

SAURASHTRA UNIVERSITY
RAJKOT



Re-Accredited Grade 'B' by NAAC (CGPA 2.93)

**COURSE (CBCS) DETAILS
OF
T.Y. B.Sc.
INDUSTRIAL CHEMISTRY
Semester-V and Semester-VI
(In Force from June – 2012)**

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

SAURSHTRA UNIVERSITY
RAJKOT



Re-Accredited Grade 'B' by NAAC (CGPA 2.93)

T.Y.B.Sc. SYLLABUS (CBCS)

INDUSTRIAL CHEMISTRY

SEMESTER – V

PAPER No: BSIC 501
PAPER No: BSIC 502
PAPER No: BSIC 503

SEMESTER – VI

PAPER No: BSIC 601
PAPER No: BSIC 602
PAPER No: BSIC 603

(In Force from June – 2012)

SAURASHTRA UNIVERSITY
THIRD YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus of BSIC – 501 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2012)
Semester – V

PAPER No : BSIC – 501 (DYES-1 & PETROCHEMICALS)

UNIT – 1

- CH – 1:** Introduction to the history of Dyes. Natural to synthetic dyes, important landmarks in the Historical development. Introduction, classification of dyes on the basis of structure and the mode of application to the fibers, color and chemical constitution of dyes.
Chemistry of the following dyes with respect to general structural features, chemistry mode of application to fibres, color shades, synthesis of typical 4-5 dyes, uses.
- CH – 2:** Manufacture of the following compounds: Methane, Ethylene, Acetylene
Manufacture of the following compounds from Methane: Methanol, Hydrogen Cyanide, Carbon disulphide.
Manufacture of the following compounds from Ethylene: Ethyl chloride, Ethanol, Ethylene oxide, Ethylene glycol, Acetic acid, Styrene, Vinyl Acetate

UNIT – 2

- CH – 1:** Introduction, Anthraquinone (Vat) dyes: Indanthrene yellow 4GK, Indanthrone Blue, Dibenzathrone, Caledon Jade Green, Flavanthrone, Pyranthrone, Indanthrene Brown RRD, Indanthrene Rubene R. Indigoid dyes: Indigo, Indigosol O, Thio indigo Reactive dyes: Reactive Red, Procion Red dye, Procion Blue HB, Procion Red 5B.
- CH – 2:** Manufacture of the following compounds From Propylene: Isopropanol, Cumene, Glycerin, Acrylonitrile, Propylene oxide, Acrylic Acid and Bis-Phenol.
Manufacture of the following compounds From C₄ hydrocarbons: Butadiene, Isobutane, Butanol, Methacrylic acid and Maleic anhydride.

UNIT – 3

- CH – 1:** Disperse dyes, Effluent treatment and Pollution control for dye stuff industry. Synthesis of Disperse Red 4. Optical whiteners – Fluorescent brighteners. Quality control and factory layout for dye stuff industry.
- CH – 2:** Manufacture of the following compounds: Benzene, Toluene, Xylene, Naphthalene, Linear alkyl benzenes and their sulphonates, Caprolatum, and adipic acid.
Manufacture of the following compounds:
- Steam refining: from natural gas and from naphtha.
 - Scheme for CO & H₂ production
 - SNG production: from naphtha and from via partial oxidation.

- Books :**
1. **LUBS Chemistry of synthetic dyes and pigments**
R.E. Krieger Publishing Company.
 2. **Chemistry of dyes and intermediates**
Cain, Thorpe and Linstend; 1969
 3. **Dyeing and chemical technology of textile fibres**
E.R. Trotman.
 4. **Development in the Chemistry and Technology of Organic Dyes.**
J. Driffths, Society of Chemical Industry, Blackwell Scientific Publications.
 5. **The Chemistry of Synthetic Dyes Vol. I-II**
K. Venkataraman, Academic Press.
 6. **The Analytical Chemistry of Synthetic Dyes**
K. Venkataraman, John Wiley, New York.
 7. **A Laboratory course in Dyeing**
C.H. Gites, The Society of dyes and colourists.
 8. **The Dyeing of Synthetic Polymers and Acetate Fibres.**
D.M. Rangnekar and P.P. Singh; Himalaya Publication, Bombay.
 9. **Dyes and their Intermediates**
N.A. Abrahert, Pergaman Press.
 10. **An Introduction to Synthetic Dyes**
D.M. Rangnekar and P.P. Singh; Himalaya Publication, Bombay.
 11. **Synthetic Dyes**
Gurdeep Chatwal
 12. **Handbook of petroleum refining process.**
R.A. Mayers; MC Graw Hill, Book Com., New York.
 13. **From Hydrocarbons to petrochemicals**
L.F. Hatch; Gulf Publishing Company, Houston.
 14. **Petrochemicals – The vise of and industry.**
Spitz, Wiley.
 15. **Introduction to Petrochemicals.**
M. Steiner, Pergaman Press.
 16. **Catalysts in petrochemicals refining**
Trima.

SAURASHTRA UNIVERSITY
THIRD YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 502 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2012)
Semester – V

PAPER No:BSIC-502(Heavy & Fine Chemicals -1 & Management)

UNIT – 1

- CH – 1:** Synthetic nitrogen products: Ammonia, ammonium nitrate and ammonium sulphate,
Nitric acid. Chlor-alkali industrial products: Caustic soda, Chlorine.
Phosphorous chemical: Phosphorus, Phosphoric acid, ammonium phosphate, super phosphate, triple super phosphate.
Industrial carbon: Carbon black, manufacture of graphite and carbon. Calcium carbide, Silicon carbide.
- CH – 2:** Organization Chart, Concept of scientific management in industry, Function of management, Decision making, Planning, Organizing, Directing and control.

UNIT – 2

- CH - 1:** Fluorine, Bromine, Iodine, Hydrobromic acid, Interhalogen compound.
Sodium chloride, sodium sulphate, sodium sulphite, sodium thiosulphate, borax, boric acid.
- CH – 2:** Plant Location, Plant Layout, Plant Maintenance, Inventory Control, Product Classification, Product Development Stages, Product Life Cycle, Product Line, Product Mix, Case Studies on Product Success and Product Failure, Management of Human Resources selection.

UNIT – 3

- CH - 1:** Manufacture of the following with reference to raw materials, flow chart, properties and uses; Fischer – Tropsch synthesis Examples; Application, uses and manufacturing of zeolites. Chemical derived from acetylene, propargyl alcohol, 4 –butanediol, acrylates, vinyl esters, vinyl chloride. Pyridine, phenol, acetone, resorcinol, phthalic anhydride, glycerol, sorbitol, melamine, formaldehyde.
- CH – 2:** Factors involved in product cost estimation, Few Methods employed for the estimation of capital investment, Capital formation, Elements of cost accounting, Interest and investment costs, Time value and money, Break Even Analysis, ABC Analysis, Cash Flow Diagram.

- Books :**
1. **Chemical process industries**
Shreve R.N.; Mc Graw Hill
 2. **Applied organic chemistry**
Kilner E. and Samual
 3. **Introduction to Material Science and Engineering.**
K.M. Rells, T.Courtney and J.Wulff; Wiley Eastern Pvt. Ltd. New Delhi
 4. **Unit process in Organic Synthesis.**
P.H. Groggine, Mc Graw Hill Kogakusin Ltd.
 5. **Outline of Chemical Technology**
G.E.Drydon; East West Press, New Delhi.
 6. **Industrial Chemicals**
Faith et al; Wiley International, New York.
 7. **Heavy Organic Chemicals.**
A.J. Saite, paragon press,U.K.
 8. **Economics of Chemical industry.**
Hempel E.E.
 9. **Industrial Organisation and management.**
Behel L.L.
 10. **Instrumental methods of chemical analysis.**
Willard, Werrit, Dean Setel.
 11. **Introduction to instrumental analysis.**
Braun R.D., Mc Graw Hill Publishing Co.
 12. **Rheology theory and application Vol. 5**
Elrich R.F.
 13. **Analytical Chemistry.**
J. G. Rick; Mc Graw Hill Publication Co.
 14. **Quantitative Inorganic Analysis.**
A. Vogel, Langman Publication.
 15. **Instrumental Methods of analysis.**
Skoog and West.
 16. **Instrumental Methods of Chemical Analysis.**
Willard.

SAURASHTRA UNIVERSITY
THIRD YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 503 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2012)
Semester – V

**PAPER No:BSIC-503 (Pharmaceuticals -1 & Fundamentals
Of Chemical Engineering -1)**

UNIT – 1

- CH - 1:** Historical background and development of pharmaceutical industry in India in brief. Pharmacopoeias: Development of Indian pharmacopoeia and introduction to B.P., U.S.P., E.P., N.P., and other important pharmacopoeias. Introduction to various types of formulations and routes of administration. Aseptic conditions, Need for dosage form. Pharmaceutical Packaging: Introduction, package selection, packaging materials, ancillary materials, packaging, machinery, quality control of packing materials.
- CH – 2:** Definition of fluids and its classification, Newton's law of viscosity. Pressure and its measuring device: Simple manometer, Differential manometer, Inclined manometer. Mechanism and types of flow, Reynold's experiment. Mass and energy balance over the fluid flow system : continuity equation and Bernoulli's equation, major and minor energy losses in flowing fluid. Various flow measuring devices: Venturimeter, Orificemeter, Nozzlemeter, Pitot tube, Rotameter. Flow measurement in open channels: rectangular notch, triangular notch.

UNIT – 2

- CH - 1:** Various types of pharmaceutical Excipients, their chemistry process of manufacture and quality specifications. Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavoring agents, gelatin and other additives, sorbitol, etc. surgical dressings, sutures, ligatures, with respect to the process, equipments and used for manufacture, methods of sterilization and quality control.
- CH – 2:** Modes of heat transfer, Fourier's law, thermal conductivity, thermal insulators. Heat flow through rectangular slab and cylinder, Compound resistance in series or parallel. Fundamentals of Natural convection and forced convection. Heat transfer in combined mode of conduction and convection. Mass and energy balance over a heat exchanger and evaporators, crystallizers, distillation column. Designing a distillation column: McCabe Thiele method for calculation of number of plates, equation of q-line, reflux ratio.

UNIT – 3

CH - 1: FDA, Important schedules and some legal aspects of drugs phytochemical. Introduction to plant classification and crude drugs, cultivation, collection, preparation for the market and storage of medicinal plants. Evaluation of crude drugs: Extractive value, Volatile oil content, foreign organic matter. Quantitative microscopic exercises, including of starch leaf content (Palaside ratio, stomatal number and index, Vein inlet number and Vein termination number) crude fiber content. Introduction to chromatographic method of identification of crude drugs.

CH – 2: Definition, classifications and applications of compressors, Various important terminologies, Working of a reciprocating compressor. Derivation of work requirement in adiabatic and isothermal compression, effect of clearance, volumetric efficiency, multi compression. Definition and importance of refrigeration, cop, Difference between heat engine, refrigerator and heat pump. Air conditioning, characteristics of good refrigerants, classification of refrigerants, Properties of refrigerants, industrially important refrigerants: ammonia, CO₂, SO₂, Freon-12, Brine. Coding of various types of refrigerants.

- Books :**
1. Practical pharmacognosy T.B. Willis.
 2. Practical pharmacognosy T.N. Vassudevan.
 3. Modern pharmacognosy Ramstand: Mc Graw Hill.
 4. Indian Pharmacopoeias, 1985.
 5. British Pharmacopoeias, 1990.
 6. Hand book of Drugs and Cosmetic Acts. Mebrotra.
 7. Pharmaceutical Excipients.
 8. Pharmaceutical dosage forms.
 9. Principles of medicinal chemistry.
W.O. Foye; Lea and Febigen Publication, Philadelphia.
 10. Text book of Organic, Medicinal and Pharmaceutical Chemistry
Wilson, Gisvold, Derge, Lippinett – Toppan.
 11. Essentials of Medicinal Chemistry
Korolkovas and Burkater; Wiley Interscience.
 12. Organic chemistry of Drugs Synthesis
Daniel Lednice and L.A. Mitscher; Wiley Interscience.
 13. An introduction to Synthetic drugs
P.P. Singh and D.W. Rangnekar; Himalaya Publication, Bombay.
 14. Introduction to Chemical Engineering
Walters and Badge and Juliur; Bancheso, Mc Graw Hill Book Co.
 15. Unit operations of chemical engineering Mc Graw Hill Book Co.
 16. Instrumentation Techniques. (Vol. III) E.B. John.
 17. Heat and mass transfer by Gavhane.
 18. Process control by Coughnour.
 19. Unit operations for chemical engineering
by McCabe and Smith.

SAURASHTRA UNIVERSITY
THIRD YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 601 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2012)
Semester – VI

PAPER No:BSIC-601 (DYES-2 & POLYMER TECHNOLOGY)

UNIT – 1

- CH – 1:** Azo dyes – Various methods of Diazotizations, Sub-classes of Azo Dyes, Mono azo Acid Dyes: Acid Orange II, Acid Orange IV. Mono azo Mordant Dyes: Eriochrome Black A, Eriochrome Black T, Eriochrome Black B, Basis Azo Dyes: Aniline Yellow, Butter Yellow, Chrysodine G, Bismark Brown, Congo Red, Benzopurpurin, Rosanthrene O. Study of Direct Black EW, Brilliant Yellow, Sirius Supra Blue 3RL, Metanil Yellow, Naphthol Blue Black 6B, Chrome Blue Black R, Tartrazine.
- CH – 2:** Introduction of Polymer, Classification of Polymers, Types of Polymerization: Addition, Condensation, Ionic and Co-ordination Polymerization techniques, Functionality in Polymers, Cross linking, Molecular weight and molecular weight distribution number, Method of determining molecular weight, Glassy state, Glass Transition Temperature (GTT), Factor affecting GTT.

UNIT – 2

- CH – 1:** Benzene Intermediates, Chloro nitrobenzene, Nitro anilines, P-nitro aniline, Nitro anisole, Toluene and Xylene intermediates, diamino benzenes etc, Naphthalene Intermediates. H- acid, J- acid, R- acid, NW- acid, Chicago acid, Schaffer's acid, Naphthol, Naphthol sulphonic acid, Naphthyl amine sulfonic acids. Anthraquinone Intermediates: 1-Amino and 2-amino Anthraquinone, Bromamine acid, Quinazarin.
- CH – 2:** Detail study of the following thermosetting polymers with respect to synthesis, chemistry, properties and application.
- Phenol formaldehyde resins.
 - Urea formaldehyde and melamine formaldehyde resins.
 - Polyurethanes.
 - Epoxy resins.
 - Elastomers – Poly isoprene, Poly butadiene.

UNIT – 3

CH – 1: Analysis and application of dyes and dye intermediates.
Analysis of intermediates, Different methods used in the analysis, Nitrite value determination, coupling value, Titanous chloride reduction, Chromatography, Halogen content determination, Iodimetry metal estimations – Cu, Ni, Cr, etc.

CH – 2: Detailed study of the following thermoplastic polymers with respect to synthesis, chemistry properties and application.
Poly ethylene, HDPE, Polypropylene, Ethylene–Propylene co-polymer, Poly Vinyl Chloride, Polystyrene.
Homo polymers, co-polymers such as SBR, ABS, Polyvinyl acetate etc.
Polyamides like Nylon-6, Nylone-66.
Poly ethers and polyesters like Tetraphthaletes, Polycarbonates.

- Books :**
1. **LUBS Chemistry of synthetic dyes and pigments**
R.E. Krieger Publishing Company.
 2. **Chemistry of dyes and intermediates**
Cain, Thorpe and Linstend; 1969
 3. **Dyeing and chemical technology of textile fibres**
E.R. Trotman.
 4. **Development in the Chemistry and Technology of Organic Dyes.**
J. Driffths, Society of Chemical Industry, Blackwell Scientific Publications.
 5. **The Chemistry of Synthetic Dyes Vol. I-II**
K. Venkataraman, Academic Press.
 6. **The Analytical Chemistry of Synthetic Dyes**
K. Venkataraman, John Wiley, New York.
 7. **A Laboratory course in Dyeing**
C.H. Gites, The Society of dyes and colourists.
 8. **The Dyeing of Synthetic Polymers and Acetate Fibres.**
D.M. Rangnekar and P.P. Singh; Himalaya Publication, Bombay.
 9. **Dyes and their Intermediates**
N.A. Abrahert, Pergaman Press.
 10. **An Introduction to Synthetic Dyes**
D.M. Rangnekar and P.P. Singh; Himalaya Publication, Bombay.
 11. **Synthetic Dyes**
Gurdeep Chatwal
 12. **Handbook of petroleum refining process.**
R.A. Mayers; MC Graw Hill, Book Com., New York.
 13. **From Hydrocarbons to petrochemicals**
L.F. Hatch; Gulf Publishing Company, Houston.
 14. **Petrochemicals – The vise of and industry.**
Spitz, Wiley.
 15. **Introduction to Petrochemicals.**
M. Steiner, Pergaman Press.
 16. **Catalysts in petrochemicals refining**
Trima.

SAURASHTRA UNIVERSITY
THIRD YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 602 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2012)
Semester – VI

PAPER No: BSIC-602 (HEAVY & FINE CHEMICALS-2 & ANALYTICAL CHEMISTRY)

UNIT – 1

- CH – 1:** Raw materials, manufacturing process, flow chart and uses of Triphenyl phosphine, alkyl phosphates (methyl, ethyl, propyl, butyl), chlorination of methane, Methyl chloride, dichloromethane, chloroform, carbon tetrachloride, ethanolamine.
Alkyl amines: Methylamines, ethyl amines, di-, tri-alkyl amines (Methyl, ethyl) Butyl amines, propyl amines. Ketenes, ethyl and methyl acetoacetates, acetaldehyde. Speciality industrial solvents DMF, DMSO, sulpholane, alkyl pyrrolidone, THF, diethyl ether dimethoxy ethane, dioxane, N-alkylated ethanol amine.
- CH – 2:** Introduction, principle, various factors, measurement, application, importance apparatus of following analysis methods:
Conductometric titration, pH and its determination, Potentiometric titrations
Refractometry, Colorimetric analysis, Polarimetric analysis.

UNIT – 2

- CH - 1:** Fine and Speciality Chemicals, Reagents and Solvents:
Analytical Reagents: Sodium carbonate, sodium bicarbonate, potassium dichromate, oxalic acid, perchloric acid.
Common solution: Fehling solution, Karl-Fisher reagent.
Solvents:
Methanol, ethanol, potassium bromide, carbon tetrachloride.
Manufacture of following fine chemicals:
sodium amide, sodium ethoxide, sodium methoxide.
- CH – 2:** Sampling procedures, sampling of bulk materials, techniques of sampling for solids, Liquids and gases.
Various Chromatographic techniques like Gas liquid chromatography and High performance (Pressure) liquid chromatography, Comparison between various types of Detectors used in Chromatography.

UNIT – 3

- CH - 1:** Food additives: classification, food additive compounds like monosodium glutamate, tartaric acid, citric acid with manufacturing processes.
Essential oils: Composition and production of some essential oils.
Surfactants: classification, industrial application
Emulsifiers: Types, HLB concept.
- CH – 2:** Principle, construction, working and Specific applications of UV visible spectroscopy, IR spectroscopy, NMR spectroscopy.

- Books :**
1. **Chemical process industries**
Shreve R.N.; Mc Graw Hill
 2. **Applied organic chemistry**
Kilner E. and Samuel
 3. **Introduction to Material Science and Engineering.**
K.M. Rells, T.Courtney and J.Wulff; Wiley Eastern Pvt. Ltd. New Delhi
 4. **Unit process in Organic Synthesis.**
P.H. Groggine, Mc Graw Hill Kogakusin Ltd.
 5. **Outline of Chemical Technology**
G.E.Drydon; East West Press, New Delhi.
 6. **Industrial Chemicals**
Faith et al; Wiley International, New York.
 7. **Heavy Organic Chemicals.**
A.J. Saite, paragon press,U.K.
 8. **Economics of Chemical industry.**
Hempel E.E.
 9. **Chemical Instrument analysis**
B.K. Sharma
 10. **Instrumental methods of chemical analysis.**
Willard, Werrit, Dean Setel.
 11. **Introduction to instrumental analysis.**
Braun R.D., Mc Graw Hill Publishing Co.
 12. **Rheology theory and application Vol. 5**
Elrich R.F.
 13. **Analytical Chemistry.**
J. G. Rick; Mc Graw Hill Publication Co.
 14. **Quantitative Inorganic Analysis.**
A. Vogel, Langman Publication.
 15. **Instrumental Methods of analysis.**
Skoog and West.
 16. **Instrumental Methods of Chemical Analysis.**
Willard.

SAURASHTRA UNIVERSITY
THIRD YEAR B.Sc. (INDUSTRIAL CHEMISTRY)
Syllabus Of BSIC – 603 (INDUSTRIAL CHEMISTRY)
(Effective from June - 2012)
Semester – VI

PAPER No:BSIC-603 (PHARMACEUTICALS-2 & FUNDAMENTALS OF CHEMICAL ENGINEERING-2)

UNIT – 1

- CH - 1:** Chemical constitution of plants including carbohydrates, amino acids, proteins, fats, waxes, volatile oils, terpenoids, Saponins, Flavanoid, tannins, glycosides, alkaloids. Sterility, Pyrogens testing.
- CH – 2:** Industrial hazards and safety consideration in chemical industries. Principles of safety, Dangerous properties of chemicals, major factors to be considered for safety, effect of chemicals on human body, engineering control of chemical plants hazards, fire and explosion, health hazard, laboratory safety, Colour codes for a safety.

UNIT – 2

- CH - 1:** Classification of various types of drugs with examples, Raw materials, Process of manufacture, effluent handling, etc. of the following bulk drugs.
- *Sulpha Drugs:* Sulphaguanidine, Sulphadoxine, Sulphamethoxazole, Sulphathiazole, Sulphacetamide.
 - *Antimicrobials:* Chloramphenicol, Furazolidine, Isoniazide, Na-PAS.
 - *Analgesics and Anti-inflammatory:* Salicylic acid its derivatives, Para amino phenol derivatives, mefenamic acid.
 - *Vitamins:* Vitamin-A, Vitamin-B₆, Vitamin-B₁₂.
 - *Cardiovascular Agents:* Methyl dopa. *Balockers:* Propanolol, Atenolol.
 - *Barbiturates:* Barbital, Phenobarbital, Aprobarbital, Butalbital, Butabarbital, Butobarbital, Talbutal, Pentobarbital, Secubarbital, Cyclobarbitone, Hexobarbitone.
- CH – 2:** Development of the project, Evaluation of process, choice of process, plant design factors, selection of equipment for chemical plant, selection of material of construction and equipments, Various engineering properties of materials, Various types of reactor and reaction vessels.

UNIT – 3

- CH - 1:** Products based on fermentation Process, Brief idea of microorganisms, their structure, growth and usefulness. Enzyme Substrate activity. Microbial products: General principle of fermentation process and product processing. Manufacture of antibiotics – Penicillin – G, V and Tetracycline, Vitamin B complex. Manufacturing of Ephedrine.
- CH – 2:** Control system and its components, Feed back control system, block diagram, Comparison between positive feedback and negative feedback, terminology, Transfer function, Transportation lag, closed and open loop control system. Control valves.
Modes of control : On-Off control, Proportional Control, Proportional Integral Control, Proportional Integral Derivative Control.

- Books :**
1. Practical pharmacognosy T.B. Willis.
 2. Practical pharmacognosy T.N. Vassudevan.
 3. Modern pharmacognosy Ramstand: Mc Graw Hill.
 4. Indian Pharmacopoeias, 1985.
 5. British Pharmacopoeias, 1990.
 6. Hand book of Drugs and Cosmetic Acts. Mebrotra.
 7. Pharmaceutical Excipients.
 8. Pharmaceutical dosage forms.
 9. Principles of medicinal chemistry.
W.O. Foye; Lea and Febigen Publication, Philadelphia.
 10. Text book of Organic, Medicinal and Pharmaceutical Chemistry
Wilson, Gisvold, Derge, Lippinett – Toppan.
 11. Essentials of Medicinal Chemistry
Korolkovas and Burkhat; Wiley Interscience.
 12. Organic chemistry of Drugs Synthesis
Daniel Lednice and L.A. Mitscher; Wiley Interscience.
 13. An introduction to Synthetic drugs
P.P. Singh and D.W. Rangnekar; Himalaya Publication, Bombay.
 14. Introduction to Chemical Engineering
Waltes and Badge and Juliur; Bancheso, Mc Graw Hill Book Co.
 15. Unit operations of chemical engineering , Mc Graw Hill Book Co.
 17. Instrumentation Techniques. (Vol. III), E.B. John.
 18. Heat and mass transfer by Gavhane.
 19. Process control by Coughnour.
 20. Unit operations for chemical engineering by McCabe and Smith.

Note: Each Theory paper contains Total 100 Marks

70 External : 20 Marks MCQ + 50 Marks Theory

30 Internal : Assignment + Seminar + Attendance + Internal Test

PRACTICALS
SEMESTER V
BSICP-504

External Marks: 105 Internal Marks: 45

Total: 150

1. **Dye Preparation (35 Marks)**
Methyl orange, Methyl red, Red - 2R, Mordant Yellow, Yellow -4G, Dispersed dye, Lake Red, Indophenol Blue, Fast Green O, Fast Red A, Benzopurpurin, Maroon 2R.
 2. **Unit Operations (30 Marks)**
Size reduction operations like Jaw crusher, Roll crusher, Ball mill.
Size Separators like cyclone separator, sieve shaker,
Psychometric analysis of ambient air, Liquid liquid extraction of three phase system (chloroform-acetic acid-water and carbon tetra chloride – acetic acid - water)
 3. **Pharmaceuticals Estimation (20 Marks)**
Estimations of various pharmaceuticals drugs like aspirin, percentage magnesium, lactic acid, isoniazide, analgin, sulphamethaxasol, diazapam, vitamin C, eno, benzyl penicillin, cephalixin, sodium benzoate, mepacrine and percentage loss of sodium chloride, chloride limit test, sulphate ash in aspirin
 4. **Polymer Identification (20 Marks)**
Identification of polymers samples like nylon 6, poly methyl metha acrylate, polyvinylchloride, polyethylene, styreneacrylonitril, polystyrene, polypropylene, polyvinyl alcohol, polyvinyl acetate by simple physical and chemical tests.
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PRACTICALS
SEMESTER VI
BSICP-604

External Marks: 105 Internal Marks: 45

Total: 150

1. **Polymer Preparation (35 Marks)**
Polymer preparation of glyptal resin, phenol formaldehyde (resol), phenol formaldehyde (novolak), urea formaldehyde, melamine formaldehyde, polystyrene, dacron, cellulose acetate, and acid value of glyptal, lactic acid.
2. **Petroleum Analysis (30 Marks)**
Analysis of various petroleum parameters like flash point, fire point, viscosity (by redwood and saybolt viscometer), smoke point, softening point, penetration number, aniline point, carbon residue, cloud and pour point, moisture content (by Dean and Stark apparatus).
3. **Pharmaceuticals Preparations (20 Marks)**
Preparation of pharmaceuticals drugs and intermediates like cold cream, aspirin, Benzotriazole, Benzocain, Benzilic acid etc.
4. **Cotton Dyeing (20 Marks)**
Dyeing of following dyes on cotton: Methylene blue, Crystal violet, Congo red, Aniline black.

INDUSTRIAL TRAINING AND PROJECT SUBMISSION

[Total Marks: 100]

BSIC-605

(Combined Semester-V and Semester-VI)

Project Report	:	60 Marks
Project submission	:	20 Marks
Viva Voce	:	20 Marks