Andhra Pradesh State Council of Higher Education

INDUSTRIAL CHEMISTRY MAJOR SYLLABUS

I B.Sc - SEMESTER- II

Course Code 3: CHEMICAL PROCESS INDUSTRIES-1

Total hours of teaching 45 hrs @ 4 hrs per week

Course Outcome: At the end of the course the student will be able to

1. **Understand the softening of water, desalting of water and analysis water.**
2. **To learn about Municipal water and Industrial waste treatment.**
3. **Understand the different types of corrosion effects and theories.**
4. **To learn about the manufacturing process of Glass and Ceramics and uses**
5. **To learn about the manufacturing process and properties of Refractories and ceramics.**

UNIT- I **9 h**

Water treatment: - Source of water, quality of natural water, water quality parameters, hardness of water causes, conditions of water, permutite, ion-exchange process, treatment of water for municipal purpose, desalting of sea water, composition, properties and quality of deposits in boilers and heat exchangers, treatment of boiler water, corrosion and treatment of heat power equipments, industrial water treatment, water analysis, BOD,COD, determination of hardness.

UNIT-II 9 h

Sewage and Sewage treatment: - Municipal waste water, sewage and its compositions, aerobic process and anaerobic processes for the treatment of sewage bacteria, methods of sewage treatment – aerobic oxidation plants.

Industrial wastes and treatment process:- Types of industrial wastes, nature, effect and treatment of chemical wastes from some important industries.

UNIT- III 9 h

Corrosion:- Introduction, economic aspects of corrosion, types of corrosion chemical corrosion and electrochemical corrosion, theories of chemical corrosion and electrochemical corrosion, factors effecting chemical corrosion, atmospheric corrosion, water corrosion, microbiological corrosion, prevention of corrosion.

UNIT – IV 9 h

Glass: :- Raw materials, methods of manufacture (pot furnace, tanks furnace, regenerative tank furnace), shaping, various glasses- coloured glass, safety glass, fibre glass, pyrex glass, photosensitive glass, glass wool.

Ceramics:- Introduction and properties of ceramics, basic raw materials, formation, types and properties of clay, manufacturing processes, glazing, porcelain, china ware- raw materials and manufacture.

UNIT- V 9 h

Refractories:- Classification, properties, manufacture of refractories, fire clay bricks and their uses, high alumina refractories, silicon bricks, magnasite refractories, super refractories, silicon carbide, graphite, oxide refractories, ceramic fibres, insulations refractories.

Cement:- Types of cements, raw materials, manufacture of cement dry, wet processes, setting of cement, properties of cement, physico – chemical principles involved , fuel burning devises – mortar and concrete.

Books for Reference:

Text Book : Industrial Chemistry (including Chemical Engineering)by B.K.Sharma, Goel Publishing house, Meerut.

I B.Sc – SEMESTER –II:

Course Code. 3: INDUSTRIAL CHEMISTRY MAJOR PRACTICAL SYLLABUS

Paper-I: CHEMICAL PROCESS INDUSTRIES-1

Total hours of laboratory Exercises 30 hrs @ 2 per week

Course Outcomes:

At the end of course, the student will be able to:

1. **Understand the basic concepts of water analysis.**
2. **Use the glassware and chemicals and follow experimental procedures in the laboratory.**
3. **Understand the analysis of cement and limestone ore.**

Analysis of tap water and sea water for

1. Estimation of total dissolved solid, chlorides and sulphates
2. Estimation of alkalinity present in a given water sample
3. Estimation of temporary hardness, permanent hardness and total hardness.
4. Analysis of cement.
5. Analysis of Lime (dolomite)
6. Estimation of chemical oxygen demand (COD).

Practical examination pattern : practical 40marks,Recors +viva=10marks

Text Book : A Text Book on Experiments and Calculation in Engineering Chemistry by S.S.Dara, S. Chand & Company Ltd, Ram nagar, New Delhi.

Co-curricular activities and assessment methods.

1. Continous Evaluation: Monitoring the progress of student's learning.
2. Class Tess, sheets and Quizzes.
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality.
4. Semester-End examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER.

B.Sc INDUSTRIAL CHEMISTRY MAJOR MOODEL PAPER
SEMESTER –I
Paper- 3 : CHEMICAL PROCESS INDUSTRIES

Time: 3hrs. Max. Marks: 75

PART - A

Answer any Five questions **5 X 5 = 25**

1. Briefly explain the determination of hardness of water?
2. Describe the sewage composition?
3. Explain the economic aspects of corrosion?
4. Explain the types of Industrial Wastes?
5. Write a short note on glazes?
6. Explain setting of cement?
7. Write the properties of refractories?
8. Define 1. Hardness of1. Water 2. Scale 3. sludge

PART -B

Answer All Questions **5 X 10 = 50**

9. Explain the treatment of hard water by Ion-exchange process? OR
   Explain the treatment of water for Municipality purposes?
10. Explain about Aerobic Oxidation Plants? OR
    Explain the treatment of any five industrial wastes?
11. Explain the theories of Wet Corrosion? OR
    Explain the factors effecting the Chemical Corrosion?
12. Explain briefly manufacture of Ceramics? OR
    Explain the manufacture of Glass?
13. Write short notes on 1. Silicon carbide 2. Silica bricks. ? OR
    Explain the manufacture of Cement?

I B. Sc - SEMESTER- II: INDUSTRIAL CHEMISTRY MAJOR SYLLABUS

Course Code 4 : INTRODUCTION TO CHEMICAL ENGINEERING-I

Total hours of teaching 45 hrs @ 4 hrs per week

Course Outcome: At the end of the course the student will be able to

1. **Understand about unit operations, unit process and basic laws .**
2. **To learn about material and energy balance.**
3. **Understand about chemical reactions in kinetics and know about chemical reactors.**
4. **To learn about the heat transfer operations.**

Unit-I **9 h**

Introduction:-Introduction-unit operations-unit processes-basic laws-useful mathematical methods-units and dimensions-nomography.

UNIT – II **9 h**

Physico-chemical calculations:-Energy-equivalent weight-solutions-solubility- vapour pressure of solutions-osmosis-electrolysis- humidity and saturation-

Unit-III **9 h**

Material Balance-Types of process – flow sheet – steps to follow material balance calculations.

Energy balance-Types of energies – reacting systems – Hess law – steps to follow energy balance calculations.

UNIT – IV **9 h**

Chemical kinetics:-Introduction-rate and order of reactions – elementary and non-elementary reactions – reversible and irreversible reactions – homogenous and heterogeneous reactions effect of temperature of reaction rate-catalysis-reactors-some useful terms in chemical processing.

Unit –V **9 h**

Heat transfer operations:- Conduction- thermal conductivity in different phases -convection- types of convection - radiation-black body radiation – radiation from sun- flow arrangements in heat exchangers-heat transfer equipment.

Evaporation- evaporation equipment – types of evaporators.

Books for Reference:

Text Book: Introduction to Chemical Engineering, by Goshal and Sanyl Datta, McGraw-Hills Company.

I B.Sc SEMESTER -II

INDUSTRIAL CHEMISTRY MAJOR PRACTICAL SYLLABUS

Coruse Code 4: INTRODUCTION TO CHEMICAL ENGINEERING-I

Total hours of laboratory Exercises 30 hrs @ 2 per week

Practical- I Qualitative Analysis of SIMPLE SALT

Qualitative inorganic analysis (Minimum of Six simple salts should be analysed) 50 M

I. Course outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic simple salt.

2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.

3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis.

II. Laboratory course syllabus: Analysis of SIMPLE SALT 50 M

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.

Cations: Lead, Copper, Iron, Aluminum, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium.

Co-curricular activities and assessment methods.

1. Continuous Evaluation: Monitoring the progress of student's learning.
2. Class Tess, sheets and Quizzes.
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality.
4. Semester-End examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER

I B.Sc., SEMESTER –II: INDUSTRIAL CHEMISTRY MODEL PAPER II
PAPER 4 : Introduction to Chemical Engineering

Time: 3hrs. Max. Marks: 75

SECTION - A

Answer any Five Questions 5 X 5 = 25

1. Explain Internal and External Energy ?
2. Discuss about solutions and solubility?
3. What are the steps to follow energy balance calculations?
4. Write about elementary and non-elementary reactions?
5. Explain about catalysis?
6. What are the flow arrangements heat exchangers?
7. Explain about applications of heat exchangers?
8. Explain about mass transfer operations?

SECTION - B

Answer All Questions 5 X 10= 50

9. What is the role of Chemical Engineer of mankind? OR
   Write about Unit Operations and Unit Process?
10. Explain the different types of Chemical Reactions.? OR
    What is the effect of temperature on reaction rates?
11. Explain about material balance calculations? OR
    Explain about Energy Balance calculate ions?
12. Write about Heat Transfer operations? OR
    Write about Industrial Heat Exchanger equipment?
13. Explain about Osmosis and Vapour Pressure of solutions? OR
    Explain about Humidity and Saturation?