

Applied Chemistry Syllabus for FYBTECH

Course Code CH-15001

Teaching Scheme:

Lectures: 3hrs / week

Practical: 2hrs/week

Evaluation Scheme:

T1-20M, T2-20M

End-SemExam:60M

Course Education Objectives (CEO)

1. To impart the understanding of fundamental principles, analytical methods and the technological aspects of modern chemistry.
2. To impart knowledge about chemical bonding and corrosion.
3. To emphasize on water chemistry and quality parameters of water.
4. To impart the awareness of various fuels and combustion.
5. To generate the usefulness of instrumental methods of analysis.
6. To bring about the overall awareness of the use of various materials like polymers and nanomaterials.

Course Outcomes(CO)

1. Student will know structure property relationship and corrosion.
2. Student will know the use of water as an engineering material, its properties and applications.
3. Student will generate usefulness and apply the various instrumental techniques for identification and characterization of materials.
4. Student will understand the various types of fuels and combustion.
5. Student will know the types, properties and applications of polymers and nanomaterials.

Unit 1: Water Technology

(6 Hrs)

Structure and Properties of water, Water quality parameters- heavy metal, microbial impurities, dissolved salts and their consequences (BIS and WHO standards), Determination of hardness by EDTA method, chloride content,

Alkalinity of water and its significance, Water treatment for civic applications, Problems associated with use of hard water in Boiler and its treatment

Unit 2: Corrosion and corrosion control (6Hrs)

Corrosion- Atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic Series, Typical Electrochemical corrosion like (Galvanic, Pitting, Inter-granular, Waterline) Factors affecting corrosion-nature of metal, nature of environment, Methods of prevention of Corrosion-cathodic and anodic protection ,Metallic coatings, hard coatings.

Unit 3: Absorption spectroscopy (7 hrs)

An overview of Electromagnetic spectrum, various regions, energies and interactions with matter . Fundamentals of Spectroscopy, Principles and applications of UV-visible, IR and microwave spectroscopy. Atomic Absorption Spectroscopy

Unit4: Fuels and combustion (8 Hrs)

Fuels: Definition, classification of conventional fuels, calorific value and its units, Determination of calorific value of solid and liquid fuels -Bomb calorimeter – working. Solid fuels : Coal, proximate and ultimate analysis of coal. Liquid fuels: refining of petroleum, Knocking, Octane number of petrol, cetane number of diesel. Air to fuel ratio, Vehicular emission, catalytic converter significance of PUC certification,

Combustion: Chemical reactions, Calculation on air requirement for combustion – numerical

Unit 5: Polymers (7Hrs)

Basic terminology, Characteristics and Properties of polymers like molecular wt., crystallinity, phase transformation, dissolution. Classes of polymers- commodity plastics, resin, elastomer, fiber, adhesive, foam etc. (any 5 examples with synthesis, properties and applications) . Specialty polymers conducting polymer, silicon base polymer, biodegradable polymers.

Unit 6: Nanomaterials

(7Hrs)

Introduction, classes of nano materials- Carbon base nano materials (graphene, graphene oxide, CNT), semiconducting nanoparticles (ZnO,SnO₂), metal nano clusters(Ag, Pt, Pd, Rh), quantum nano structures, Synthesis by physical and chemical processes: 2 each. Applications of nanomaterials in Catalysis, Electronics, Communication, Medicines, Composites, Energy sciences

List of Recommended Books

1. A textbook of Engineering Chemistry: Jain and Jain, Dhanpatrai Publication.
2. Instrumental Methods of Chemical analysis, Willard Dean, Merritte, Tata MacGrow Hill Limited.
3. A textbook of Engineering Chemistry: S. S. Dara, S. Chand Publication 2010 edn.
4. A textbook of Engineering Chemistry: Shashi Chawla, Dhanpatrai Publication.
5. Polymer Science: V.R.Gowariker, New Age International Publication
6. Introduction to Nanotechnology: Charles P. Poole, Frank J. Owens.

LIST OF EXPERIMENTS

Teaching Scheme:

Evaluation Scheme:

Practical: 2hrs/week

Total Marks: 100 M

CCE: 70M, ESE: 30M

1. Preparation and Standardization of Analytical Reagents
2. Determination of temporary and permanent hardness of water sample by EDTA method.
3. Determination of total alkalinity of water sample.
4. Available chlorine in bleaching powder
5. pH-metric titration of Acid/Base
6. Colorimetric determination of concentration of given inorganic sample.

7. Demonstration of UV_VIS spectrophotometer
8. Determination of calorific value of a fuel using Bomb's calorimeter
9. Proximate Analysis of coal
10. Determination of molecular weight of a polymer using Ostwald's viscometer.
11. Determination of chloride content of water by Mohr's method