

**St. Thomas College, Bhilai**

**Industrial Chemistry Monthly Teaching Schedule, 2019-20**

**B.Sc Part-I Paper - I**

**Name of Faculty Member- Dr. Chanda Verma**

<b>Month</b>	<b>Topic</b>
July	<b>Unit-I</b> Nomenclature Generic names, Trade names. Raw Materials for Organic compounds Petroleum, natural gas, Fractionation of Crude oil.
August	<b>Unit-II</b> Petrolium :- Cracking, reforming Hydroforming isomerisation Coal - Types, Structure, Properties, distillation of coal, chemicals derived there from.
September	<b>Unit-III</b> Renewable natural resources :- Cellulose, starch, properties, modification, important industrial Chemicals derived from them, Alcohol and alcohol based chemicals, Oxalic acid, Furfural. Basic metallurgical operations- Pulverisation, calcination, Roasting, refining.
October	<b>Unit-IV</b> Physico chemical principles of extraction of, :- Iron, Copper, Lead, Silver, Sodium, Aluminium, Magnesium, Zinc, Chromium
November	<b>Unit-V</b> Inorganic materials of Industrial Importance - Their availability, forms, structure and modification. Alumina, Silica, Silicates, Clays, Mica, Carbon, Zeolites.

**Paper-II**

Name of Faculty Member - Ms. Neha Verma

<b>Month</b>	<b>Topic</b>
July	<b>Unit-1</b> Surface. chemistry and Interfacial Phenomena Adsorption Isotherm, Sols, Gels, Emulsions, Microemulsions, micelles, Aerosols, Effect of surfactants, Hydrotropes.
August	<b>Unit-II</b> Catalysts :- Introduction, Types, Homogeneous and Heterogeneous, Basic Principles, Mechanisms factors affecting the performance, Introduction to phase transfer catalysis
September	<b>Unit-III</b> Enzyme catalysed reactions - Rate model, Industrially important reactions. Material Balance without chemical Reactions:- flow diagram for material balance, simple material with or without recycle or by-pass for chemical engineering operations such as distillation, crystallisation, evaporation, extraction, etc.
October	<b>Unit-IV</b> Dimensions and Units :- Basic. chemical calculations -Atomic weight, molecular weight, equivalent weight, mole composition of (i) liquid mixture & (ii) gaseous mixture. Material balance involving chemical reaction :- concept of limiting reactant, conversion, yield liquid phase reaction, gas phase reactions with/without recycle or by-pass.
November	<b>Unit-V</b> Energy Balance :- Heat capacity of pure gases and gaseous mixtures at constant pressures. Sensible heat changes. in liquids, Enthalpy changes.

**Name of Faculty Member - Dr. Ashish Kumar Bhui**

<b>Month</b>	<b>Topic</b>
July	<b>Unit-I</b> .Distillation - Introduction; Batch and continuous distillation, separation of azeotropes, plate columns & packed,columns. Absorption - Introduction, Equipments- Packed columns, spray columns, bubble columns, packed bubble columns, mechanically, agitated contractors.
August	<b>Unit-II</b> Evaporation-Introduction,Equipments-short tube (standard) evaporator, forced circulation evaporators, falling film evaporators, climbing film (Upward flow) evaporators, wiped (agitated) film evaporator.Filtration - Introduction, filter media and filter aids, Equipments- Plate and frame,filter press, nutch filter, rotatory drum filter, sparkler filter, candle filter, bahgfifter, cen-trifuge.Drying - Introducton, free moisture, bound. moisture,drying curve, Equipments tray dryer, rotatory dryer, flash drater, fluid bed dryer, drum dryer, spray dryer.
September	<b>Unit-III</b> Utilities in chemical IndustryFuel - Types of fuels -advantages and disadvantages, combustion of fuels, calortific value. specification for fuel oil.Boilers - Types of.-boilers and their functioning.Water - Specifications fof industrial use, various water treatments
October	<b>Unit-IV</b> Fluid Flow:Fans, blowers, compressors, vacuum pumps, ejector. Pumps :- Reciprocating pumps,, Gear pumps,, centrifugal pumps.
November	<b>Unit-V</b> Heat Exchangers -: Shall and Tube type; finned tube heat exchangers, plate heat exchangers, refrigeration cycles

**B.Sc Part-II Paper - 1**

**Name of Faculty Member- Ms. Neha Verma**

<b>Month</b>	<b>Topic</b>
August	<b>Unit-I</b> Material Science : Mechanical Properties of materials and change with respect to temperature.Material of constructions used in Industry :Metals and Alloys Important metals & alloys; iron, copper aluminium lead,nickel, titanium and their alloys Mechanical and chemical properties and their applications. Cement : Types of cement, composition, manufacturing process, setting of cement. Ceramics : Introduction, Types, Manufacturing process, Applications. Refractories
September	<b>Unit-II</b> Polymeric Mateials : Industrial polymer and comoposite materials- Their constitution,.Chemical and physical properties, Industrial applications
October	<b>Unit-III</b> Glass : Types, composition, manufacture,. physical and chemical properties Applications Corrosion : Various types of corrosion relevant to chemical Industry- Machanism, Preventive methods
November	<b>Unit-IV</b> Pollution : Air, Oxygen, nitrogen cycle, water Biosphere, flora and fauna, Energy, soil Pollutants and their statutory limits, pollution evaluation methods
December	<b>Unit-V</b> Air pollution-various pollutants inorganic pollutants water pollution-organic Noise pollution, sewage analysis pesticide pollution Radiation pollution green house effect, future

**Paper-II**Name of Faculty Member- **Dr. Chanda Verma**

Month	Topic
August	<b>Unit-I</b> Unit processes in organic chemicals manufacture Nitration Introduction - Nitrating agents, Kinetics and mechanism of nitration processes such as nitration of :i Paraffinic hydrocarbons ii) Benzene to nitrobenzene and m-dinitrobenzene iii) Chlorobenzene to o and p nitrochloro benzenes.iv)Acetanilide to p-nitroacetanilide v)TolueneContinuous vs batch nitration
September	<b>Unit-II Halogenation:</b> Introduction-Kinetics of halogenation reactions reagents for halogenation, Halogenation of aromatics-side chain and nuclear halogenations, commercial manufacture of chlorobenzene, chloral, monochloroacetic acid and chloromethanes, dichloro fluormethane
October	<b>Unit-III Sulphonation :</b> Introduction-sulphonating agents, chemical and physical factors in sulphonation, Kinetics and mechanism of sulphonation reaction, commercial sulfonation of benzene, naphthalene, alkyl benzene, Batch vs continuous sultphonation
November	<b>Unit-IV IV Effluent Treatment and waste Management :</b> Principles and equipments for aerobic, anaerobic treatment, adsorption, filtration, sedimentation
December	<b>Unit-V</b> Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers, absorbers, solid waste management, industrial safety.

**Paper No-II**Name of faculty member- **Dr. Ashish Kumar Bhui**

Month	Topic
August	<b>Unit-I Oxidation :</b> Introduction-Types of oxidation reactions, oxidizing agents, kinetics and mechanism of oxidation of organic compounds liquid phase oxidation, vapor phase oxidation, commercial manufacture of benzoic acid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid.
September	<b>Unit-II Hydrogenation :</b> Introduction-Kinetics and thermo-dynamics ofhydrogenation reactions, catalysts for hydrogenation reactions, hydrogenation of vegetable oil manufacture of methanol from carbon monoxide and hydrogen, hydrogenation of acids and esters to alcohols, catalytic reforming. Alkylation: Introducton; Types of alkylation, Alkylating agents, Thermodynamics and mechanism of alkylation reactions, manufacture of - alkyl benzenes (for detergent manufacture), ethyl benzene, phenyl ethyl alcohol, N-alkyl anilines (mono and dimethyl anilines)
October	<b>Unit-III Esterification :</b> Introduction; Hydrodynamics and kinetics of esterification reactions, Esterification by organic acids, by addition of unsaturated compounds, esterification of carboxy acid derivaives, commercial manufacture of ethyl acetate, dioctyl phthalate, vinyl acetate, cellulose acetate. Amination : (A) By reduction : Intoduction, Methods of reduction-metal and acid, catalytic, sulfide, electrolytic, metal and alkali sulfites, metal hydrides, sodium metal, concentrated caustic oxidation, reduction, commercial manufacture of aniline, m-nitroaniline, p-amino phenol. By aminolysis : Introduction, aminating agents, factors affecting.

	Hydrolysis : Introduction; hydrolysing agents, kinetics, thermodynamics and mechanism of hydrolysis.
November	<b>Unit-IV Process Instrumentation</b> : concept of measurement and accuracy Principle, construction and working of following measuring instruments. Temperature : Glass thermometers, bimetallic thermometer pressure spring thermometer, vapour filled thermometers resistance thermometers. radiation pyrometers. Pressure : Manometers, barometers, bourdon pressure gauge ; bellow type diaphragm type pressure gauges, macleod gauges, pirani gauges, etc.
December	<b>Unit-V Liquid level</b> : Direct-indirect liquid level measurement, Float type liquid level gauge, ultrasonic level gauges; bubbler system, density measurement, viscosity measurement, polymerization, reactions of diazonium salts. Instrumental methods of analysis : Use of colourimeter pH meter, potentiometer, conductometer, refractometer, polarimeter. Material testing: Testing of alloys identification of plastics/rubber estimation of yield point, young's modulus, flaredness; Optical, thermal mechanical and electrical properties. Process Instrumentation Transducers of different types. use of Transducer for measuring flow control. Determination of flash point and ignition points of liquids. Water analysis : Solid contents, Hardness, COD and other tests as per industrial specifications. Flow measuring devices : Floats Monographs of representative raw materials such as sulphuric acid, toluene, sodium, carbonate, sodium hydroxide, carbon tetrachloride benzoic acid (5-6 compounds). Limit tests for heavy metals Pb, AS, Hg, Fe and ash content.

### B.Sc.Part- III Paper-I

Name of faculty member- Dr. Ashish Kumar Bhui

Month	Topic
August	<b>Unit-I</b> Factors involved in project cost estimation, methods employed for the estimation of capital investment. Capital formation, elements of cost accounting.
September	<b>Unit-II</b> Interest & investment cost, time value of money equivalence. Depreciation, method of determining depreciation, taxes. Some aspects of marketing, pricing policy.
October	<b>Unit-III</b> Profitability criteria, economics of selecting alternatives. Variation of costs with capacity, Break-even point, optimum batch sizes, Production, scheduling etc. Sampling of Bulk materials, techniques of sampling of solids, liquids and gases. Collection & Processing data. Particle size determination. Rheological properties of liquids, plastics and their analysis
November	<b>Unit-IV</b> Concept of scientific management in industry. Functions of management, decisionmaking, planning, organising. directing & control. Location of industry
December	<b>Unit-V</b> . Materials management. Inventory control. Management of human resources- selection, incentives, welfare & safety.

Paper-II

Name of Faculty Member- Ms. Neha Verma

Month	Topic
August	<b>Unit-I</b> Historical Background & development of pharmaceutical industry in India in brief. Pharmacopoeias - Development of Indian pharmacopoeia & introduction of B.P., U.S.P., E.P., N.F. & other Important Pharmacopoeias. Introduction to various types of formulations & routes of administration. Aseptic conditions, need for sterilisation, various methods of sterilisation
September	<b>Unit-II</b> Various types of pharmaceutical excipients their chemistry, process manufacture & quality, specifications Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavouring agents gelatin & other additives, sorbitol, mannitol, viscosity builders etc. Surgical dressing, sutures, ligatures with respect to the process, equipments used for manufacture, method of sterilization and quality control.
October	<b>Unit-III</b> Pharmaceutical packaging introduction, package selection, packaging materials, ancillary materials, packaging machinery, quality control of packaging materials. F.D.A., Important schedules & some legal aspects of drugs. Pharmaceutical quality control (other than the analytical methods covered under core-subject) - sterility testing, pyrogenic testing, glass testing, bulk density of power
November	<b>Unit-IV</b> Evaluation of crude drugs-Moisture content, extractive value, volatile oil content, foreign organic matter, quantitative microscopic exercises, including starch, leaf content, (palisade ratio, stomatal number & index vein, islet number & vein termination number), crude fiber content, introduction to chromatographic method of identification of crude drugs. Chromatography, Paper chromatography, TLC, HPLC, GLC. Ion chromatography.
December	<b>Unit-V</b> UV-Visible spectroscopy. IR-Spectroscopy non-dispersive IR. NMR Spectroscopy. Atomic Absorption & Flame photometry. Neutron diffraction. X-Ray Fluorescence. Ion Selective Electrodes.

### Paper-III

Name of Faculty Member **Dr.Chanda Verma**

Month	Topic
August	<b>Unit-I</b> Phyto-chemicals-Introduction to plant classification & crude drugs, cultivation, collection, preparations for the market & storage of medicinal plants. Classification of various types of drugs with examples. Raw materials, process of manufacture, effluent handling, etc. of the following bulk drugs :- Sulpha drugs-sulphaguanidine, sulphamethoxazole.
September	<b>Unit-II</b> Chemical constitution of plants including carbohydrates, amino acids, proteins, fats, waxes, volatile oils, terpenoids, steroids, saponins flavonoids, tanins, lycosides, alkaloids. 2. Various isolation procedures for active ingredients with examples for alkaloids, reserpine one for steroids sapogenin, diosgenin, diogron.
October	<b>Unit-III</b> Antimicrobial :- Chloramphenicol, Furazolidone, Mercurochrome, Isoniazid, Na-PAS. Analgesic-AntiInflammatory :- Salicylic acid and its derivatives, Ibuprofen, Mefenamic acid Steroidal Hormones :- Progesterone, Testosterone, Methyl testosterone
November	<b>Unit IV</b> Vitamin Vit.-A, Vit. B6, Vit.C. Barbiturates Pentobarbital. Blockers Propranolol, Atenolol. Cardiovascular Agent :- Methyl dopa. Antihistamines :- Chloropheneramine Maleate.

December	<p><b>Unit-V</b> Products based of fermentation processes :- Brief idea of micro-organisma, their structure, growth &amp; usefulness. Enzyme systems useful for transformation, microbial products.General principles of fermentation processes &amp; product processing.Manufacture of antibiotics - Pencillin-G &amp; semi synthetic pencillines, Rifamycin, Vitamin-B12.Bio-transformation process for prednisolone, 11-hydroxylation in steroids.Enzyme catalysed transformation, manufacture of ephidrine</p> <p>-</p>