COURSE STRUCTURE

FOR

T. Y. B. Sc. (SEMESTER – VI) INDUSTRIAL CHEMISTRY

SEMESTER – VI			
Principal Subject	**Course Code**	**Paper Title**	**Credits**
INDUSTRIAL CHEMISTRY	US06CICH01	SYNTHETIC DYES AND INTERMEDIATES	**3**
	US06CICH02	PHARMACEUTICALS	**3**
	US06CICH03	POLYMER TECHNOLOGY	**3**
	US06CICH04	MANAGEMENT, COSTING AND PLANT DESIGN	**3**
	US06CICH05	INDUSTRIAL INSTRUMENTATION AND PROCESS CONTROL	**3**
	US06CICH06	MASS TRANSFER OPERATIONS	**3**
	US06CICH07	PRACTICAL DYES AND DRUGS	**2**
	US06CICH08	PRACTICAL POLYMER TECHNOLOGY	**2**
	US06CICH09	PRACTICAL MASS TRANSFER OPERATIONS	**2**

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US 06 C ICH 01 (3 CREDITS, 7O MARKS)
(SYNTHETIC DYES AND INTERMEDIATES)

UNIT: 1
Introduction to the Dyes, Natural to synthetic dyes, Theories of colour, Classification of Dyes on the basis of structure and the mode of application to the fibers and Chemical constitution of dyes.

UNIT: 2
Chemistry of the following dyes with respect to general structural features, chemistry mode of application to fibers and classification: Azo dyes, Acid dyes, Basic dyes and Mordant dyes.

UNIT: 3
Anthraquinone (VAT) dyes, Indigoid dyes. Reactive dyes and Disperse dye: Introduction, Classification and applications.

UNIT: 4
Analysis of dyes and dye intermediates: Nitrite value determination, Coupling value, Titanous chloride reduction, Halogen content determination, Metal Estimations: Cu, Ni, Cr, etc.

REFERENCE BOOKS

1. LUBS Chemistry of synthetic dyes and pigments,R.E. Krieger Publishing Company.
Chemistry of dyes and intermediates, Cain,Thorpe and Linstend. 1969.
2. Dyeing and Chemical technology of textile fibres, E.R.Trotman.
3. Development in the Chemistry and Techology of Organic Dyes, J.Driffths, Society of Chemicals Industry, Blackwell Scientific Publications
4. The chemistry of Synthetic Dyes, K.Venkataraman, Academic Press, Vol. I-III.
5. The analytical Chemistry of Synthetic Dyes, K.Venkateraman, John Viley, New York.
6. A Laboratory Course in Dyeing, C.H.Gites, The society of Dyes and Colourists.
7. The Dyeing of Synthetic polymers and acetate fibres, D.M.Nunn, Dyers Company Publishing Trust.
8. Dyes and Their Intermdiates, H.A. Abrahert, Pergaman Press.

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US 06 C ICH 02 (3 CREDITS, 7O MARKS)
(PHARMACEUTICALS)

UNIT: 1
Drugs Introduction: Drugs, pro-drugs, biotransformation of drugs, routes of drugs administration and dosage forms, drug binding, drug toxicity, drug addiction, some important terms used in chemistry of drugs, biological and medical terms used in the study of drugs, distinctive definition. Classification of drugs, relation of chemical structure and chemical activity.

UNIT-2
The life saving drugs: Introduction, Sulfadrugs, Antipyretics and analgesics, Antifungal and Anti-inflammatory drugs.

UNIT-3
Vitamins and Hormones: Introduction, origin of Vitamins, Classification, Deficiency and Disease. Hormones- Adernaline, Thyroid gland hormone and sex Hormone.

UNIT- 4
Fermentation: Brief idea of microorganisms, their structure, growth and usefulness. Enzyme systems useful for transformation, microbial products. General principle of fermentation process and product processing. Manufacture of Antibiotics Penicilling and semi-synthetic Penicillins, Vitamin B_{12}.

REFERENCE BOOKS

1. Organic Chemistry of Drugs Synthesis, Daniel Lednice and L.A. Mitsohar, Wiley Interscience.
2. An introduction to synthetic Drugs, P.P.Singh and D.W.Rangnekar, Himalaya Publication, Bombay.
3. Synthetic Drugs by Gurdeep R. Chatwal (Himalaya Publishing House).
4. Principles of medicinal chemistry, W.O.Foye: Lea and Febigen, Publication, Philidelphia.
5. Text book of organic medicinal and pharmaceutical chemistry Milson, Gisvold, Derge, Lippinett Toppan.

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US06CICH03. (03 CREDITS, 70 MARKS)
TITLE: POLYMER TECHNOLOGY

Unit-1
Polymerization – classification, nomenclature of polymers, mechanism of chain polymerization, free radical polymerization and its kinetics, ionic polymerization, co-ordination polymerization. Polycondensation- Introduction, Mechanism and effect of various parameters.

Unit-:
Raw material manufacture, polymerization, properties and application of PF, UF, MF, PU, Epoxy resins.

Unit-3:
Raw material manufacture, polymerization, properties and application of PE, PP, polycarbonates, PTFE, PVC, PS, PVA.

Unit-4
Fiber – Natural and synthetic fiber- nylon, polyester and rayon.Rubber – Natural and synthetic rubbers, Polyisoprene, Butadiene, Neoprene, SBR and Thiokol.

REFERENCE BOOKS

1. Shreve's Chemical Process Industries by Austin (MacGrow- Hill Publication, New Delhi)
2. Riegel's Hand Book of Industrial Chemistry by James A Kent (CBS Publishers & Distributors - New Delhi)
3. Polymer Science by V. H. Gowariker, N. V. Viswanathan, JayadevSreedhar, Wiley Eastern. (New Age International (P) Ltd., New Delhi)
4. Polymer Science and Technology of Plastics and Rubbers by PremamoyGhosh (Tata McGraw-Hill Publishing Co. Ltd., New Delhi)

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US06CICH04. (03 CREDITS, 70 MARKS)
TITLE: MANAGEMENT, COSTING AND PLANT DESIGN

Unit-1:
Financial management(source of finance, working and fixed capital). Interest and Depreciation, Taxes and Insurance.

Unit-2:
Marketing management (core concepts of marketing), Pricing policy,Break Even Analysis, Profitability criteria and selection of alternatives.

Unit-3:
Project cost estimation, Plant location, Inventory management(methods for calculating economic order quantity), Welfare and Safety.

.Unit-4:
Development of the project, evaluation of a process, choice of process, plant design factors, selection of process equipment and materials, reactors, plant layout.

REFERENCE BOOKS

1. Finance Management by I. M. Pandey (Vikas Publishing House Pvt. Ltd. – New Delhi)
2. Marketing Management by Philip Kotler. (Prentice Hall of India Pvt. Ltd. – New Delhi)
3. Plant Design Economics for Chemical Engineers by Peter and Timmerhourse. (McGraw-Hill, Inc. – New Delhi)
4. Chemical Engineering Plant Designing By Vilbrandt& Dryden (McGraw-Hill Co.)

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US 06 C ICH 05. (03 CREDITS, 70 MARKS)
TITLE: INDUSTRIAL INSTRUMENTATION AND PROCESS CONTROL

Unit 1: Concept of measurement and accuracy, Principle ,construction and working of temperature measuring instruments, Expansion thermometer, Thermoelectric temperature measurement, Resistances thermometers, Pyrometers.

Unit 2 : Pressure Terms, Bourden pressure gauge ,Bellow type and Diaphragm type pressure gauge ,Vacuum measurement, Calibration of pressure gage, Direct and indirect method of level measurement, Sp. Gravity scales, Density and sp. Gravity measurement, Viscosity measurement.

Unit 3: Flow measurement – classification of instruments, Differential pressure and differential area meters, Open channel flow measurement.

Unit 4: Control system, Terminology, Manual and automatic control, Open and closed loop control, Process time lags, Modes of control actions, Final Control Element.

Indicators, Recorders, Control panels and Control center, instrumentation diagram, Pneumatic and electrical transmission system.

REFERENCE BOOKS

1. Industrial Instrumentation by Donald P Eckman (Wiley Estern Ltd.)
2. Mechanical & Industrial Measurement by R. K. Jain (Khanna Publishers)
3. Industrial Instrumentation & Process Control by Kulkarni (Nirali Prakashan – Pune)
4. Process Instrumentation & Control Handbook – Douglass M Considine. (McGraw-Hill, Inc., New Delhi)
5. Instrumentation Technology(volume iii)E.B. John

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US 06 C ICH 06. (03 CREDITS, 70 MARKS)
TITLE: MASS TRANSFER OPERATIONS

Unit 1: Distillation- volatility and relative volatility, Boiling point diagram and equilibrium diagram, Types of distillation, Mass and enthalpy balance calculations, Calculation of number of theoretical plates, Mc-Cabe Thiel method, Importance of reflux ratio, Steam distillation, Equipments for Distillation .

Unit 2: Drying, Classification of dryers, Compartment dryer, Tunnel dryer ,Rotary dryer, Drum dryer, Spray dryer etc., Types of moisture, Theory of drying.

Evaporation- batch and continuous type evaporators, Multiple effect evaporator, Capacity of evaporator, Accessories of evaporator.

Unit 3: Crystallization- approaches for crystallization, Batch and continuous crystallization, Theory of crystallization. Gas absorption, Solvents for gas absorption,

Batch and continuous type equipments for gas absorption.

Unit 4: Leaching and liquid liquid extraction, Factors affecting rate of leaching and extraction, Industrial extractors, Leaching of cellulose material and fine solids, mechanical agitators. Batch and continuous type equipments liquid extractor,Solvents for extraction.

REFERENCE BOOKS

1. Unit Operations : Volume I & II, by K. A. Gavhane (Nirali Prakashan- Pune)
2. Introduction to Chemical Engineering by Walter L Badger and Juline T Banchero (McGraw-Hill Book Co.)
3. Unit Operation of Chemical Engineering by Warreh L Mc Cabe & Jullian C Smith (McGraw-Hill Book Co.)
4. Chemical Engineering (volume I & II) by J. M. Coulson & K. F. Richardson (Asian Books Pvt. Ltd., New delhi)

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US 06 C ICH 07 (2 CREDITS, 7O MARKS)
(DYES AND DRUGS)

Preparation of intermediates and dyes from different groups., Analysis and estimation of dyes., TLC of intermediates, Paper Chromatography of Dyes., Dyeing: Dyeing of the following dyes on cotton – Direct, Azoics, Acid, on wool and silk Demonstration of various pharmaceutical packaging materials quality control tests of some materials. Aluminium strips, cartons, glass bottles., Limits tests for chlorine, heavy metals, arsenic etc. of two representative bulk drugs., Demonstration of various pharmaceutical products.
Identification of raw drugs (TLC method).

SEMESTER-VI
PAPER NO.: US06CICH08. (02 CREDITS, 70 MARKS)
TITLE: POLYMER TECHNOLOGY

Synthesis of polymers and resins like Novalak Phenol formaldehyde, Resol Phenol formaldehyde, Urea formaldehyde, Melamine formaldehyde, Glyptalresin, Saturated and Unsaturated polyester.Cellulose Acetate, Cellulose Nitrate, Polysulfone rubber.
% purity determination of formaline, Benzoyl peroxide & Hydrogen peroxide.
Determination of acid value, Saponifaction value and Hydroxyl value

INDUSTRIAL CHEMISTRY
SEMESTER-VI
PAPER NO.: US06CICH09. (02 CREDITS, 70 MARKS)
TITLE: MASS TRANSFER OPERATIONS

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1. Study of types of distillation-Simple distillation, Rectification, Steam distillation, 2. Study of yield of crystallization with seeding and without seeding, 3. To generate Mier's super saturation curve, 4. Study on evaporation with respect to temperature and surface area, 5. Study of boiling point depression, 6. Study of adsorption behavior, 7. Study of humidity parameter using DBT-WBT method and dew point method, 8. Calibration of industrial instruments.