
3. **Dr. Neetu Sharma**
4. **Dr. R.K. Bachheti**

**Scope & objective:** The objective of the course is to understand the basics of chemistry and to correct it with technologies and industrial application. Engineering Chemistry is taught in all branches of chemistry running in the university. Practical are designed in such a way that they may be useful in metallurgical, paper and pulp, paint , dying industry, water treatment plants and to check pollution caused by industrial units, automobiles and pharmaceutical units .

**Text Book(s):**  
 **TB1**  [Sunita Rattan](http://www.bookadda.com/author/sunita-rattan), “ Comprehensive Engineering Chemistry”, S.K. Kataria & Sons Delhi, Indi, 2nd Edition (2009)

**TB2** Shashi Chawala , “Theory and Practicals of Engineering Chemistry”, Dhanpat Rai and Company, India 3rd Edition (2012)

**REFERENCE BOOKS**

**R1** F.W.Bill Meyer, Text book of Polymer Chemistry, 3rd Edition 2009, W.J.Wiley India

**R2** J.D.Lee,Concise Inorganic Chemistry 5th Edition 2009, W.J.Wiley India

**R3** I.L.Finar, Organic Chemistry (Vol. I & II) 5th Edition 2009, Pearson Publication

**Course Plan:**

|  |  |  |  |
| --- | --- | --- | --- |
| Lecture No. | Learing Objectives | Topics to be covered | Reference Chap/Sec(Book) |
| 1 | Introduction to Chemical Bonding, Basic terms and their definition ,Principles ,Basic idea of Hybridization. | Introduction to chemical bonding | TB1  Chap. 6 |
| 2-3 | Postulates of VSEPR theory ,Structure of NH3, NH4+­,H2O, of H3O+,SO2, and XeF4 on the basis of VSEPR theory and Draw back of VSEPR theory. | VSEPR Postulates and Examples | TB1  Chap. 6 |
| 4-5 | Postulates of Molecular Orbital theory (MOT), Formation of homo and heteronuclear diatomic molecules/ions | Molecular Orbital theory | TB1  Chap. 6 |
| 6 | Hydrogen Bonding and its applications, Metallic Bonding (Band theory). | Hydrogen Bonding and Metallic Bonding | TB1  Chap. 6 |
| 7-8 | Hardness of water and its measurement, Numerical problems based hardness of water. | Hardness of water | TB1  Chap. 1 |
| 9-12 | Softening of water by L-S process, Zeolite process,Reverse osmosis process, Ion Exchange process and Calgon Process, Specifications for drinking water, (WHO standards) Numerical problems based on L-S Process, Zeolite Process . | Treatment of water Softening and Numerical problems | TB1  Chap. 1 |
| 13-15 | Nature of Organic molecules, Cleavage of Covalent Bond, Electron displacement effects (Inductive, Mesomeric and Hyperconjugation). Reaction Intermediates (Carbocation, Carbanions, Free radicals, Carbenes) their characteristics and stability | Reaction Intermediates | TB2  Chap. 1 |
| 16-17 | Aliphatic Nucleophilic Substitution Reactions (SN1 and SN2 Mechanism), Aromatic Electrophilic Substitution Reactions – Mechanism of halogenation, nitration and sulphonation. | Substitution Reactions | TB2  Chap. 1 |
| 18-21 | Polymerization, degree of polymerization, functionality of monomer ,Degree of polymerization, Classifications of polymers on the basis of tacticity, mode of formation, structure of monomer unit, Mechanism of addition polymerization, Preparation, Properties and uses of Kevlar & PMMA, | Classification,Formation and Mechnism od Polymers | TB1  Chap. 14 |
| 22-25 | Plastics,definition,preparation, classification and applications, Fibers- preparation, properties and uses of Nylon – 6,6 Nylon and Dacron, Conducting polymers: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; Applications of Conducting polymers. Bio-degradable Polymers. | Plastics ,Fibers ,Conducting and biodegradable polymers | TB1  Chap. 14 |
| 26-29 | Classification of fuels and characteristics of a good fuel, calorific value and its determination by Bomb Calorimeter (Numerical problems}, proximate analysis of coal, Cracking of heavy oil residues – thermal and catalytic cracking, knocking , octane number and cetane number and their significance, Composition and uses of Natural gas, CNG, LPG.Bio fuels as alternative sources of energy (biomass, biogas). | Fuels | TB1  Chap.2 |
| 30-31 | Definition, classification, functions, characteristic properties of an ideal lubricant with special reference to flash point, fire point, cloud point, pour point, acid value, saponification value . | Lubricants | TB2  Chap. 14 |
| 32-36 | Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions. Activation Energy and Activated complexes and numerical problems based upon them. | Chemical Kinetics | TB1  Chap.10 |
| 37-39 | Electrode potential, factors affecting the electrode potential of a cell. Nernst equation, Concentration cells. Numerical problems based on electrode potential and e,m.f of a cell. | Electrochemistry | TB1  Chap.4 |
| 40-41 | Corrosion its causes and effects, Theories of corrosion – Chemical & Electrochemical corrosion; Factors affecting rate of corrosion and methods to control the corrosion. | Corrosion | TB1  Chap.5 |

**Evaluation Scheme:**

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| --- | --- | --- | --- | --- | --- | --- |
| **EC No.** | **Component** | **Duration** | **Marks** | **Weightage (%)** | **Date & Time** | **Nature** |
| 1. | Mid Term Test | 2 hrs | 60 | 30 |  |  |
| 2. | End Term Exam | 3 hrs | 100 | 60 |  |  |
| 3. | Assignments |  | 50 | 5 | See Note 1 |  |
| 4. | Class test/participation |  | 10 | 5 | See Note 2 |  |

**Note 1**: Total five assignments will be given in the entire semester (10 marks each) which will contain numerical as well as theory questions.

1. Assignment 1 Chemical Bonding
2. Assignment 2 Water Chemistry
3. Assignment 3 Organic Reaction Mechanism and Chemical Kinetics
4. Assignment 4 Polymers, and Fuels
5. Assignment 5 Electrochemistry, Corrosion and Lubricants

**Note 2**: Two class tests will be conducted in this semester; the date will be announced subsequently in the respective classes. Out these the best performance in any one test will be considered.

**Chamber Consultation Hours**:

Dr.Bhawana

Dr.R.G.Sharma Monday aand Tuesday 4-5pm

Dr.C.K.Saini Monday and Tuesday

Dr.R.K.Bachheti Friday and Saturday 4-5pm

Dr. Neetu Sharma Wednesday and Thursday 4-5pm

**Notices**: All notices concerning this course will be displayed on the Chemistry Department Notice Board and will also be available in the B. Tech Ist year web-site. [www.btech.ac.in](http://www.btech.ac.in)