

**COURSE STRUCTURE
FOR
S. Y. B. Sc. (SEMESTER – III) INDUSTRIAL CHEMISTRY**

SEMESTER – III			
Principal Subject	Course Code	Paper Title	Credits
INDUSTRIAL CHEMISTRY	US03CICH01	HEAVY AND FINE CHEMICALS	3 CREDITS
	US03CICH02	CHEMICAL PROCESS PRINCIPLES	3 CREDITS
	US03CICH03	PRACTICAL	3 CREDITS
	US03CPHY01	OPTICS	3 CREDITS
	US03CPHY02	BASIC SOLID STATE ELECTRONICS	3 CREDITS
	US03CPHY03	PHYSICS PRACTICAL	3 CREDITS
	US03ECHE04	ORGANIC CHEMISTRY	2 CREDITS
	US03ECHE05	BASIC ANALYTICAL CHEMISTRY	2 CREDITS
	US03FENG01	FUNCTIONAL ENGLISH	2 CREDITS

INDUSTRIAL CHEMISTRY
SEMESTER-III
PAPER NO.: US03CICH01 (3 CREDITS, 70 MARKS)
TITLE: HEAVY AND FINE CHEMICALS

Unit-1:

Acids: Manufacture, Properties and uses of Nitric acid, Sulphuric acid, Phosphoric acid, Hydrochloric acid

Industrial Gases: Hydrogen, Nitrogen, Oxygen, Carbon dioxide and Sulphur dioxide.

Unit-2:

Alkali: Sources, uses and preparation of sodium chloride, Manufacture and uses of Sodium hydroxide, Sodium carbonate, Sodium bicarbonate and sodium hypochlorite.

Unit-3:

Electro thermal industries: Introduction, uses and economics of furnaces and their classification, Manufacture of silicon carbide, Calcium carbide, Boron carbide, Boron nitride, Synthetic graphite, Carbon electrode.

Electrochemical industries: Anhydrous magnesium, Magnesium chloride, Magnesium oxide, hydrogen peroxide, Potassium permanganate, Hydroxyl amine.

Unit-4:

Speciality industrial solvents : Synthesis, properties and uses of Dimethyl-formamide (DMF) ,Dimethyl sulfoxide (DMSO), Tetrahydrofuran (THF), Dioxane, Diethyl ether and sulfolane.

REFERENCE BOOKS:

1. Chemical process industries by Shreve R. N. , McGraw Hill
2. Industrial chemistry by B.K. Sharma 7th edition
3. Introduction to material science and engineering by K.M. Rells, T. Courtney and J. Wulff, Wiley Dastern Pvt. Ltd. New Delhi
4. Unit process in organic synthesis by P.H Groggine, McGraw Hill Kogakusin Ltd.
5. Outline of chemical technology by G.E. Dryen, East West Press, New Delhi
6. Industrial chemicals by Faith et. al. Wiley Interscience, New York
7. Heavy organic chemicals by A. J. Saile, Pargaon Press U.K.

INDUSTRIAL CHEMISTRY
SEMESTER-III
PAPER NO.: US03CICH02 (3 CREDITS, 70 MARKS)
TITLE: CHEMICAL PROCESS PRINCIPLES

Unit 1:

Units and dimensions, Basis of calculation, Units to express composition of systems, Ideal gas equation, Behavior of gaseous mixtures.
Vapor pressure of liquids and solution, Critical properties.

Unit 2:

Elementary concept of unit operations and unit processes, Flow diagram preparation, Concept of mass balance and types of mass balance problems, Strategies and Guidelines for mass balance calculation, Mass balance calculations for processes-without and with chemical reactions, Recycle operation and purge operation, Bypass operation.

Unit 3:

Concept of Energy balance, Forms of energy, Energy balance for batch and continuous processes, Heat capacity and specific heat, Combustion and Calorific value of fuels, Combustion calculations, Flue gas analysis.

Unit 4:

Humidification and saturation, Saturated and unsaturated vapor gas mixture and units to express its composition, Psychrometric chart,
Adsorption: Adsorbent and adsorbate, Chemisorptions and physical adsorption, Adsorption isotherms, Application of adsorption.

REFERENCE BOOKS:

1. Chemical Process Principles: (Part I), Haugen, Watson and Regatz (Asia Pub. House).
2. Stoichiometry : B. L. Bhatt & Vora S. M. (Tata McGraw- Hill Publication).
3. Basic Principles & Calculation in Chemical Engineering, David M Himmelblan (Prentice Hall Inc.)
4. Chemical Process Calculation (Stoichiometry), K. A. Gavhane (Nirali Prakashan-Pune)
5. Fuels and combustion, S. P. Sharma and Chandra Mohan Tata Mc Graw.
6. Fuels and Combustion, Samir Sarkar, Orient Longniur Ltd.

INDUSTRIAL CHEMISTRY
SEMESTER-III
PAPER NO.: US03CICH03 (3 CREDITS, 70 MARKS)
LABORATORY

1. Preparation and Standardization of solution.
2. Analysis of raw material, intermediate and finished products with respect to purity, specification etc.
3. Water Analysis.
4. Organic Spotting.

Subject: Physics
Course: US03CPHY01
Optics
(Three Credit Course –3 Hours per week)
(Effective from June-2012)

UNIT- I Geometrical Optics

Lens Systems: Introduction to lens systems, Cardinal points of lens systems, Construction of image using cardinal points, Newton's formula, Combination of two thin lenses, Related Numericals

Lens Aberrations: Types of monochromatic aberration and their reduction- Spherical aberration, Coma, Astigmatism, Curvature of field, Distortion, Chromatic aberration in a lens

Eyeieces: Importance of an objective lens, Huygens eyepiece, Ramsden eyepiece

UNIT - II Interference and Diffraction

Interference: Techniques for obtaining interference, Interference by division of wavefront- Fresnel's biprism, Lloyd's single mirror, Interference by division of amplitude- Newton's ring, Multiple beam interferometry- Multiple reflections from a plane parallel film, Feby-Perot interferometer and Etalon

Diffraction: Fresnel's diffraction, Diffraction due to a narrow wire, Cornu's spiral, Fraunhofer's diffraction, Fraunhofer's diffraction at double slit and its analytical treatment, Fraunhofer's diffraction at N slits, Related Numericals

UNIT - III Polarization

Introduction, Types of polarization- plane, circular, elliptical, Production of linearly polarized light, Polarizer and analyzer, Anisotropic crystals, Calcite crystal, Huygens' explanation of double refraction, Superposition of waves linearly polarized at right angles, Types of polarized light, LCDs

UNIT- IV Fiber Optics

Introduction, Optical fiber, Total internal reflection, Propagation of light through an optical fiber, Fractional refractive index change, Numerical aperture, Modes of propagation, Classification of optical fibers, The three types of fibers, Materials, Characteristics of the fibers, Merits of optical fibers

Books Recommended:

1. A Textbook of Optics
Subrahmanyam, Brij lal and Avadhnulu
S Chand Publication
2. Optics
Ajoy Ghatak, McGraw-Hill Publishing Co. Ltd.
3. Textbook of light
D N Vasudev
Atma Ram and Sons, New Delhi
4. Fundamental of Optics
F A Jenkine and H E White
Tata McGraw Hill Book Co. Ltd.

Subject: Physics
Course: US03CPHY02
Basic Solid State Electronics
(Three Credit Course –3 Hours per week)
(Effective from June-2012)

UNIT- I Transistor Biasing Circuits

Introduction, Need to bias a transistor, Selection of operating point, Need for bias stabilization, Requirement of a biasing circuits, Different biasing circuits, Fixed-bias circuit, Collector to base bias circuit, Voltage divider biasing circuit, Approximate analysis, Accurate analysis, Emitter- bias circuit, PNP transistor biasing circuit, Related numericals

UNIT- II Small Signal Amplifiers and h-parameters

Introduction, Single stage transistor amplifier, Amplifier performance analysis methods, Graphical method, AC and DC load lines, Calculation of gain, Input and output phase relationship, Equivalent circuit method, Development of transistor AC equivalent circuit, h- parameter equivalent circuit, Amplifier analysis, Need of multistage amplifier, Gain of multistage amplifier, Related numericals

UNIT-III Feedback in Amplifiers

Concepts of feedback in amplifiers, Types of feedback, Voltage gain of feedback amplifier, Advantages of negative feedback, Stabilization of gain, Reduction in distortion and noise, Increase in input impedance, Decrease in output impedance, Increase in bandwidth, Amplifier circuit with negative feedback, RC coupled amplifier without bypass capacitor, Emitter follower, Related Numericals

UNIT-IV Oscillators

Need of an oscillator, Classification of oscillators, Tuned circuit for generation of sine waves, Frequency of oscillation in LC circuit, Sustained oscillations, Positive feedback amplifier as an oscillator, The starting voltage, Hartley oscillator, Colpitts oscillator, Basic principles of RC oscillator, Phase shift oscillator, Wien bridge oscillator, Crystal oscillators, Crystal oscillator circuit, Related Numericals

Books Recommended:

1. Electronic Principles
A P Malvino
Tata McGraw Hill Publishing Co. Ltd., New Delhi
2. Basic Electronics (Solid State)
B L Theraja
S Chand, New Delhi
3. Basic Electronics and Linear Circuits
N N Bhargava, D C Kulshreshtha and S C Gupta
Tata McGraw Hill Publishing Co. Ltd., New Delhi

B.Sc. (Semester -3)
Subject: Physics Practicals
Course No. US03CPHY03
(Three Credit Course –6 Hours per week)
(Effective from June-2012)

List of Practicals:

1. Kater's reversible pendulum (fixed & variable distance between knife edges)
2. Cardinal points of two lens system
3. Dispersive curve and power of a prism.
4. Resolving power of a telescope
5. Biprism
6. Hybrid parameters 'h' of a BJT
7. Frequency response of a RC coupled amplifier (without feedback)
8. Thermal conductivity (K) of a rubber tube
9. Velocity of sound by resonance tube
10. Impedance by voltage drop
11. Study of L-C-R series resonance
12. RC Phase shift oscillator
13. Planck's constant "h" using photocell
14. Exponential least square fitting
15. Numerical differentiation

Note: To provide flexibility up to the maximum of 20% of total experiments can be replaced/ added to the list by the board of studies.

Books Recommended:

1. Advanced Practical Physics for students
B L Wosnop and H T Flint
Methuen and Co. Ltd., London
2. B.Sc. Practical Physics
C L Arora
S.Chand & Co. Ltd., New Delhi
3. Advanced Practical Physics
M S Chauhan and S P Singh
Pragati Prakashan, Meerut
4. Advanced Practical Physics
S L Gupta and V Kumar
Pragati Prakashan, Meerut

US03ECHE04 (ORGANIC CHEMISTRY)
[02 Credits] [Total Unit IV]
Total Marks: 100 [Internal 30 + External 70]

Total 30 lecturers

UNIT: I FUNDAMENTAL ASPECTS IN ORGANIC CHEMISTRY [07 Hrs.]

Hybridization, Sigma and pi bonds, Hydrogen bond, Inductive effect, Electronic effect, Resonance effect, Hyperconjugation, Steric effect, Acid and bases, Definition, Structure and stability of free radical, Carbocation, Carbanion and Benzyne, Energy profiles.

UNIT: II PHENOLS, ALCOHOLS, ETHERS AND EPOXIDES [08 Hrs.]

Structure, Nomenclature, Preparation, Physical properties, Salts of phenol, Acidity of phenols, Reactions. Alcohols- Structure, Classification, Nomenclature, Preparation, Physical properties, reactions, Alcohols as acids and bases, Synthesis using alcohols, Formation of 1,2-diols, Analysis of 1,2-diols, Oxidation cleavage of polyhydroxy alcohols. Ethers- Structure, Nomenclature, Preparation, Physical properties, Reactions, Cyclic ethers. Epoxides- Preparation and reactions.

UNIT: III ALDEHYDES, KETONES, CARBOXYLIC ACIDS AND THEIR DERIVATIVES [08 Hrs.]

Structure, Classification, Nomenclature, Preparation, Physical properties, Nucleophilic addition reactions, Base promoted halogenation of ketones, Acid catalyzed halogenation of ketones. Structure, Nomenclature, Preparation, Physical properties, Salts of carboxylic acids, Acidity of carboxylic acids, Effect of substituents on acidity, Reactions, reactions of acid chloride, Acid anhydrides, Amides and esters. Preparation of malic acid and tartaric acid from maleic acid, preparation of citric acid from glycerol.

UNIT: IV AMINES AND DIAZONIUM SALTS [07 Hrs.]

Amines- Structure, Nomenclature, Preparation, Hoffman rearrangement, Physical properties, Salts of amines, Basicity of amines, Effect of substituents on basicity, reactions, Hoffman elimination, Analysis of amines, Phase transfer catalyst.

Diazonium salts- Synthesis, reaction and characteristics.

Reference Books:

1. Organic Chemistry by M. K. Jain and S. C. Jain (Shoban LAI Nagin Chand & Co. Educational Publishers, Jalandhar).
2. Organic Chemistry by Robert T. Morrison and Robert T. Boyd (VIth Edition, Prentice Hall of India Pvt. Ltd. New Delhi)
3. Organic Chemistry by R. K. Bansal (Tata McGraw – Hill Publishing Co. Ltd. New Delhi)

USO3ECHE05 (BASIC ANALYTICAL CHEMISTRY)

[02 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

Total 30 lecturers

UNIT: I

[07 Hrs.]

Data Analysis: Analytical data evaluations: Errors, Accuracy and precision, Normal distribution curve, Mean and standard deviation, Comparison of results (students-t-test, f-test) paired t-test, Linear regression and correlation coefficient.

UNIT: II

[08 Hrs.]

Titrimetric Methods of Chemical Analysis, General principle of titrimetry, Types of reactions in titrimetry, Standard solution, Basic requirements of titrimetry, Equivalence point and end point. Aqueous Acid Base Titrations. Concept of acid base titration, Titration curves, Acid-base indicators, Titration Feasibility and its applications.

UNIT: III

[07 Hrs.]

Redox Titrations

Introduction, Redox systems, Equilibrium constant, Titration curve & Feasibility, Redox indicators, Iodometric and iodimetric titrations., Complexometric Titrations: Introduction, Stability constant, Ways of detecting end point, Titration curves, Types of EDTA titrations,

UNIT: IV

[08 Hrs.]

Precipitation Titrations: Introduction, Feasibility and end point detection, Indicators, Volhard, Fajan and Mohr's methods, Factors affecting solubility of precipitates., Gravimetric Methods of Analysis: Principle of gravimetry, Requirements of precipitates.

Reference Books:

1. Analytical Chemistry: Principles-by J.H.Kennedy, Saunders college publishers, 2nd edition,1990
2. Introduction to Chemical Analysis-by R.D.Braun, Mc-Graw Hill Book Co. 2nd edition 1995
3. Vogel's Textbook of Quantitative Chemical Analysis- by G.H.Jeffory, J.Mendham, R.C.Denney, 5th edition,1998
4. Analytical Chemistry-by G.D.Christian, Jhon Willey & Sons, 3rd edition
5. Quantitative Analysis-by R.A.Day, Prantice hall of India(P) Ltd., New Delhi,6th edition,1993
6. Modern Analytical Chemistry, By David Harvey, Mc Graw-Hill (USA).
7. Principles of instrumental analysis-by D.A.Skoog & F.J.Holler & T.A.Nieman Saunders college Publishers, 5th edition, 1998.

Syllabus of B.Sc. (Third Semester)
 Foundation Course in English
 Subject: Functional English
 Course Code: (US03FENG01)
 2 credits (Practical)
 Hours per week (2 hours/batch)
 Internal 30 marks + External 70 marks
 Total: 100 Marks

<u>Unit 1 Introduction to Phonetics of English Language</u>		Marks
1	Definition of Phoneme and phonetic keys (Match the following)	03
2	Phonetic Transcription from the specified list (Words)	03
3	Types of some of the sounds i.e. voiced and voiceless from the specified list (classify the words)	04
4	Classification of sounds (vowels, consonants, diphthongs) Ref: CDs of Cambridge Dictionary (for No. 3 and 4)	05
Total=		15

<u>Unit 2 Writing Skills</u>		
1	Writing Emails and short messages (In general)	05
2	Writing Circulars / Notices /Memos(only for information)	---
3	Business Letters (i.e. Letter of Inquiry and Reply, Placing Order, Complaining and adjustment)	10
4	Report Writing (Individual Reports on for example, suitability of some premises, general inefficiency of staff, increasing competition from rival enterprises etc.)	
Total=		15

<u>Unit 3 Oral Skills</u>		
1	Preparing and Delivering Speeches (Welcome Speech, Vote of Thanks, Key note address etc.) (On specified topic)	10
2	Making presentation in seminars (just information)	---
3	Handling formal meetings (just information)	
4	AV (Look Ahead) BBC (31 to 45)	10
Total=		20
20+05 journal=		25

<u>Unit 4 Grammar and Vocabulary</u>		
1	Use of Verbs, Tenses, Prepositions, Modals (fill in the blank)	05
2	Degrees of Comparison (fill in the blank)	03
3	Abbreviation used in English language (Write the full form)	04
4	Homophones and Homonyms, Misused words (fill in the blank)	03
Total=		15