

SAURASHTRA UNIVERSITY



★★★★
FOUR STAR
(Accredited by NAAC)

COURSE (CBCS) DETAILS

OF

Sem – I and Sem- II

**F.Y. B.Sc.
INDUSTRIAL CHEMISTRY**

(In Force From June – 2010)

**SAURASHTRA UNIVERSITY
UNIVERSITY CAMPUS
RAJKOT-5
(GUJARAT) (INDIA)**

SAURSHTRA UNIVERSITY

RAJKOT



★★★★
(By NAAC)

F.Y.B.Sc. SYLLABUS

INDUSTRIAL CHEMISTRY

SEMESTER – I

PAPER No: BSIC 101

SEMESTER – II

PAPER No: BSIC 201

IN FORCE FROM JUNE – 2010

SAURASHTRA UNIVERSITY
FIRST YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 101 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2010)
Semester – I

Unit 1

1.0 Petroleum & Metallurgy

PETROLEUM:

Origin of Petroleum, Composition and Classification of petroleum, Processing of crude petroleum, Natural gas, Uses of natural gas, Liquefied Petroleum Gas & its Uses, Secondary fuels derived from petroleum, Thermal cracking, Mechanism of thermal cracking, Catalytic cracking, Fixed bed cracking, Fluidized bed cracking, Reforming process, Hydro forming, Isomerisation, Shell process and Girbotol process, Doctor process, Hydro-desulfurization.

METALLURGY:

Division of metallurgy, Occurrence of metals, Definition of Gangue, Minerals and ore, Ore dressing with classification, Hydraulic washing, Magnetic separation, Froth floatation process, Chemical process, Reduction of metal oxide into metal by carbon, other reactive metal and electrolysis, Calcinations, Roasting, Smelting, Fluxes, Slags, Extraction of metals such as Fe, Al, Refining process, Liquefaction, Oxidation, Electrolysis, Thermodynamics of metallurgical process.

2.0 Coal

Fuels, Classification of fuels, Primary fuels and Secondary fuels, Origin and formation of coal, Rank of coal, Cleaning and storage of coal, Analysis of coal, Calorific value or heating value of coals, Classification of coal, Chemical constitution of coal, Secondary fuels and other products derived from coal, Process of carbonization, Production of coke and gas,

Beehive oven, Horizontal Chamber Coke Oven, Vertical Gas Retorts (Intermittent and Continuous), Properties and uses of coke, coal gas and coke oven gas, Coal gas and Coke oven gas.

3.0 Renewable natural sources

Cellulose, its preparation and properties, Nitrocellulose, Cellobiose, Celluloid Artificial silk, Acetate Silk, Cuprammonium process (Cupra Silk), Viscose silk (Rayon), Paper, Caustic soda process and Sulphite process, Starch, Manufacturing of starch from corn, Properties & uses of Starch, Dextrin, Glycogen, Inulin, Raw starch, Tapioca starch, Iodized starch, Alcohols, Methyl alcohol, Ethyl alcohol, Denatured alcohol, Special solvent alcohol, Propyl alcohol, Butyl alcohol.

Unit 2

1.0 Dimensions & Units

Fundamental quantities, Derived quantities, Dimensions and System of Unit, Conversions of units, Basis of calculation, Atomic weight, Molecular weight, Equivalent weight, Molarity, Normality, Molality, Methods of expression, Composition of mixtures and solutions, Mole fraction, Weight fraction.

2.0 Material balance without chemical reaction

Outlines of procedure for material balance, Calculation by using various operations carried out in industry: their significance and block diagrams of distillation, evaporation, adsorption, extraction (liquid-liquid), drying, filtration, mixing, blending, dissolution, and crystallization.

3.0 Utilities in chemical industry

Fuels: Types of fuels, Advantages and disadvantages, Combustions of fuels, Calorific value, Specifications of fuel oil.

Unit 3

1.0 Unit operations in chemical industry-I

DISTILLATION:

Introduction, Batch & Continuous distillation, Separation of azeotropes, Plate columns and packed columns, Steam Distillation.

2.0 Unit operations in chemical industry-II

ABSORPTION:

Introduction, Equipments, Packed columns, Spray columns, Packing materials, Mechanical Contactor, Rotating disc contactor,

EXTRACTION:

Introduction, Selection of solvents, Equipment spray columns, Packed column, Mixer settler.

3.0 Unit operations in chemical industry-3

EVAPORATION:

Introduction, Equipment, Short tube (standard) evaporator, Forced circulation Evaporators, Falling film evaporators, Climbing film evaporators, Wiped film evaporator, Multiple effect evaporators.

SAURASHTRA UNIVERSITY

FIRST YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 201 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2010)

Semester – II

Unit 1

1.0 Fundamentals of Computer, Office Automations tools & Internet

Computer definition, Characteristics Applications, Input devices: Keyboard, Mouse, Joystick, OCR, OMR, MICR, Scanner, Output devices: Visual Display Unit, LCD, Printers, Plotters, Types of Memory: RAM, ROM, Storage devices: Floppy, Magnetic disk, CD, DVD, OS commands. WINDOWS: What are windows? Starting windows, The Desktop and icons, Logging off and Shutting down windows, Control panel, Concepts of add new hardware/remove program, Date/Time, Display, Mouse, My computer, Concepts of drives and printers, Recycle bin, Maximize, Minimize, Resize and closing a window, Windows explorer, Concepts of files & folder, Rules for naming files, Different techniques of copying, moving & deleting files, Creating folder, Creating short cuts, Searching files & folders, MS-WORD: Creating & Editing Document, Select Delete & replace text, Undo, redo changes, Copy paste text, Formatting document including Formatting text using font, Formatting toolbar & keyboard short cuts, Bullets & Numbering, Border & Shading, Find text & checking spelling/grammar, Page setup, Print setup, Inserting tables & charts, Using drawing toolbar, Inserting graphics. MS-EXCEL: Excel basic, Spreadsheet, Excel screen, Creating, saving, editing workbook. Formatting cells, Creating tables, POWERPOINT: Creating simple presentation, Formatting presentations, Slide show.

INTERNET:

Basic concepts, email, information searching, website.

2.0 Surface Chemistry & Colloidal Solutions

ADSORPTION:

Adsorbate, Adsorbent, Adsorption of gases by solid, Physical & Chemical adsorption, Factors affecting adsorption, Adsorption isotherms, Freundlich isotherm, Langmuir adsorption, Adsorption of solute from solution, Applications of adsorption Application of ion exchange adsorption,

COLLOIDAL SOLUTION:

Colloidal dispersion introduction & its classification, Lyophilic and Lyophobic colloids, Colloidal solution preparation and purification, Optical properties of sols, Kinetic properties of sols, Sedimentation of suspension, Electrophoresis, Electro-osmosis, Stability of suspension, Precipitation of sols, Emulsions, Gels, Surfactants, Hydrophile-Lipophile Balance.

3.0 Catalysis

Introduction,

Types: Homogeneous & heterogeneous, Positive & negative catalysis, Characteristics of catalytic reaction, Promoters, Catalytic poisoning, Autocatalysis, Activation energy & catalysis, Theories of catalysis with mechanism (intermediate compound formation & adsorption theories), Acid-Base catalysis, Enzyme catalysis, Mechanisms, Characteristics of enzyme catalysis, Some industrial importance of catalytic process.

Unit 2

1.0 Material balance involving chemical reactions

Definitions of terms involved, Limiting reactants/components, Excess reactants, Conversion, Yield and selectivity, Liquid phase reactions, Gas phase reactions with / without recycle or bypass.

2.0 Energy balance

Enthalpy, Forms of energy common unit of thermal energy, Flow process, General energy balance procedures, Heat capacity, Specific heat, Heat capacity of pure gases and gaseous mixtures at constant pressure, Enthalpy changes accompanying chemical reactions.

3.0 Boilers

Types of boilers and their functioning, Steam generation and uses, Specifications of air and its industrial use, Processing of air

Unit 3

1.0 Unit operations in chemical industry-1

CRYSTALLIZATION:

Introduction, Solubility, Super saturation, Nucleation, Crystal growth, Equipment: Tank crystallizer, Agitated crystallizer, Evaporator crystallizer, Swenson-Walker Crystallizer, Oslo crystallizer.

FILTRATION:

Introduction, Filter media, Filler aids, Equipments, Plate and frame filter press, Nutch filter, Rotary drum filter, Sparkler filter, Bag filter, Leaf filter, Nutrex

Centrifuge:

Tubular bowl, Disc Bowl

2.0 Unit operations in chemical industry-2

DRYING:

Introduction, Free moisture, Bound moisture, Drying curve, Equipments, Tray dryer, Rotary dryer, Flash dryer, Fluid bed dryer, Drum dryer, Spray dryer

MIXING:

Introduction, Mixing of solid-solid, Solid-Liquid system and its equipments.

3.0 Unit operations in chemical industry-3

FLUID FLOW

Fans, Blowers, Compressors, Reciprocating pump, Centrifugal pumps, Gear pumps,

HEAT EXCHANGERS:

Shell & tube type heat exchangers, Finned tube exchanger, Plate type heat exchangers.

BOOKS FOR REFERENCES:

- 1) Coal conversions, E.J. Hoffman, The energon co. Lavamic, Wyoming USA.
- 2) Introduction to Petroleum Chemicals, H.Stdiner, Pergmon Press.
- 3) Cotton – Cellulose: Its Chemistry & Technology, Hall A.G.
- 4) Chemistry of Cellulose, Heuser C.
- 5) Modified Starches: Properties & Uses, Wzrzbug O.B.
- 6) Principles of Extractive Metallurgy, Herbashi Vol. 1,2.
- 7) Textbook of Metallurgy, Baiky A.R.
- 8) Theories of Metallurgy, Voisky A.R., Fillpipov Mir Publication.
- 9) Industrial Chemistry, Regregel, Reinhold Publication.
- 10) Catalysis: Heterogeneous and Homogeneous, Delmon B. and Janner G.
- 11) Catalysis in Theory and Practice, Rideal and Taylor.
- 12) Surface Chemistry: J. J. Bikeman Academic Press.
- 13) Physical Chemistry of Surface, A.W. Adamson.
- 14) For Catalysis: Gavhane.
- 15) Stochiometry, B.I.Bhatt & Vora McGraw Hill Publication.
- 16) Chemical Process Principles- (Part-I), Hougen Ragaraz Watson, Asia Publication House.
- 17) Unit Operations in chemical Engineering, McCabe & Smith, McGraw Hill Book Comp.
- 18) Unit Operations I & II, D.D. Kale Pune Vidyarthigriha Prakashan-Pune.
- 19) Chemical Engineer Hand Book, J. H. Perry, McGraw Hill Book Comp.
- 20) Introduction to Chemical Engineering, Badger Banchemo McGraw Hill Comp.
- 21) Fuels & Combustion by Samir Sarkar
- 22) Metallurgy By B.K.Sharma.
- 23) Stochiometry by Gavhane.
- 24) Engineering Chemistry by S.S. Dara.
- 25) Microsoft Office 2000 by HI Publication
- 26) Microsoft Windows 95 – 6 in 1 by BPB Publication.
- 27) Windows-98 6 in 1 Practice Hall Publications.
- 28) BC of Word 97 by BPB Publication.
- 29) ABC of Excel by BPB Publication.
- 30) Computer Fundamentals P.K. Sinha by BPB Publication.
- 31) Internet-An Introduction, TATA McGraw Hill Publication.

PRACTICALS

- 1) Simple Laboratory Techniques:
 - a) Crystallization simple & fractional, with & without seeding.
 - b) Distillation, one component & two-component system, fractional distillation.
- 2) Preparation of standard solutions, primary and secondary standard i.e., double titration, without includes mixture.
- 3) Calibration of some glassware such as Burette, Pipette, Beakers, Thermometer & calibration of weight box.
- 4) Acquaintance with safety measure in laboratory, Hazards of chemicals.
- 5) Measurement of B.P.\M.P. of solids and liquids.
- 6) Determination of physical constant by
 - a) Refractive Index (Pure liquids and mixtures)
 - b) Determination of Surface Tension (Simple liquid) & effects of surfactant in surface tension such as castor oil in benzene or toluene, glycerine in water, paraffin in benzene or toluene.
 - c) Determination of Viscosity of liquids and determination of flow time and concentration of unknown solution..
- 7) Partition function (Partition Coefficient):
Benzoic acid in Benzene or Kerosene, Ammonia in CCl₄, Iodine in CHCl₃
- 8) Practical based on MS-Windows -98, MS Word-2000 and MS-Excel 2000, Power point presentations.
- 9) Internet surfing informative websites.(Demo)

* Semester – I:

BSIC – 101 (Theory + Internal+ Practical) (70 + 30 + 25)

&

BSICP -102

» Theory:

Paper carries

70 Marks

Four Lectures / Week

» Practical:

Practical carries

25 Marks

Two days / Week

1) Volumetric Exercise

(08 Marks)

2) Partition Coefficient

(12 Marks)

3) Viva (Written Question)

(03 Marks)

4) Journal

(02 Marks)

* Semester – II:

BSIC – 201 (Theory + Internal + Practical) (70 + 30 + 25)

&

BSICP -202

» Theory:

Paper carries

70 Marks

Four Lectures / Week

» Practical:

Practical carries

25 Marks

Two days / Week

5) Physical Exercise

(12 Marks)

6) Computer lab

(08 Marks)

7) Viva (Written Question)

(03 Marks)

8) Journal

(02 Marks)

Paper No.	Subject per Semester	No. Of Paper	Theory Exam Time	Practical Exam hours
BSIC101 & BSICP102	Industrial Chemistry	One	3 Hours	3.5
BSIC201 & BSICP202	Industrial Chemistry	One	3 Hours	3.5