

LESSON PLAN OF 3rd SEMESTER(2021-2022) CHEMICAL ENGINEERING

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| Discipline :- CHEMICAL | Semester:-3 RD | Name of the Teaching Faculty: Sibasish Mahapatra |
| Subject:- PHYSICAL CHEMISTRY | No of Days/per Week Class Allotted :-04 | Semester From:-1 ST October 2021 To:-8 TH January 2022 |
| Week | Class Day | Theory/ Practical Topics |
| 1 st | 1 st | PHYSICAL PROPERTIES OF LIQUIDS Intermolecular forces in liquid |
| | 2 nd | Vapour pressure and its Effect on Temperature and Boiling point |
| | 3 rd | Surface Tension |
| | 4 th | Viscosity, Measurement of viscosity by Ostwald Method |
| 2 nd | 1 st | Refractive Index, specific Refraction |
| | 2 nd | Determination of Refractive index by Refractometer |
| | 3 rd | Optical Activity, measurement of Optical Activity |
| | 4 th | Measurements of Optical Activity |
| 3 rd | 1 st | Solved problems based on physical properties of liquids |
| | 2 nd | Chapterwise Test |
| | 3 rd | SOLUTIONS Solution and types of solutions |
| | 4 th | Ways of Expressing concentration |
| 4 th | 1 st | Solved numerical related to concentration |
| | 2 nd | Solutions in Gases in Gases |
| | 3 rd | Henry's law and solved problems |
| | 4 th | Solution in liquids in liquids |
| 5 th | 1 st | Solubility of partially miscible liquids |
| | 2 nd | Solubility of solid in liquid |
| | 3 rd | Equilibrium concept, solubility curve |
| | 4 th | Raoult's law, ideal solution |
| 6 th | 1 st | Explanation of lowering of vapour pressure and its measurements |
| | 2 nd | Concept of elevation of boiling point and depression of freezing point |
| | 3 rd | OSMOSIS AND OSMOTIC PRESSURE Osmosis and Osmotic Pressure with Example |
| | 4 th | Function of semi-permeable Membrane |
| 7 th | 1 st | Osmotic pressure and Isotonic pressure |
| | 2 nd | Theories of osmosis |
| | 3 rd | Reverse osmosis |
| | 4 th | The laws of Osmotic Pressure |
| 8 th | 1 st | Solved problems on Osmosis |

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| | 2nd | Relation between Vapour pressure & Osmotic pressure |
| | 3rd | Relation between Vapour pressure & Osmotic Pressure |
| | 4th | Simple problems |
| 9th | 1st | Surprise Test on chapter-1,2,3 |
| | 2nd | DISTRIBUTION LAW Introduction |
| | 3rd | Nernst's Distribution Law |
| | 4th | Equilibrium constant from distribution law |
| 10th | 1st | Solvent Extraction |
| | 2nd | Multiple Extraction |
| | 3rd | Concept of liquid-liquid Chromatography |
| | 4th | Application of Distribution law |
| 11th | 1st | Application of Distribution law |
| | 2nd | Application of Distribution law |
| | 3rd | Numerical problems related to Distribution law |
| | 4th | COLLOIDS Colloids and Types of colloidal system |
| 12th | 1st | Characteristics of solutions |
| | 2nd | Applications of colloids |
| | 3rd | Methods of preparation of sols & purifications of sols |
| | 4th | Optical ,kinetic and electrical properties of sols |
| 13th | 1st | Emulsion and types of emulsion |
| | 2nd | Roles of Emulsifier |
| | 3rd | Preparation of Emulsions and there properties |
| | 4th | Gel, types of gel, |
| 14th | 1st | Properties and Application of gel |
| | 2nd | ADSORPTION Introduction |
| | 3rd | Types of Adsorption |
| | 4th | Physical adsorption and Chemisorption |
| 15th | 1st | Application of Adsorption |
| | 2nd | Ion – exchange adsorption |
| | 3rd | Compare absorption and adsorption |
| | 4th | Ion – exchange application. |

LESSON PLAN OF 3rd SEMESTER(2021-22) CHEMICAL ENGINEERING

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| DISCIPLINE: CHEMICAL | Semester:- 3 RD | <u>NAME OF THE TEACHING FACULTY</u> Yayati Kishore Mohanta |
| SUBJECT: FLUID MECHANICS | No of days per Week Allotted : 04 | Semester From:-1ST October 2021 To:-8TH January 2022 No of Weeks: 15 |
| Week | Class/ Day | Theory/ Practical Topics |
| 1st | 1st | Units And Dimensions; Fluid and its classification |
| | 2nd | Properties of fluid and its units |
| | 3rd | Newton's law of viscosity |
| | 4th | Newtonian & Non-Newtonian fluid |
| 2nd | 1st | Hydrostatic equilibrium and pressure head |
| | 2nd | Fluid pressure measuring devices |
| | 3rd | Different types of manometers and its applications |
| | 4th | Derivation of manometric equation |
| 3rd | 1st | Problems on Manometric Equation |
| | 2nd | Equation of continuity |
| | 3rd | Problems on Continuity Equation |
| | 4th | Types of fluid flow |
| 4th | 1st | Laminar and turbulent flow |
| | 2nd | Reynolds's number, critical velocity |
| | 3rd | Mechanism of fluid flow in pipes |
| | 4th | Reynolds' experiment |
| 5th | 1st | Bernoulli's theorem, pump work (solve simple problems) |
| | 2nd | Bernoulli's theorem, pump work (solve simple problems) |
| | 3rd | Bernoulli's theorem, pump work (solve simple problems) |
| | 4th | Flow of incompressible fluids in pipe |

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| 6th | 1st | Flow of incompressible fluids in pipe |
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| | 2nd | Flow of incompressible fluids in pipe |
| | 3rd | Friction factor, roughness |
| | 4th | Estimate friction loss in pipes & coils, equivalent length |
| 7th | 1st | Fanning's equation (Solve simple problems) |
| | 2nd | Fanning's equation (Solve simple problems) |
| | 3rd | Friction losses through sudden enlargement in pipes |
| | 4th | Friction losses through sudden contraction in pipes |
| 8th | 1st | Problems on friction losses through sudden enlargement in pipes |
| | 2nd | Problems on friction losses through sudden contraction in pipes |
| | 3rd | Flow of fluids in non-circular conduits. Water hammer |
| | 4th | Working of flow measuring devices, advantages & disadvantages |
| 9th | 1st | Expression for flow measurement through orifice meter |
| | 2nd | Expression for flow measurement through venturi meter |
| | 3rd | Expression for flow measurement through pitot tube |
| | 4th | Working of Rota meter and its calibration |
| 10th | 1st | Simple problems on flow measurement |
| | 2nd | Simple problems on flow measurement |
| | 3rd | Simple problems on flow measurement |
| | 4th | Simple problems on flow measurement |
| 11th | 1st | Concept of transportation of fluid by pipes and tubes |
| | 2nd | Different pipe fittings and its application |
| | 3rd | Different types of valves and their applications |
| | 4th | Classification of pumps |
| 12th | 1st | Construction and working of centrifugal pump |
| | 2nd | Performance characteristics of centrifugal pumps |
| | 3rd | Cavitation, Net positive suction head, Air binding & priming of pump |

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| | 4th | Centrifugal pump troubles and remedies |
| 13th | 1st | Construction and working of centrifugal pump |
| | 2nd | Performance characteristics of centrifugal pumps |

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| | 3rd | Working of Piston pump, plunger pump, gear pump, diaphragm pump |
| | 4th | Pumping device for gas: blower, compressor and vacuum devices |
| 14th | 1st | Pressure drop in porous medium |
| | 2nd | Concept of fluidization |
| | 3rd | Types of fluidization |
| | 4th | Minimum fluidization velocity |
| 15th | 1st | Fluidized bed pressure drop |
| | 2nd | Principle of pneumatic conveyance |
| | 3rd | Flow through packed bed; Problems on fluidisation |
| | 4th | Previous Year Questions Practice |

| LESSON PLAN OF 3 rd SEMESTER (2021-2022) CHEMICAL ENGINEERING DEPARTMENT | | |
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| Discipline: Chemical | Semester: 3rd | Name of The Teaching Faculty: Sanjukta Nayak |
| Subject: Theory-3 Mechanical Operation | No of Days per week class allotted: 4 | Semester From:- 1 ST October 2021 To:- 8 TH January 2022 No of Weeks: 15 |
| Week | Class days | Theory/Practical Topic |
| 1 st | 1 st | Introduction to mechanical operation |
| | 2 nd | Objectives of size reduction |
| | 3 rd | State laws of crushing like Bonds law, Rittinger's law, Kick's law |
| | 4 th | Practice numerical related to different laws |
| 2 nd | 1 st | Concept of Crushing efficiency, Work index |
| | 2 nd | Classification of size reduction equipment and their construction and operation |
| | 3 rd | Construction and working of Jaw crusher, Gyratory crusher |
| | 4 th | Construction and working of Smooth roll crusher, Hammer Mill, Ball Mill |
| 3 rd | 1 st | Closed and open circuit grinding, dry grinding |
| | 2 nd | Define wet grinding, free and choke grinding |
| | 3 rd | Practice of the chapter and solve simple problems |
| | 4 th | Practice previous years questions |
| 4 th | 1 st | Objectives of size separation |
| | 2 nd | Shape and size of irregular particle |
| | 3 rd | Different types of screen analysis |
| | 4 th | Define ideal screen & actual screen |
| 5 th | 1 st | Material balance over the screen |
| | 2 nd | Construction and operation of different types of industrial screens and their effectiveness |
| | 3 rd | Construction and operation of different types of industrial screens and their effectiveness |
| | 4 th | Construction and operation of air filters, air separator |
| 6 th | 1 st | Construction and working of cyclone separator, magnetic and Electromagnetic separation |
| | 2 nd | Theory of settling like free |
| | 3 rd | Hindered settling |
| | 4 th | State Stoke's law, Classification |
| 7 th | 1 st | Solve simple numerical based on the chapter |
| | 2 nd | Theory on Sedimentation, thickeners, clarifiers |

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| | 3rd | Theory on hydraulic classifiers, jigs, classifier riffled table and their use |
| | 4th | Principle & operation of froth floatation and its use |
| 8th | 1st | Revision of the chapter and practice previous year question |
| | 2nd | Types of filtrations, Theory of filtration, |
| | 3rd | Types of cakes, cake resistance, pressure drop, filter medium |
| | 4th | Filter Aids and related derivation |
| 9th | 1st | Classification, constructions and working principles of filtration equipments, Thickeners |
| | 2nd | Classification, constructions and working principles of filtration equipments, Thickeners |
| | 3rd | Batch and continuous centrifuges with their construction, operation |
| | 4th | Uses of batch and continuous centrifuges |
| 10th | 1st | Flocculation, coagulants and role of coagulant in filtration |
| | 2nd | Practice questions based on the chapter |
| | 3rd | Doubt clearing class |
| | 4th | Theory on mixing |
| 11th | 1st | Various mixing operations like Mixing of liquid with liquid |
| | 2nd | Mixing of liquid with solid |
| | 3rd | Mixing of viscous materials |
| | 4th | Mixing of Solid with solid |
| 12th | 1st | Mixing of gases with liquids |
| | 2nd | The flow pattern in agitated vessel |
| | 3rd | Methods of prevention of swirling and vortex formation, baffling |
| | 4th | Different impellers used in mixing operation |
| 13th | 1st | Different propellers, paddles used in mixing operation |
| | 2nd | Revision of the chapter and practice different questions |
| | 3rd | Introduction to transportation and storage |
| | 4th | Objectives of transportation and storage |
| 14th | 1st | Transportation of solid by belt conveyor |
| | 2nd | apron conveyor, screw Conveyor |
| | 3rd | bucket elevators, scrapers and pneumatic conveyers |
| | 4th | Storage and handling of solids |
| 15th | 1st | construction and uses of silos and bins |
| | 2nd | Revision of the chapters |
| | 3rd | Doubt clearing class |

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| | 4th | Practice question answer |
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**LESSON PLAN OF CHEMICAL ENGINEERING DEPARTMENT WINTER
2021**

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| Discipline: Chemical | Semester: 3rd | Name of Faculty: Sibasish Mahapatra |
| Subject: Industrial Stoichiometry (TH-4) | No of Days per week class allotted:4 | Semester From:-1ST October 2021 To:-8TH January 2022 |
| Week | Class Day | Theory Topics |
| 1 st | 1 st | CHAPTER-1: UNITS AND DIMENSIONS Introduction |
| | 2 nd | Basic and derived units used in process industry. |
| | 3 rd | Units of physical and chemical properties |
| | 4 th | Relation between units and dimension |
| 2 nd | 1 st | Unit conversion and solve numerical |
| | 2 nd | Concepts of unit operation and unit process |
| | 3 rd | Application of various graphs in process calculation |
| | 4 th | Solve numerical |
| 3 rd | 1 st | CHAPTER-2: MOLE CONCEPT Atomic number, atomic weight of elements |
| | 2 nd | Mol. Wt., mole unit, mole fraction (or percent) and mass fraction (or percent), |
| | 3 rd | Relation between mole and mass fraction |
| | 4 th | Mole concept with respect to chemical equation. |
| 4 th | 1 st | Principle of atom conservation. |
| | 2 nd | Mole calculation from reaction |
| | 3 rd | Methods of expressing composition of mixtures and solutions |
| | 4 th | Solve related numericals |
| 5 th | 1 st | CHAPTER-3: STOICHIOMETRY Introduction |
| | 2 nd | Concept of limiting reactant, Atomic weight, |
| | 3 rd | Concept of Molecular weight and empirical formula |
| | 4 th | Solved numerical based on limiting reactant, mass-mass and mass volumebasis |
| 6 th | 1 st | Concepts of Eq. weight, valence of molecule |
| | 2 nd | Solve related numerical |
| | 3 rd | Concepts of preparation of solution |
| | 4 th | Weight and volume percent of solutions |
| 7 th | 1 st | Basics of Normality, molarity and molality |
| | 2 nd | Numerical on solution preparation |
| | 3 rd | Solve related numerical |
| | 4 th | CHAPTER-4: GASES AND GASEOUS MIXTURES |

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| | | Introduction |
| 8th | 1st | Define gases, different gaseous mixture |
| | 2nd | Derivation of Ideal gas equation |
| | 3rd | Derive average molecular weight and Values of R |
| | 4th | Derivation of density of gas mixture |
| 9th | 1st | Solve related numerical |
| | 2nd | Composition by vol% and by weight % related to average molecularweight of gas mixture |
| | 3rd | Solve the examples and exercises related to Avg. mol wt. and Ideal gasequation. |
| | 4th | Concepts of Pressure, partial pressure and various laws related toPVT behavior. |
| 10th | 1st | Concepts of State Raoult's law and Henry's law |
| | 2nd | CHAPTER-5: MATERIAL BALANCE WITHOUT CHEMICAL REACTION Introduction |
| | 3rd | Basics of chemical equation and stoichiometry |
| | 4th | Concepts of law of conservation of mass and material balance over thereaction. |
| 11th | 1st | Material balance problems without chemical reactions of unit operations |
| | 2nd | Material balance of Evaporation and solve numerical |
| | 3rd | Material balance of mixing and solve numerical |
| | 4th | Material balance of crystalization |
| 12th | 1st | Material balance over distillation and solve numerical |
| | 2nd | Material balance over drying and solve related numerical |
| | 3rd | Material balance humidification and solve related numerical |
| | 4th | Material balance over filtration |
| 13th | 1st | Material balance over absorption, extraction |
| | 2nd | Solve numerical |
| | 3rd | CHAPTER-6: MATERIAL BALANCE WITH CHEMICALREACTION Introduction |
| | 4th | Concepts of Limiting reactant, Excess reactant |
| 14th | 1st | Concepts of Conversion, Selectivity, Yield. |
| | 2nd | Basic concepts involved in material balance calculations. |
| | 3rd | Material balance over combustion |
| | 4th | Material balance over chemical reaction calculation |
| 15th | 1st | Concepts of heat of combustion and heat of formation. |
| | 2nd | Concept of recycle and by pass, purge |
| | 3rd | Excess air and theoretical air |
| | 4th | Numerical based on combustion, Excess air and theoretical air |

**LESSON PLAN OF CHEMICAL ENGINEERING DEPARTMENT WINTER
2021**

| Discipline: Chemical | | Semester: 3rd | Name of Faculty: Siddhibinayak Pradhan | |
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| Subject: Theory-5 Environmental Studies | | No of Days per week class allotted | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Week-15 | |
| Week | Class No | Class days | Chapter | Theory Topic |
| Chapter -1 The Multidisciplinary nature of environmental studies | | | | |
| 1 st | 1 | 1 st | 1.1 | Definition & important issues with environmental science |
| | 2 | 2 nd | 1.2 | Scope and importance of environmental studies |
| | 3 | 3 rd | 1.3 | Components of Environment and its importance |
| | 4 | 4 th | 1.4 | Need for public awareness, Institution related to environmental studies |
| Chapter -2 Natural Resources, Renewable and nonrenewable resource | | | | |
| 2 nd | 5 | 1 st | 2.1.1 | Forest resources: Use and over-exploitation, deforestation, case studies, |
| | 6 | 2 nd | 2.1.1 | Timber extraction, mining, dams and their effects on forests and tribal people |
| | 7 | 3 rd | 2.1.2 | Water resources: Use and over-utilization of surface and ground water, floods, |
| | 8 | 4 th | 2.1.2 | Drought, conflicts over water, dam's benefits, and problems |
| 3 rd | 9 | 1 st | 2.1.3 | Mineral Resources: Use and exploitation, environmental effects of extracting |
| | 10 | 2 nd | 2.1.4 | Food Resources: World food problems, changes caused by agriculture |
| | 11 | 3 rd | 2.1.4 | Effects of modern agriculture, fertilizers- pesticides problems, water logging |
| | 12 | 4 th | 2.1.5 | Energy Resources: Growing energy need, renewable and non-renewable |
| 4 th | 13 | 1 st | 2.1.6 | Land Resources: Land as a resource, soil erosion, and desertification |
| | 14 | 2 nd | 2.2-2.3 | Role of individual in conservation of natural resources, sustainable lifestyles |
| Chapter -3 Systems | | | | |
| | 15 | 3 rd | 3.1 | Concept of an eco-system, understanding Eco system, Resource Utilization |
| | 16 | 4 th | 3.2 | Structure and function of an eco-system- Structural & functional aspects |
| 5 th | 17 | 1 st | 3.3 | Producers, consumers, decomposers- Examples in eco system |
| | 18 | 2 nd | 3.4 | Energy flow in the eco system- examples of different cycles |
| | 19 | 3 rd | 3.5 | Ecological succession-examples in eco system |
| | 20 | 4 th | 3.6 | Food chains, food webs and ecological pyramids □ |
| 6 th | 21 | 1 st | 3.7 | Introduction characteristic function of eco system: Forest ecosystem |
| | 22 | 2 nd | 3.8 | Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries) |
| Chapter -4 Biodiversity and it's Conservation | | | | |
| | 23 | 3 rd | 4.1 | Introduction-Definition: genetics, species, and ecosystem diversity |
| | 24 | 4 th | 4.2 | Biogeographically classification of India |

| Week | Class No | Class days | Chapter | Theory Topic |
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| 7 th | 25 | 1 st | 4.3 | Value of biodiversity: consumptive use, productive use |
| | 26 | 2 nd | 4.3 | Social ethical, aesthetic and Option values |
| | 27 | 3 rd | 4.4 | Biodiversity at global, national, and local level |
| | 28 | 4 th | 4.5 | Threats to biodiversity: Habitats loss, Hot spot of biodiversity |
| 8 th | 29 | 1 st | 4.5 | poaching of wildlife, man wildlife conflicts, India as megadiversity nation |
| | 30 | 2 nd | 4.5 | Conservation of biodiversity-In situ Conservation, Ex situ Conservation |
| | | | | Chapter -5 Environmental Pollution |
| | 31 | 3 rd | 5.1.1 | Definition Causes, effects, and control measures of air pollution |
| | 32 | 4 th | 5.1.2 | Definition Causes, effects, and control measures of water pollution |
| 9 th | 33 | 1 st | 5.1.3 | Definition Causes, effects, and control measures of soil pollution |
| | 34 | 2 nd | 5.1.4 | Definition Causes, effects, and control measures of marine pollution |
| | 35 | 3 rd | 5.1.5 | Definition Causes, effects and control measures of noise pollution |
| | 36 | 4 th | 5.1.5 | Definition Causes, effects and control measures of thermal pollution |
| 10 th | 37 | 1 st | 5.1.6 | Definition Causes, effects and control measures of nuclear hazards |
| | 38 | 2 nd | 5.2 | Solid waste Management: Causes, effects, and management |
| | 39 | 3 rd | 5.2 | Control measures of urban and industrial wastes |
| | 40 | 4 th | 5.3 | Role of an individual in prevention of pollution |
| 11 th | 41 | 1 st | 5.4 | Disaster management: Floods, earthquake and its mitigation measure |
| | 42 | 2 nd | 5.4 | cyclone and landslides its mitigation measure |
| | | | | Chapter -6 Social Issues and the Environment |
| | 43 | 3 rd | 6.1 | Form unsustainable to sustainable development |
| | 44 | 4 th | 6.2 | Urban problems related to energy |
| 12 th | 45 | 1 st | 6.3 | Water conservation, rainwater harvesting, water shed management |
| | 46 | 2 nd | 6.4 | Resettlement and rehabilitation of people; its problems and its concern |
| | 47 | 3 rd | 6.5 | Environmental ethics: issue and possible solutions |
| | 48 | 4 th | 6.6 | Climate change, global warming, acid rain, ozone layer depletion, |
| 13 th | 49 | 1 st | 6.6 | Nuclear accidents and holocaust, case studies |
| | 50 | 2 nd | 6.7 | Air (prevention and control of pollution) Act |
| | 51 | 3 rd | 6.8 | Water (prevention and control of pollution) Act |
| | 52 | 4 th | 6.9 | Public awareness, Issues related to Environment legislation |
| | | | | Chapter -7 Human population and the environment |
| 14 th | 53 | 1 st | | Population growth and variation among nations |
| | 54 | 2 nd | | Population explosion- family welfare program |
| | 55 | 3 rd | | Environment and human health, Environmental Health, Climate health |

| Week | Class No | Class days | Chapter | Theory Topic |
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| | 56 | 4th | | Human rights, issues connected with environment and human rights |
| 15th | 57 | 1st | | Value education, Environmental value, valuing nature, valuing culture |
| | 58 | 2nd | | Social Justice, Human heritage, Equitable use of resources |
| | 59 | 3rd | | Common Property resources, Equitable use of resources |
| | 60 | 4th | | Role of information technology in environment and human health |

| LESSON PLAN OF 3 rd SEMESTER (2021-2022) CHEMICAL ENGINEERING DEPARTMENT | | |
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| Discipline: Chemical | Semester: 3rd | Name of The Teaching Faculty: Sanjukta Nayak |
| Subject: Practical 5 | No of Days per week class allotted:4 | Semester From:-1 ST October 2021 To:-8 TH January 2022 |
| Chemical Engg. Drawing | | No of Weeks: 15 |
| Week | Practical days | Practical Topic |
| 1 st | 1 st | 1.1 Draw symbols of equipment used in chemical industries |
| | 2 nd | Draw symbols of equipment used in chemical industries |
| | 3 rd | 1.2 Draw symbol of pipe line |
| | 4 th | Valves |
| 2 nd | 1 st | Pumps |
| | 2 nd | Compressor |
| | 3 rd | heating cooling arrangements |
| | 4 th | Furnaces |
| 3 rd | 1 st | Boilers |
| | 2 nd | Practice symbols |
| | 3 rd | process vessels |
| | 4 th | Storage vessels |
| 4 th | 1 st | Driers |
| | 2 nd | Separators |
| | 3 rd | Filters |
| | 4 th | Centrifuge |
| 5 th | 1 st | Stirrer |
| | 2 nd | Feeder |
| | 3 rd | Conveyor |
| | 4 th | Practice all the symbols |
| 6 th | 1 st | 2. Draw sketch of Chemical Engineering Equipment like Heat exchanger (double pipe and shell) |
| | 2 nd | Heat exchanger (tube type) |
| | 3 rd | Distillation column |

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| | 4th | Dryer |
| 7th | 1st | Evaporator |
| | 2nd | Ball mill |
| | 3rd | Practice the chemical engineering equipments |
| | 4th | Cyclone Separator |
| 8th | 1st | Crystalliser |
| | 2nd | Absorber |
| | 3rd | Extractor |
| | 4th | 3.1 PROCESS INSTRUMENTATION DIAGRAM Draw symbols of flow rate indicator |
| 9th | 1st | flow recorder |
| | 2nd | Draw symbols of level indicator |
| | 3rd | pH recorder |
| | 4th | level controller |
| 10th | 1st | Class test related to symbols |
| | 2nd | 3.2 Draw P.I. diagrams of Cooler temperature control |
| | 3rd | Reactor temperature control |
| | 4th | Heater temperature control |
| 11th | 1st | Hot fluid temperature control |
| | 2nd | Practice different control system |
| | 3rd | Evaporator circulation control |
| | 4th | Evaporator circulation control |
| 12th | 1st | Tray dryer control |
| | 2nd | Class test |
| | 3rd | Top temperature control of distillation column |
| | 4th | Top temperature control of distillation column |
| 13th | 1st | Control of level |
| | 2nd | reflux condenser |
| | 3rd | Steam flow rate |
| | 4th | level control of reboiler |
| 14th | 1st | Practice previous diagram |
| | 2nd | Class test |

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| | 3 rd | 3.3 Utility Line diagram Service fluid code for piping |
| | 4 th | Utility block diagram for steam |
| 15 th | 1 st | Utility block diagram for chilled water |
| | 2 nd | Practice the diagram |
| | 3 rd | Practice the diagram |
| | 4 th | Practice the diagram |

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| Discipline: Chemical | | Semester: 5 th – Group-A | Name of Faculty: YAYATI KISHORE MOHANTA | |
| Subject: Student Centric Activity | | No of Days per week class allotted-03 | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Week-15 | |
| Week | Class No | Class days | | |
| 1 st | 1 | 1 st | September 4 th Week | Orientation Program and Mentor Mentee Meet |
| | 2 | 2 nd | | |
| | 3 | 3 rd | | |
| 4 | 1 st | October 2 nd week | | |
| 5 | 2 nd | | | |
| 6 | 3 rd | | | |
| 3 rd | 7 | 1 st | October 3 rd week | Seminar by Industry Expert- latest trend in Plastic Processing- ProprietorSree Plast Limited or Functioning of State Pollution Control Board- RO Regional Office OSPCB |
| | 8 | 2 nd | | |
| | 9 | 3 rd | | |
| 4 th | 10 | 1 st | October 4 th week | Laboratory Maintenance- 1.Cleaning of equipment,2. Lubrication 3. Running of equipment 4.Removal of residue material 5.Pianting of parts, 6.Arranging glass ware, Chemicals 7. Minor maintenance of equipment |
| | 11 | 2 nd | | |
| | 12 | 3 rd | | |
| 5 th | 13 | 1 st | November 1 st week | Creativity & Idea Presentation- |
| | 14 | 2 nd | | |
| | 15 | 3 rd | | |
| 6 th | 16 | 1 st | November 2 nd week | Seminar by Industry Expert- Pharmaceutical Intermediate Processing-Dept of Pharmacy BU/ Roland Institute of pharmacy |
| | 17 | 2 nd | | |
| | 18 | 3 rd | | |
| 7 th | 19 | 1 st | November 4 th week | Field Visit or Industry visit- JK paper/ Waste Treatment plant Mahuda/SreePlast limited |
| | 20 | 2 nd | | |
| | 21 | 3 rd | | |
| 8 th | 22 | 1 st | December 1 st week | CV/ Interview preparation/Career Counseling Program |
| | 23 | 2 nd | | |
| | 24 | 3 rd | | |
| 9 th | 25 | 1 st | December 2 nd week | Laboratory Maintenance-1.Cleaning of equipment,2. Lubrication 3. Running of equipment 4.Removal of residue material 5.Pianting of parts, 6.Arranging glass ware, Chemicals 7. Minor maintenance of equipment |
| | 26 | 2 nd | | |
| | 27 | 3 rd | | |
| 10 th | 28-30 | 1 st - 3 rd | December 3 rd week | Seminar by Industry Expert- From IISER/ CoE BU in the latest area of research |

| LESSON PLAN OF 3 rd SEMESTER (2021-2022) CHEMICAL ENGINEERING DEPARTMENT | | |
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| Discipline: Chemical | Semester: 3rd | Name of The Teaching Faculty: Sanjukta Nayak |
| Subject: Practical-3 Mechanical Operation | No of Days per week class allotted:3 | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Weeks: 15 |
| Week | Practical days | Practical Topic |
| 1 st | 1 st 2 nd 3 rd | Demonstrate operation of a Blake type jaw crusher and Verify Rittinger's Law and the capacity of jaw crusher |
| 2 nd | 1 st 2 nd 3 rd | a. Demonstrate operation of a Ball mill b. Find-out the critical speed of a ball mill and compare with the actual speed |
| 3 rd | 1 st 2 nd 3 rd | Determine the effect the number of balls and time of grinding and plot a graph between the no. of balls Vs. Time |
| 4 th | 1 st 2 nd 3 rd | Demonstrate operation of sieve shaker |
| 5 th | 1 st 2 nd 3 rd | determine the average size of the product after performing separation size separation by screen analysis |
| 6 th | 1 st 2 nd 3 rd | Demonstrate operation of vibrating screen & find-out its screen efficiency |
| 7 th | 1 st 2 nd 3 rd | Demonstrate operation of froth flotation cell and Concentrate the given coal sample and find out the ash present after and before concentration |
| 8 th | 1 st 2 nd 3 rd | Perform the batch sedimentation test and plot a graph between height of the dead zone and time |

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| 9th | 1st | Demonstrate operation of a magnetic separator |
| | 2nd | |
| | 3rd | |
| 10th | 1st | Demonstrate operation of cyclone separator and estimate its efficiency |
| | 2nd | |
| | 3rd | |
| 11th | 1st | Demonstrate operation of Wilflay table |
| | 2nd | |
| | 3rd | |
| 12th | 1st | Demonstrate operation of a centrifuge |
| | 2nd | |
| | 3rd | |
| 13th | 1st | Demonstrate operation of a classifier |
| | 2nd | |
| | 3rd | |
| 14th | 1st | Determine operation of a paddle mixer |
| | 2nd | |
| | 3rd | |
| 15th | 1st | Demonstrate operation of filter press |
| | 2nd | |
| | 3rd | |

| Discipline: Chemical | | Semester: 3rd | Name of Faculty: Satya Sankar Raj | |
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| Subject: Practical-1 Physical Chemistry Laboratory | | No of Days per week class allotted-04 | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Week-15 | |
| Week | Class No | Class days | Chapter | Practical Topic |
| | | | Experiment no-1 Preparation of standard solution of an acid and alkali | |
| 1 st | 1 | 1 st | 1.1 | To acquaint with safety and SOP of Chemistry laboratory |
| | 2 | 2 nd | 1.2 | To understand the concept of Normality, Molarity and standard solution |
| | 3 | 3 rd | 1.3 | Demonstration of experiment |
| | 4 | 4 th | 1.4 | Practice on preparation of standard solution |
| 2 nd | 5 | 1 st | 1.4 | Practice on preparation of standard solution |
| | 6 | 2 nd | 1.4 | Determine the strength of standard solution |
| | | | Experiment no-2 Determine the viscosity of a liquid by Red wood viscometer at different temperatures and plotting graph between viscosity and temperature | |
| | 7 | 3 rd | 2.1 | Concept of viscosity and theory of viscosity measurement |
| | 8 | 4 th | 2.2 | Description of Viscometer and demonstration of working of viscometer |
| 3 rd | 9 | 1 st | 2.3 | Demonstration of experiment |
| | 10 | 2 nd | 2.4 | Practice on Determination of viscosity of standard oil |
| | 11 | 3 rd | 2.4 | Practice on preparation of viscosity of standard oil at different temperature |
| | 12 | 4 th | 2.5 | Calculation of viscosity and plotting of graph |
| | | | Experiment no-3 To determine the partition coefficient of iodine between water and carbon tetrachloride at room temperature | |
| 4 th | 13 | 1 st | 3.1 | Study of solubility of solvent in different solvent and its behavior |
| | 14 | 2 nd | 3.2 | Nernst's distribution law- statement and explanation, limitation |
| | 15 | 3 rd | 3.3 | Demonstration of solvent extraction |
| | 16 | 4 th | 3.4 | Determine the partition coefficient of iodine between water and CCl ₄ |
| 5 th | 17 | 1 st | 3.4 | Practice on experimental technique of solvent extraction |
| | 18 | 2 nd | 3.5 | Calculation, Result, and discussion on partition coefficient of iodine |
| | | | Experiment no-4 To determine the partition coefficient of benzoic acid between water and benzene at room temperature and molecular state of Benzoic acid in benzene as compared to its solution in water. | |
| | 19 | 3 rd | 4.1 | Study of behavior of benzoic acid between water and benzene |
| | 20 | 4 th | 4.2 | Demonstration of Experiment on solvent extraction |
| Week | Class No | Class days | Chapter | Practical Topic |
| 6 th | 21 | 1 st | 4.3 | Determine partition coefficient of Benzoic acid between water and Benzene |

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| | 22 | 2 nd | 4.4 | Practice on experimental technique of solvent extraction |
| | 23 | 3 rd | 4.4 | Practice on experimental technique of solvent extraction |
| | 24 | 4 th | 4.5 | Calculation, Result, and discussion on partition coefficient of benzoic acid |
| | | | | Experiment no-5 To prepare colloidal solution of starch. |
| 7 th | 25 | 1 st | 5.1 | Study on Colloidal state, colloid and types of colloidal system |
| | 26 | 2 nd | 5.2 | Study on classification of colloids |
| | 27 | 3 rd | 5.3 | Demonstration of Preparation of colloidal solution of starch |
| | 28 | 4 th | 5.4 | Preparation of colloidal solution of starch |
| 8 th | 29 | 1 st | 5.4 | Practice on Preparation of colloidal solution of starch |
| | 30 | 2 nd | 5.5 | Result, and discussion, application on colloidal system |
| | | | | Experiment no-6 To prepare colloidal solution of egg albumin |
| | 31 | 3 rd | 6.1 | Study of characteristic of lyophilic sol and lyophobic sol |
| | 32 | 4 th | 6.2 | Discussion on different methods of preparation of sols, purification of sols |
| 9 th | 33 | 1 st | 6.3 | Demonstration of Preparation of colloidal solution of starch |
| | 34 | 2 nd | 6.4 | Preparation of colloidal solution of starch |
| | 35 | 3 rd | 6.4 | Practice on Preparation of colloidal solution of starch |
| | 36 | 4 th | 6.5 | Result, and discussion, application on colloidal system |
| | | | | Experiment no-7 Determine the solubility of a given salt at room temperature and draw its solubility curve. |
| 10 th | 37 | 1 st | 7.1 | Study of solution, solubility, Types, Solution of solids in liquids |
| | 38 | 2 nd | 7.2 | Discussion on determination of solubility and solubility curve |
| | 39 | 3 rd | 7.3 | Demonstration of the experiment on solubility of a given salt |
| | 40 | 4 th | 7.4 | Practice on determine solubility at different temperature |
| 11 th | 41 | 1 st | 7.4 | Practice on determine solubility at different temperature |
| | 42 | 2 nd | 7.5 | Result, and discussion, application of solubility curve |
| | | | | Experiment no-8 To determine the adsorption isotherm of acetic acid by activated charcoal. |
| | 43 | 3 rd | 8.1 | Study of Principle of adsorption, type, Comparison |
| | 44 | 4 th | 8.2 | Study of adsorption isotherm, plotting, limitations, and assumption |
| 12 th | 45 | 1 st | 8.3 | Demonstration of the experiment on adsorption of acetic acid by charcoal. |
| | 46 | 2 nd | 8.4 | Practice on adsorption of acetic acid by charcoal |
| | 47 | 3 rd | 8.4 | Practice on adsorption of acetic acid by charcoal |
| | 48 | 4 th | 8.5 | Result, and discussion, application of adsorption isotherm of acetic acid |
| Week | Class No | Class days | Chapter | Practical Topic |

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| | | | Experiment no-9 To investigate the adsorption of oxalic acid from aqueous solution of activated charcoal and examines the validity of Freundlich and Langmuir's adsorption isotherm | |
| 13 th | 49 | 1 st | 9.1 | Study of characteristic of Freundlich and Langmuir's adsorption isotherm |
| | 50 | 2 nd | 9.2 | Study of plotting of Freundlich and Langmuir's adsorption isotherm |
| | 51 | 3 rd | 9.3 | Demonstration of the experiment on adsorption of oxalic acid by charcoal. |
| | 52 | 4 th | 9.4 | Practice on adsorption of oxalic acid by charcoal |
| 14 th | 53 | 1 st | 9.4 | Practice on adsorption of oxalic acid by charcoal |
| | 54 | 2 nd | 9.5 | Result, and discussion, application of adsorption isotherms of oxalic acid |
| | | | Experiment no-10 To determine the rate constant for hydrolysis of ethyl acetate catalyzed by hydrochloric acid | |
| | 55 | 3 rd | 10.1 | |
| | 56 | 4 th | 10.2 | |
| 15 th | 57 | 1 st | 10.3 | Demonstration of the experiment on hydrolysis of ethyl acetate. |
| | 58 | 2 nd | 10.4 | Practice on hydrolysis of ethyl acetate |
| | 59 | 3 rd | 10.4 | Practice on hydrolysis of ethyl acetate at different time interval |
| | 60 | 4 th | 10.5 | Result, and discussion, application of adsorption isotherms of oxalic acid |

**LESSON PLAN OF CHEMICAL ENGINEERING DEPARTMENT WINTER
2021**

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| Discipline: Chemical | Semester: 5th | Name of Faculty: Siddhibinayak Pradhan |
| Subject: Practical-4 Environmental Engineering Laboratory | No of periods per week allotted:3 | Semester From:-1 ST October 2021 To:-8 TH January 2022 |
| Week | Experiment | Experiment Topic |
| 1 st | 1 | Collection of sample of waste water |
| 2 nd | 2 | Analyze a given sample of waste water for estimation of dissolved chloride |
| 3 rd | 2 | Analyze a given sample of waste water for estimation of dissolved chloride |
| 4 th | 3 | Determine the dissolved oxygen content of water by Winkler's method |
| 5 th | 3 | Determine the dissolved oxygen content of water by Winkler's method |
| 6 th | 4 | Determine the chemical oxygen demand (BOD) exerted by a given sample of waste water |
| 7 th | 4 | Determine the chemical oxygen demand (BOD) exerted by a given sample of waste water |
| 8 th | 5 | Determine the chemical oxygen demand (COD) of a given sample of waste water |
| 9 th | 5 | Determine the chemical oxygen demand (COD) of a given sample of waste water |
| 10 th | 6 | Determine the turbidity of a given sample of waste water |
| 11 th | 7 | Determine the total dissolved solid in a given sample of waste water |
| 12 th | 7 | Determine the total dissolved solid in a given sample of waste water |
| 13 th | 8 | Determine the optimum amount of Coagulant required to treat to turbid water |
| 14 th | 8 | Determine the optimum amount of Coagulant required to treat to turbid water |
| 15 th | 9 | Determine the amount of sulphate in a given sample of water. |

CHEMICAL ENGINEERING DEPARTMENT LESSON PLAN (2021-22)

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| Discipline :- CHEMICAL | Semester:-5 th | Name of the Teaching Faculty Satya Sankar Raj |
| Subject:- Entrepreneurship And Management & Smart Technology | No of Days/per Week Class Allotted :-04 | Semester From:-1ST October 2021 To:-8TH January 2022 |
| Course Code : TH 1 | | |
| Week | Class Day | Theory/ Practical Topics |
| 1st | 1 st | Chapter 1: Entrepreneurship Concept /Meaning of Entrepreneurship |
| | 2 nd | Need of Entrepreneurship |
| | 3 rd | Characteristics, Qualities and Types of entrepreneur, |
| | 4 th | Entrepreneur's vs. Manager |
| 2nd | 1 st | Forms of Business Ownership: Sole proprietorship, partnership forms and others |
| | 2 nd | Types of Industries, Concept of Start-ups |
| | 3 rd | Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc. |
| | 4 th | Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks |
| 3rd | 1 st | Functions and Barriers in entrepreneurship |
| | 2 nd | Chapter 2: Market Survey and Opportunity Identification (Business Planning) Business Planning |
| | 3 rd | SSI, Ancillary Units, Tiny Units, Service sector Units |
| | 4 th | Time schedule Plan, Agencies to be contacted for Project Implementation |
| 4th | 1 st | Assessment of Demand and supply and Potential areas of Growth |
| | 2 nd | Identifying Business Opportunity |
| | 3 rd | Final Product selection |
| | 4 th | Chapter 3: Project report Preparation Preliminary project report |
| 5th | 1 st | Detailed project report, |
| | 2 nd | Techno economic Feasibility |
| | 3 rd | Project Viability |
| | 4 th | Chapter 4: Management Principles Definitions of management |
| 6th | 1 st | Principles of management |

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| | 2nd | Functions of management (planning, organising, staffing, directing and controlling etc.) |
| | 3rd | Level of Management in an Organisation |
| | 4th | Chapter 5: Functional Areas of Management Production management: Functions, Activities |
| 7th | 1st | Productivity Quality control Production Planning and control |
| | 2nd | Inventory Management |
| | 3rd | Need for Inventory management |
| | 4th | Models/Techniques of Inventory management |
| 8th | 1st | Financial Management |
| | 2nd | Functions of Financial management |
| | 3rd | Management of Working capital, Costing (only concept) |
| | 4th | Break even Analysis |
| 9th | 1st | Brief idea about Accounting Terminologies: Book Keeping, Journal entry |
| | 2nd | Marketing Management, Concept of Marketing and Marketing Management |
| | 3rd | Marketing Techniques, Concept of 4P s (Price, Place, Product, Promotion) |
| | 4th | Human Resource Management |
| 10th | 1st | Functions of Personnel Management |
| | 2nd | Manpower Planning, Recruitment, Sources of manpower, |
| | 3rd | Selection process, Method of Testing, Methods of Training & Development, Payment of Wages |
| | 4th | Chapter 6: Leadership and Motivation Definition and Need/Importance |
| 11th | 1st | Qualities and functions of a leader, Manager Vs Leader |
| | 2nd | Style of Leadership (Autocratic, Democratic, Participative) |
| | 3rd | Definition and characteristics of motivation, Importance of motivation |
| | 4th | Factors affecting motivation, Theories of motivation (Maslow) |
| 12th | 1st | Methods of Improving Motivation |
| | 2nd | Importance of Communication in Business |
| | 3rd | Types and Barriers of Communication |
| | 4th | Chapter 7: Work Culture, TQM & Safety Human relationship and Performance in Organization |
| 13th | 1st | Relations with Peers, Superiors and Subordinates |
| | 2nd | TQM concepts: Quality Policy, Quality Management, Quality system |
| | 3rd | Accidents and Safety, Cause, preventive measures, |
| | 4th | General Safety Rules , Personal Protection Equipment(PPE) |
| 14th | 1st | Chapter 8: Legislation Introduction |
| | 2nd | Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights |
| | 3rd | Features of Factories Act 1948 with Amendment (only salient points) |

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| | 4th | Features of Payment of Wages Act 1936 (only salient points) |
| 15th | 1st | Chapter 9: Smart Technology Concept of IOT, How IOT works |
| | 2nd | Components of IOT, Characteristics of IOT, |
| | 3rd | Categories of IOT |
| | 4th | Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc |

| LESSON PLAN OF 5 th SEMESTER(2021-2022) CHEMICAL ENGINEERING DEPARTMENT | | |
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| Discipline: Chemical | Semester: 5th | Name of the Teaching Faculty: Siddhibinayak Pradhan |
| Subject: Theory-2 | No of Days per week class allotted:4 | Semester From:-1 ST October 2021 To:-8 TH January 2022 |
| Mass Transfer -2 | | No of Weeks :15 |
| Week | Class days | Theory/ Practical Topic |
| 1 st | 1 st | Chapter – 1: Humidification and Dehumidification Introduction about humidification and dehumidification |
| | 2 nd | Define temperature, wet bulb temperature and dry bulb temperature |
| | 3 rd | The principle of wet blub temperature theory |
| | 4 th | Illustrate humidity chart |
| 2 nd | 1 st | Different methods of measurement of Humidity |
| | 2 nd | Practice to identify different lines, temperatures, humidity in humidity chart |
| | 3 rd | Different methods of humidification |
| | 4 th | Different methods of dehumidification |
| 3 rd | 1 st | The construction and working of natural cooling tower |
| | 2 nd | The construction and working of mechanical draft cooling tower |
| | 3 rd | Solve simple problems |
| | 4 th | Revision of the chapter |
| 4 th | 1 st | Doubt clearing and practicing class |
| | 2 nd | Chapter – 2: Drying Introduction to drying |
| | 3 rd | Types of Moisture content-equilibrium, unbound, free moisture |
| | 4 th | Showing different types of moisture content in the graph |
| 5 th | 1 st | Concept of drying rate with graphical view |
| | 2 nd | Practicing numerical |
| | 3 rd | The methods of removing liquids from solids |
| | 4 th | Illustrate constant rate and falling rate period |
| 6 th | 1 st | The construction and working principle of tray dryer |
| | 2 nd | The construction and working principle of rotary dryer, spray dryer |
| | 3 rd | The construction and working principle of tunnel dryer, flash dryer |
| | 4 th | The construction and working principle of dryer fluidized bed dryer |

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| 7th | 1st | Dryer for heat sensitive materials |
| | 2nd | Solve simple problem |
| | 3rd | Solve simple problem |
| | 4th | Revision of the chapter |
| 8th | 1st | Practicing previous year questions |
| | 2nd | Chapter – 3: Extraction Introduction to extraction |
| | 3rd | Liquid extraction and leaching |
| | 4th | Different types of extraction |
| 9th | 1st | Learning concentration on the triangular diagram |
| | 2nd | The principle of solid liquid extraction |
| | 3rd | Revision of the chapter |
| | 4th | Define Batch leaching with example |
| 10th | 1st | Continuous leaching operation |
| | 2nd | Construction and working of Solid-Liquid extraction equipment |
| | 3rd | Construction and working of Solid-Liquid extraction equipment |
| | 4th | The principal of liquid-liquid extraction |
| 11th | 1st | The parameter in choice of solvent for liquid-liquid extraction |
| | 2nd | Revision and doubt clearing class about the chapter |
| | 3rd | Practice questions based on the chapter |
| | 4th | Construction and working principle of liquid-liquid extraction equipment |
| 12th | 1st | Construction and working principle of solid liquid extraction equipment |
| | 2nd | Solve simple problems |
| | 3rd | Solve simple problems |
| | 4th | Chapter – 4: Crystallization Introduction to crystallization |
| 13th | 1st | Principle of crystallization |
| | 2nd | Construction and working of different types of batch crystallizer |
| | 3rd | Construction and working of different types of continuous crystallizer |
| | 4th | Solve simple problems |
| 14th | 1st | Solve simple problems |
| | 2nd | Practice previous years question related to the chapter |
| | 3rd | Revision of the chapter-1 |

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| | 4th | Revision of the chapter-2 |
| 15th | 1st | Revision of the chapter-3 |
| | 2nd | Revision of the chapter-4 |
| | 3rd | Practice previous year questions |
| | 4th | Practice previous years questions |

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**CHEMICAL ENGINEERING DEPARTMENT
LESSON PLAN**

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| Discipline :- CHEMICAL | Semester:- 5th | Name of the Teaching Faculty Mr SIBASISH MAHAPATRA |
| Subject:- Chemical Process Industries – II | No of Days/per Week Class Allotted :-04 | Semester From:- 1ST October 2021 To:- 8TH January 2022 |
| Course Code : TH 3 | | |
| Week | Class Day | Theory/ Practical Topics |
| 1 st | 1 st | CHAPTER-1: PESTICIDES Introduction |
| | 2 nd | Pesticides, Classification |
| | 3 rd | Manufacture of DDT |
| | 4 th | DDT flow sheet description & application |
| 2 nd | 1 st | CHAPTER-2: PAINTS AND VARNISHES Introduction about paint, varnishes, lacquers, enamels and their components |
| | 2 nd | Constituents of paints and their characteristics |
| | 3 rd | Manufacturing process of paints and varnishes. |
| | 4 th | Failure of paints |
| 3 rd | 1 st | Advance technologies in paint industries |
| | 2 nd | CHAPTER-3: EXPLOSIVES Introduction about explosives |
| | 3 rd | Classification of different explosives |
| | 4 th | Manufacture of cellulose nitrate |
| 4 th | 1 st | Broad application of cellulose nitrate |
| | 2 nd | Manufacture nitroglycerine and dynamite |
| | 3 rd | CHAPTER-4: PLASTICS Introduction about plastics, types |
| | 4 th | Differentiate between thermoplastic and thermosetting |
| 5 th | 1 st | Classification of plastics |
| | 2 nd | Properties and manufacture of phenol formaldehyde and its application |
| | 3 rd | Properties and manufacture of urea formaldehyde and its application |
| | 4 th | Properties and Manufacture of polyethylene and its application |
| 6 th | 1 st | Properties and Manufacture of P.V.C and its application |
| | 2 nd | CHAPTER-5: SYNTHETIC FIBERS Introduction about fibre and its classification |
| | 3 rd | Properties of polyamides |
| | 4 th | Manufacture of Nylon and its application |
| 7 th | 1 st | Properties and Manufacture of Viscose rayon and its application |
| | 2 nd | Properties and Manufacture of Cupro ammonium rayon and its application |

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| | 3rd | Properties and Manufacture of Acetate rayon and its application |
| | 4th | Properties and Manufacture of Polyester and its application |
| 8th | 1st | CHAPTER-6: RUBBER Introduction about rubber and its classification |
| | 2nd | Vulcanization of rubber |
| | 3rd | Natural and synthetic rubber |
| | 4th | Manufacture of SBR and their properties |
| 9th | 1st | Manufacture of Nitrile rubber and their properties |
| | 2nd | CHAPTER-7: SUGAR Introduction |
| | 3rd | Manufacture of sugar from sugarcane |
| | 4th | Manufacture of industrial alcohol and uses |
| 10 th _h | 1st | Classification of alcoholic beverages |
| | 2nd | Properties of Alcohols |
| | 3rd | Manufacture of Beer |
| | 4th | Cont.. |
| 11 th _h | 1st | CHAPTER-8: OILS AND FATS Classify different types of oil |
| | 2nd | Manufacture of vegetable oil |
| | 3rd | Differentiate edible and essential oil |
| | 4th | Differentiate oil and fats |
| 12 th _h | 1st | Hydrogenation of oil and application |
| | 2nd | Advance technologies in oil production |
| | 3rd | CHAPTER-9: SOAPS AND DETERGENTS Introduction on soaps and detergent |
| | 4th | Differentiate between soap and detergent |
| 13 th _h | 1st | Properties of surfactant |
| | 2nd | Cleaning action of soap |
| | 3rd | Types of soap |
| | 4th | Manufacture of soap and uses |
| 14 th _h | 1st | Manufacture of detergent and uses |
| | 2nd | Industrial application of surfactants |
| | 3rd | CHAPTER-10: PHARMACEUTICAL INDUSTRY Classification of pharmaceutical industry |
| | 4th | Major pharmaceutical industry in India |
| 15 th _h | 1st | Pharmaceutical industry products |
| | 2nd | Properties and structure of penicillin |
| | 3rd | Manufacture of penicillin by fermentation |
| | 4th | Application of penicillin |

| LESSON PLAN OF 5TH SEMESTER(2021-22) CHEMICAL ENGINEERING | | |
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| DISCIPLINE: CHEMICAL | Semester:-5TH | <u>NAME OF THE TEACHING FACULTY</u> Sanjukta Nayak |
| SUBJECT: CHEMICAL ENGINEERING THERMODYNAMICS | No of days per Week Allotted : 04 | Semester From:-1ST October 2021 To:-8TH January 2022 No of Weeks:- 15 |
| Week | Class/ Day | Theory/ Practical Topics |
| 1ST | 1st | Scope and limitations of Thermodynamics |
| | 2nd | System, surrounding and boundary |
| | 3rd | Different types of systems |
| | 4th | Processes, state, properties |
| 2ND | 1st | Path and State functions |
| | 2nd | Heat and Work |
| | 3rd | Equilibrium state and phases |
| | 4th | Zerorth law of Thermodynamics |
| 3rd | 1st | State and explain first law of Thermodynamics |
| | 2nd | State and explain first law of Thermodynamics |
| | 3rd | Concept of internal energy, Enthalpy, heat capacity |
| | 4th | Concept of internal energy, Enthalpy, heat capacity |
| 4th | 1st | First law of thermodynamics for cyclic process, non-flow process, and flow process |
| | 2nd | First law of thermodynamics for cyclic process, non-flow process, and flow process |
| | 3rd | First law of thermodynamics for cyclic process, non-flow process, and flow process |
| | 4th | Solve numerical on application of 1ST law of thermodynamics |
| 5th | 1st | Solve numerical on application of 1ST law of thermodynamics |
| | 2nd | Constant volume process for ideal gases |
| | 3rd | Constant pressure process for ideal gases |
| | 4th | Constant temperature process for ideal gases |
| 6th | 1st | Adiabatic process for ideal gases |
| | 2nd | Polytrophic process for ideal gases |
| | 3rd | Solve simple problems |
| | 4th | Solve simple problems |
| 7th | 1st | Solve simple problems |

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| | 2nd | Equation of state and ideal gas |
| | 3rd | P-V-T behavior of pure fluid |
| | 4th | P-V-T behavior of pure fluid |
| 8th | 1st | Concept of heat reservoir, heat engine, and heat pump |
| | 2nd | Concept of heat reservoir, heat engine, and heat pump |
| | 3rd | State and explain second law of thermodynamics |
| | 4th | Concept of entropy |
| 9th | 1st | Concept of entropy |
| | 2nd | Calculate change of entropy for various conditions |
| | 3rd | Calculate change of entropy for various conditions |
| | 4th | Calculate change of entropy for various conditions |
| 10th | 1st | Third law of Thermodynamics |
| | 2nd | Solve simple problems |
| | 3rd | Solve simple problems |
| | 4th | Classify thermodynamic properties |
| 11th | 1st | Work function and Gibb's free energy |
| | 2nd | Work function and Gibb's free energy |
| | 3rd | Gibb's phase rule |
| | 4th | Various relationships among thermodynamic properties |
| 12th | 1st | Maxwell equation |
| | 2nd | Maxwell equation |
| | 3rd | Clapeyron equation |
| | 4th | Entropy-heat capacity relation |
| 13th | 1st | Differential equation for entropy |
| | 2nd | Effect of temperature, pressure and volume on U, H and S, relationship between C_p and C_v |
| | 3rd | Effect of temperature, pressure and volume on U, H and S, relationship between C_p and C_v |
| | 4th | Gibb's-Helmholtz equation |
| 14 TH | 1st | Fugacity co-efficient, effect of temperature and pressure on fugacity, fugacity of pure gases, solids and liquids |
| | 2nd | Fugacity co-efficient, effect of temperature and pressure on fugacity, fugacity of pure gases, solids and liquids |
| | 3rd | Concept of activity, Effect of pressure and temperature on activity |
| | 4th | Concept of activity, Effect of pressure and temperature on activity |

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| 15 TH | 1st | Concept of Refrigeration and liquefaction process |
| | 2nd | Previous Year Questions discussion |
| | 3rd | Previous Year Questions discussion |
| | 4th | Objective Questions discussion |

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| Discipline: Chemical | | Semester: 5 th | Name of Faculty: Yayati Kishore Mohanta | |
| Subject: Theory-5 Instrumentation & Chemical Analysis | | No of Days per week class allotted | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Week-15 | |
| Week | Class No | Class days | Chapter | Theory Topic |
| | | | Chapter -1 Instrument | |
| 1 st | 1 | 1 st | 1.1 | Introduction to instrumentation, Measurement, and its aim |
| | 2 | 2 nd | 1.2 | Standards of measurements- International standard, basic standards |
| | 3 | 3 rd | 1.3 | Functional elements of an instrument |
| | 4 | 4 th | 1.4 | Performance characteristics of an instrument |
| 2 nd | 5 | 1 st | 1.5 | Errors in instrumentation, Sources, Units of measurement |
| | | | Chapter -2 Measurement of Characteristics | |
| | 6 | 2 nd | 2.1 | Viscosity measurement, Principle, capillary viscometer, Efflux Cup viscometer |
| | 7 | 3 rd | 2.1 | Redwood viscometer, falling sphere viscometer, Continuous viscometer |
| | 8 | 4 th | 2.2 | Nature of radiant energy, Electromagnetic spectrum |
| 3 rd | 9 | 1 st | 2.2 | Phenomena related with energy: Absorption & Emission, Fluorescence |
| | 10 | 2 nd | 2.2 | Type of Spectroscopy-Microwave, Ultraviolet and visible spectroscopy |
| | 11 | 3 rd | 2.2 | Fundamental laws and working of a spectrometer, Colorimeter, applications |
| | 12 | 4 th | 2.3 | Optical activity & polarimetry, Specific and molecular rotation |
| 4 th | 13 | 1 st | 2.3 | Working of polarimeter and application of polarimeter |
| | 14 | 2 nd | 2.4 | Concept of refractometry, Snell's law, principle of refractometer |
| | 15 | 3 rd | 2.4 | Measurement of refractive index by refractometer, application in Industry |
| | | | Chapter -3 pH and Conductivity Measurement | |
| | 16 | 4 th | 3.1 | pH measurement working principle |
| 5 th | 17 | 1 st | 3.1 | Construction of pH electrodes and its operation |
| | 18 | 2 nd | 3.1 | Operation of pH meter, advantages, disadvantages, and applications |
| | 19 | 3 rd | 3.2 | Principles of measurement of electrical conductivity |
| | 20 | 4 th | 3.2 | Operation of Conductivity meter, advantages, disadvantages, and applications |
| | | | Chapter -4 Temperature Measurement | |
| | 21 | 1 st | 4.1 | Different temperature scales and its interconversions |
| | 22 | 2 nd | 4.1 | Basic fixed points, secondary fixed points |
| | 23 | 3 rd | 4.2 | Methods of temperature measurement- principle and applications |
| | 24 | 4 th | 4.3 | Measurements of temperature in liquid in glass thermometer |
| Week | Class No | Class days | Chapter | Theory Topic |
| 7 th | 25 | 1 st | 4.4 | Working of resistance thermometer, advantages, and disadvantages |

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| | 26 | 2 nd | 4.4 | Thermocouples, material used in thermocouples and its advantages |
| | 27 | 3 rd | 4.4 | Working of radiation pyrometer, advantages, disadvantages, and application |
| | 28 | 4 th | 4.4 | Working of Optical pyrometer, advantages, disadvantages, and application |
| 8 th | 29 | 1 st | 4.4 | Fiber optics temperature measurement and ultrasonic thermometers |
| | 30 | 2 nd | 4.4 | Calibration of thermometers, miscellaneous measurement techniques |
| | | | | Chapter -5 Pressure Measurement |
| | 31 | 3 rd | 5.1 | Different types of pressures, units, and interconversions |
| | 32 | 4 th | 5.2 | Methods of pressure measurements |
| 9 th | 33 | 1 st | 5.3 | Elastic Pressure transducers, components in Bourdon tube Pressure Gauge |
| | 34 | 2 nd | 5.3 | Adjustments in Bourdon tube Pressure Gauge, advantages, disadvantages |
| | 35 | 3 rd | 5.3 | Diaphragm pressure transducers, advantages, disadvantages, and application |
| | 36 | 4 th | 5.3 | Bellows type gauge advantages, disadvantages, and application |
| 10 th | 37 | 1 st | 5.3 | Measurement of vacuum-Capsule gauge, McLeod gauge-applications |
| | 38 | 2 nd | 5.3 | Calibration of pressure measuring instrumentations |
| | 39 | 3 rd | 5.4 | Maintenance of pressure measuring instruments-Inspection, care, and repair |
| | 40 | 4 th | 5.4 | Troubleshooting of pressure measuring instruments. |
| | | | | Chapter -6 Automatic Control |
| 11 th | 41 | 1 st | 6.1 | Automatic control system and explain the application with example. |
| | 42 | 2 nd | 6.1 | Working of a heat exchanger Control system |
| | 43 | 3 rd | 6.1 | Working of a liquid level tank Control system |
| | 44 | 4 th | 6.2 | Elementary idea on transfer functions for a first order system & time constant |
| 12 th | 45 | 1 st | 6.2 | Block diagram and components of Process Control system |
| | 46 | 2 nd | 6.2 | Function of sensors and transmitters, transfer function of a control system |
| | 47 | 3 rd | 6.2 | Working of sensor transmitter combination |
| | 48 | 4 th | 6.3 | Types of process control system, advantages, and disadvantages |
| 13 th | 49 | 1 st | 6.3 | Working of open loop control system with examples |
| | 50 | 2 nd | 6.3 | Working of Closed loop control system with examples |
| | 51 | 3 rd | 6.3 | Working of Feed Forward control system with examples |
| | 52 | 4 th | 6.3 | Working of cascade control system with examples |
| 14 th | 53 | 1 st | 6.4 | Elementary idea about different types of automatic controllers. |
| | 54 | 2 nd | 6.4 | Ratio control system, analog and digital control system |
| | 55 | 3 rd | 6.5 | Application based control system- sequential control system, Numerical CS |
| | 56 | 4 th | 6.5 | I,D,PI, PD,PID Pneumatic, Hydraulic and electronic controller |
| Week | Class No | Class days | Chapter | Theory Topic |
| 15 th | 57 | 1 st | 6.5 | Principle of PLC, computer Aided measurement and control |

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| 58 | 2nd | 6.5 | PLC Architecture, PLC basic structure and programming |
| 59 | 3rd | 6.5 | Role of computers in measurement and control |
| 60 | 4th | 6.5 | Elements of computer aided measurement and control, architecture |

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|-----------------------------------|----------|---------------------------------------|---|---|
| Discipline: Chemical | | Semester: 5 th – Group-A | Name of Faculty: Satya Sankar Raj | |
| Subject: Student Centric Activity | | No of Days per week class allotted-03 | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Week-15 | |
| Week | Class No | Class days | | |
| 1 st | 1 | 1 st | September 4 th Week | Orientation Program and Mentor Mentee Meet |
| | 2 | 2 nd | | |
| | 3 | 3 rd | | |
| 2 nd | 4 | 1 st | | |
| | 5 | 2 nd | | |
| | 6 | 3 rd | | |
| 3 rd | 7 | 1 st | October 3 rd week | Seminar by Industry Expert- latest trend in Plastic Processing- ProprietorSree Plast Limited or Functioning of State Pollution Control Board- RO Regional Office OSPCB |
| | 8 | 2 nd | | |
| | 9 | 3 rd | | |
| 4 th | 10 | 1 st | October 4 th week | Laboratory Maintenance- 1.Cleaning of equipment,2. Lubrication 3. Running of equipment 4.Removal of residue material 5.Pianting of parts, 6.Arranging glass ware, Chemicals 7. Minor maintenance of equipment |
| | 11 | 2 nd | | |
| | 12 | 3 rd | | |
| 5 th | 13 | 1 st | November 1 st week | Creativity & Idea Presentation- |
| | 14 | 2 nd | | |
| | 15 | 3 rd | | |
| 6 th | 16 | 1 st | November 2 nd week | Seminar by Industry Expert- Pharmaceutical Intermediate Processing-Dept of Pharmacy BU/ Roland Institute of pharmacy |
| | 17 | 2 nd | | |
| | 18 | 3 rd | | |
| 7 th | 19 | 1 st | November 4 th week | Field Visit or Industry visit- JK paper/ Waste Treatment plant Mahuda/SreePlast limited |
| | 20 | 2 nd | | |
| | 21 | 3 rd | | |
| 8 th | 22 | 1 st | December 1 st week | CV/ Interview preparation/Career Counseling Program |
| | 23 | 2 nd | | |
| | 24 | 3 rd | | |
| 9 th | 25 | 1 st | December 2 nd week | Laboratory Maintenance-1.Cleaning of equipment,2. Lubrication 3. Running of equipment 4.Removal of residue material 5.Pianting of parts, 6.Arranging glass ware, Chemicals 7. Minor maintenance of equipment |
| | 26 | 2 nd | | |
| | 27 | 3 rd | | |
| 10 th | 28-30 | 1 st - 3 rd | December 3 rd week | Seminar by Industry Expert- From IISER/ CoE BU in the latest area of research |

**LESSON PLAN OF CHEMICAL ENGINEERING
DEPARTMENT WINTER 2021**

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|---|-----------------------------------|--|----------------------------------|
| Discipline: Chemical | Semester: 5th | Name of Faculty: Yayati Kishore Mohanta | |
| Subject: Practical-1 Instrumentation Laboratory | No of periods per week allotted:6 | Semester From:-1 ST October 2021 | To:-8 TH January 2022 |
| Week | Experiment | Experiment Topic | |
| 1 st | 1 | Separation of Iron using solvent extraction technique | |
| 2 nd | 2 | Determine pH and conductivity of a given solution by pH-meter | |
| 3 rd | 2 | Determine pH and conductivity of a given solution by pH-meter | |
| 4 th | 3 | Determine the concentration of sugar in sugar solution by Polarimeter | |
| 5 th | 3 | Determine the concentration of sugar in sugar solution by Polarimeter | |
| 6 th | 4 | Determine the refractive index of different liquids by Abbe's Refractometer | |
| 7 th | 4 | Determine the refractive index of different liquids by Abbe's Refractometer | |
| 8 th | 5 | To determine Maximum wavelength of a solution of cobalt chloride | |
| 9 th | 5 | Verify Beer's Law and apply it to find the concentration of the given unknown solution by Spectrophotometer | |
| 10 th | 6 | To verify Beer's law of solution of KMnO ₄ and K ₂ Cr ₂ O ₇ using calorimeter | |
| 11 th | 7 | Demonstrate different types of pressure gauges and temperature measuring device | |
| 12 th | 8 | Determine the viscosity of an Oil by Red Wood Viscometer at different temperature and plotting a graph between viscosity and temperature | |
| 13 th | 8 | Determine the viscosity of an Oil by Red Wood Viscometer at different temperature and plotting a graph between viscosity and temperature | |
| 14 th | 9 | Calibration of a thermocouple | |
| 15 th | 10 | Demonstrate function of digital multi-meter | |

| LESSON PLAN OF 5 TH SEMESTER (2021-2022) CHEMICAL ENGINEERING DEPARTMENT | | |
|--|---|---|
| Discipline: Chemical | Semester: 3rd | Name of The Teaching Faculty: Siddhibinayak Pradhan |
| Subject: Practical-3 Mass Transfer 2 Laboratory | No of Days per week class allotted:3 | Semester From:-1 ST October 2021 To:-8 TH January 2022 No of Weeks: 15 |
| Week | Practical days | Practical Topic |
| 1 st | 1 st | A. Demonstraton of operation of a Cooling Tower B. Determination of humidity, humid volume, humid heat, percentage of humidity by psychometric method. |
| | 2 nd | |
| | 3 rd | |
| 2 nd | 1 st | A) Demonstration of operation of the wetted wall column B) Determination of Psychometric parameter of outlet air |
| | 2 nd | |
| | 3 rd | |
| 3 rd | 1 st | A) Demonstrate operation of a tray dryer (Vacuum / Atmospheric type) B) Plot the rate of drying curve for a given sample of wet solid |
| | 2 nd | |
| | 3 rd | |
| 4 th | 1 st | Demonstrate operation of a Fluidized bed dryer |
| | 2 nd | |
| | 3 rd | |
| 5 th | 1 st | A) Demonstrate operation of an open pan crystallizer B) Find the yield of crystal from a given solution |
| | 2 nd | |
| | 3 rd | |
| 6 th | 1 st | Mid Term Viva |
| | 2 nd | |
| | 3 rd | |
| 7 th | 1 st | Demonstrate operation of Swanson Walker Crystallizer |
| | 2 nd | |
| | 3 rd | |
| 8 th | 1 st | MID TERM VIVA |
| | 2 nd | |
| | 3 rd | |

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| 9th | 1st | Separate a solution into its component by using liquid liquid extraction metho |
| | 2nd | |
| | 3rd | |
| 10th | 1st | Demonstrate operation of a solid-liquid extractor |
| | 2nd | |
| | 3rd | |
| 11th | 1st | Demonstrate operation of spray tower |
| | 2nd | |
| | 3rd | |
| 12th | 1st | To determine the partition coefficient of Iodine between water and carbon tetrachlorid |
| | 2nd | |
| | 3rd | |
| 13th | 1st | Demonstrate operation of liquid-liquid extractor |
| | 2nd | |
| | 3rd | |
| 14th | 1st | END TERM VIVA |
| | 2nd | |
| | 3rd | |
| 15th | 1st | RECORD SUBMISSION AND VIVA BY EXTERNAL |
| | 2nd | |
| | 3rd | |