

## GOVERNMENT POLYTECHNIC JAGATSINGHPUR

| <b>LESSON PLAN OF 3<sup>rd</sup> SEMESTER CHEMICAL ENGINEERING</b> |  |  |
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| Discipline :-<br>CHEMICAL  | Semester:-3 <sup>RD</sup>                | <u>Name of the Teaching Faculty</u><br><b>RAJESH KUMAR DUTTA</b>                 |
| Subject:-<br>PHYSICAL<br>CHEMISTRY<br>(TH 1)                       | No of Days per<br>Week Allotted :-<br>04 | <b>SEMESTER: OCTOBER TO JANUARY</b><br><b>No of Weeks:- 15</b>                   |
| Week   | Class Day                                | Theory/ Practical Topics   |
| 1 <sup>st</sup>  | 1 <sup>st</sup>                          | <b>PHYSICAL PROPERTIES OF LIQUIDS</b><br>Intermolecular forces in liquid         |
|  | 2 <sup>nd</sup>                          | Vapour pressure and its Effect on Temperature and Boiling point                  |
|  | 3 <sup>rd</sup>                          | Surface Tension  |
|  | 4 <sup>th</sup>                          | Viscosity, Measurement of viscosity by Ostwald Method                            |
| 2 <sup>nd</sup>  | 1 <sup>st</sup>                          | Refractive Index, specific Refraction  |
|  | 2 <sup>nd</sup>                          | Determination of Refractive index by Refractometer                               |
|  | 3 <sup>rd</sup>                          | Optical Activity, measurement of Optical Activity                                |
|  | 4 <sup>th</sup>                          | Measurements of Optical Activity   |
| 3 <sup>rd</sup>  | 1 <sup>st</sup>                          | Solved problems based on physical properties of liquids                          |
|  | 2 <sup>nd</sup>                          | Chapterwise Test   |
|  | 3 <sup>rd</sup>                          | <b>SOLUTIONS</b><br>Solution and types of solutions                              |
|  | 4 <sup>th</sup>                          | Ways of Expressing concentration   |
| 4 <sup>th</sup>  | 1 <sup>st</sup>                          | Solved numerical related to concentration  |
|  | 2 <sup>nd</sup>                          | Solutions in Gases in Gases  |
|  | 3 <sup>rd</sup>                          | Henry's law and solved problems  |
|  | 4 <sup>th</sup>                          | <b>Solution in liquids in liquids</b>  |
| 5 <sup>th</sup>  | 1 <sup>st</sup>                          | Solubility of partially miscible liquids   |
|  | 2 <sup>nd</sup>                          | Solubility of solid in liquid  |
|  | 3 <sup>rd</sup>                          | Equilibrium concept, solubility curve  |
|  | 4 <sup>th</sup>                          | Raoult's law, ideal solution   |
| 6 <sup>th</sup>  | 1 <sup>st</sup>                          | Explanation of lowering of vapour pressure and its measurements                  |
|  | 2 <sup>nd</sup>                          | Concept of elevation of boiling point and depression of freezing point           |
|  | 3 <sup>rd</sup>                          | <b>OSMOSIS AND OSMOTIC PRESSURE</b><br>Osmosis and Osmotic Pressure with Example |
|  | 4 <sup>th</sup>                          | Function of semi-permeable Membrane  |
| 7 <sup>th</sup>  | 1 <sup>st</sup>                          | Osmotic pressure and Isotonic pressure   |
|  | 2 <sup>nd</sup>                          | Theories of osmosis  |
|  | 3 <sup>rd</sup>                          | Reverse osmosis  |
|  | 4 <sup>th</sup>                          | The laws of Osmotic Pressure   |

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| 8 <sup>th</sup>  | 1 <sup>st</sup> | Solved problems on Osmosis                                |
|                  | 2 <sup>nd</sup> | Relation between Vapour pressure & Osmotic pressure       |
|                  | 3 <sup>rd</sup> | Relation between Vapour pressure & Osmotic Pressure       |
|                  | 4 <sup>th</sup> | Simple problems   |
| 9 <sup>th</sup>  | 1 <sup>st</sup> | Surprise Test on chapter-1,2,3                            |
|                  | 2 <sup>nd</sup> | <b>DISTRIBUTION LAW</b><br>Introduction                   |
|                  | 3 <sup>rd</sup> | Nernst's Distribution Law                                 |
|                  | 4 <sup>th</sup> | Equilibrium constant from distribution law                |
| 10 <sup>th</sup> | 1 <sup>st</sup> | Solvent Extraction  |
|                  | 2 <sup>nd</sup> | Multiple Extraction                                       |
|                  | 3 <sup>rd</sup> | Concept of liquid-liquid Chromatography                   |
|                  | 4 <sup>th</sup> | Application of Distribution law                           |
| 11 <sup>th</sup> | 1 <sup>st</sup> | Application of Distribution law                           |
|                  | 2 <sup>nd</sup> | Application of Distribution law                           |
|                  | 3 <sup>rd</sup> | Numerical problems related to Distribution law            |
|                  | 4 <sup>th</sup> | <b>COLLOIDS</b><br>Colloids and Types of colloidal system |
| 12 <sup>th</sup> | 1 <sup>st</sup> | Characteristics of solutions                              |
|                  | 2 <sup>nd</sup> | Applications of colloids                                  |
|                  | 3 <sup>rd</sup> | Methods of preparation of sols & purifications of sols    |
|                  | 4 <sup>th</sup> | Optical ,kinetic and electrical properties of sols        |
| 13 <sup>th</sup> | 1 <sup>st</sup> | Emulsion and types of emulsion                            |
|                  | 2 <sup>nd</sup> | Roles of Emulsifier                                       |
|                  | 3 <sup>rd</sup> | Preparation of Emulsions and there properties             |
|                  | 4 <sup>th</sup> | Gel, types of gel,  |
| 14 <sup>th</sup> | 1 <sup>st</sup> | Properties and Application of gel                         |
|                  | 2 <sup>nd</sup> | <b>ADSORPTION</b><br>Introduction                         |
|                  | 3 <sup>rd</sup> | Types of Adsorption                                       |
|                  | 4 <sup>th</sup> | Physical adsorption and Chemisorption                     |
| 15 <sup>th</sup> | 1 <sup>st</sup> | Application of Adsorption                                 |
|                  | 2 <sup>nd</sup> | Ion – exchange adsorption                                 |
|                  | 3 <sup>rd</sup> | Compare absorption and adsorption                         |
|                  | 4 <sup>th</sup> | Ion – exchange application.                               |

# LESSON PLAN OF 3<sup>rd</sup> SEMESTER CHEMICAL ENGINEERING

| <b>DISCIPLINE:</b><br>CHEMICAL                  | <b>Semester:-3<sup>RD</sup></b>              | <u>NAME OF THE TEACHING FACULTY</u><br><br><b>PRATEEK KUMAR DAS</b> |
|---|--|---|
| <b>SUBJECT:</b><br>FLUID<br>MECHSNICS<br>(TH 2) | <b>No of days per<br/>Week Allotted : 04</b> | <b>SEMESTER: OCTOBER JANUARY</b><br><br><b>No of Weeks:- 15</b>     |
| <b>Week</b>                                     | <b>Class/ Day</b>                            | <b>Theory/ Practical Topics</b>                                     |
| 1 <sup>st</sup>                                 | 1 <sup>st</sup>                              | Fluid and its classification  |
|   | 2 <sup>nd</sup>                              | Properties of fluid and its units                                   |
|   | 3 <sup>rd</sup>                              | Newton's law of viscosity   |
|   | 4 <sup>th</sup>                              | Newtonian & Non-Newtonian fluid                                     |
| 2 <sup>nd</sup>                                 | 1 <sup>st</sup>                              | Hydrostatic equilibrium and pressure head                           |
|   | 2 <sup>nd</sup>                              | Fluid pressure measuring devices                                    |
|   | 3 <sup>rd</sup>                              | Different types of manometers and its applications                  |
|   | 4 <sup>th</sup>                              | Derivation of manometric equation                                   |
| 3 <sup>rd</sup>                                 | 1 <sup>st</sup>                              | Problems on Manometric Equation                                     |
|   | 2 <sup>nd</sup>                              | Equation of continuity  |
|   | 3 <sup>rd</sup>                              | Problems on Continuity Equation                                     |
|   | 4 <sup>th</sup>                              | Types of fluid flow   |
| 4 <sup>th</sup>                                 | 1 <sup>st</sup>                              | Laminar and turbulent flow  |
|   | 2 <sup>nd</sup>                              | Reynolds's number, critical velocity                                |
|   | 3 <sup>rd</sup>                              | Mechanism of fluid flow in pipes                                    |
|   | 4 <sup>th</sup>                              | Reynolds' experiment  |
| 5 <sup>th</sup>                                 | 1 <sup>st</sup>                              | Bernoulli's theorem, pump work (solve simple problems)              |
|   | 2 <sup>nd</sup>                              | Bernoulli's theorem, pump work (solve simple problems)              |
|   | 3 <sup>rd</sup>                              | Bernoulli's theorem, pump work (solve simple problems)              |
|   | 4 <sup>th</sup>                              | Flow of incompressible fluids in pipe                               |

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| 6 <sup>th</sup>  | 1 <sup>st</sup> | Flow of incompressible fluids in pipe                                |
|                  | 2 <sup>nd</sup> | Flow of incompressible fluids in pipe                                |
|                  | 3 <sup>rd</sup> | Friction factor, roughness   |
|                  | 4 <sup>th</sup> | Estimate friction loss in pipes & coils, equivalent length           |
| 7 <sup>th</sup>  | 1 <sup>st</sup> | Fanning's equation (Solve simple problems)                           |
|                  | 2 <sup>nd</sup> | Fanning's equation (Solve simple problems)                           |
|                  | 3 <sup>rd</sup> | Friction losses through sudden enlargement in pipes                  |
|                  | 4 <sup>th</sup> | Friction losses through sudden contraction in pipes                  |
| 8 <sup>th</sup>  | 1 <sup>st</sup> | Problems on friction losses through sudden enlargement in pipes      |
|                  | 2 <sup>nd</sup> | Problems on friction losses through sudden contraction in pipes      |
|                  | 3 <sup>rd</sup> | Flow of fluids in non-circular conduits. Water hammer                |
|                  | 4 <sup>th</sup> | Working of flow measuring devices, advantages & disadvantages        |
| 9 <sup>th</sup>  | 1 <sup>st</sup> | Expression for flow measurement through orifice meter                |
|                  | 2 <sup>nd</sup> | Expression for flow measurement through venturi meter                |
|                  | 3 <sup>rd</sup> | Expression for flow measurement through pitot tube                   |
|                  | 4 <sup>th</sup> | Working of Rota meter and its calibration                            |
| 10 <sup>th</sup> | 1 <sup>st</sup> | Simple problems on flow measurement                                  |
|                  | 2 <sup>nd</sup> | Simple problems on flow measurement                                  |
|                  | 3 <sup>rd</sup> | Simple problems on flow measurement                                  |
|                  | 4 <sup>th</sup> | Simple problems on flow measurement                                  |
| 11 <sup>th</sup> | 1 <sup>st</sup> | Concept of transportation of fluid by pipes and tubes                |
|                  | 2 <sup>nd</sup> | Different pipe fittings and its application                          |
|                  | 3 <sup>rd</sup> | Different types of valves and their applications                     |
|                  | 4 <sup>th</sup> | Classification of pumps  |
| 12 <sup>th</sup> | 1 <sup>st</sup> | Construction and working of centrifugal pump                         |
|                  | 2 <sup>nd</sup> | Performance characteristics of centrifugal pumps                     |
|                  | 3 <sup>rd</sup> | Cavitation, Net positive suction head, Air binding & priming of pump |
|                  | 4 <sup>th</sup> | Centrifugal pump troubles and remedies                               |
| 13 <sup>th</sup> | 1 <sup>st</sup> | Construction and working of centrifugal pump                         |

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|                  | 2 <sup>nd</sup> | Performance characteristics of centrifugal pumps                |
|                  | 3 <sup>rd</sup> | Working of Piston pump, plunger pump, gear pump, diaphragm pump |
|                  | 4 <sup>th</sup> | Pumping device for gas: blower, compressor and vacuum devices   |
| 14 <sup>th</sup> | 1 <sup>st</sup> | Pressure drop in porous medium                                  |
|                  | 2 <sup>nd</sup> | Concept of fluidization   |
|                  | 3 <sup>rd</sup> | Types of fluidization   |
|                  | 4 <sup>th</sup> | Minimum fluidization velocity                                   |
| 15 <sup>th</sup> | 1 <sup>st</sup> | Fluidized bed pressure drop                                     |
|                  | 2 <sup>nd</sup> | Principle of pneumatic conveyance                               |
|                  | 3 <sup>rd</sup> | Flow through packed bed   |
|                  | 4 <sup>th</sup> | Problems on Fluidization  |

| <b>LESSON PLAN OF 3<sup>rd</sup> SEMESTER CHEMICAL ENGINEERING</b> |  |   |
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| <b>DISCIPLINE:<br/>CHEMICAL</b>                                    | <b>Semester:-3<sup>RD</sup></b>              | <b>NAME OF THE TEACHING FACULTY<br/>JAGANNATH PRASAD PATTANAYAK</b>                               |
| <b>SUBJECT:<br/>MECHANICAL OPERATION<br/>(TH 3)</b>                | <b>No of days per Week<br/>Allotted : 04</b> | <b>SEMESTER: OCTOBER TO JANUARY<br/>No of Weeks:- 15</b>  |
| <b>Week</b>  | <b>Class/ Day</b>                            | <b>Theory/ Practical Topics</b>   |
| 1 <sup>ST</sup>  | 1 <sup>st</sup>                              | Objectives of size reduction  |
|  | 2 <sup>nd</sup>                              | Kick's law  |
|  | 3 <sup>rd</sup>                              | Rittinger's law   |
|  | 4 <sup>th</sup>                              | Bonds law   |
| 2 <sup>ND</sup>  | 1 <sup>st</sup>                              | Crushing efficiency, Work index   |
|  | 2 <sup>nd</sup>                              | Solve simple problems   |
|  | 3 <sup>rd</sup>                              | Jaw crusher   |
|  | 4 <sup>th</sup>                              | Gyratory crusher  |
| 3 <sup>rd</sup>  | 1 <sup>st</sup>                              | Smooth roll crusher, Hammer Mill  |
|  | 2 <sup>nd</sup>                              | Ball Mill   |
|  | 3 <sup>rd</sup>                              | Closed and open circuit grinding  |
|  | 4 <sup>th</sup>                              | Dry and wet grinding  |
| 4 <sup>th</sup>  | 1 <sup>st</sup>                              | Free and choke grinding   |
|  | 2 <sup>nd</sup>                              | Objectives of size separation   |
|  | 3 <sup>rd</sup>                              | Shape and size of irregular particle  |
|  | 4 <sup>th</sup>                              | Different types of screen analysis  |
| 5 <sup>th</sup>  | 1 <sup>st</sup>                              | Ideal screen & actual screen, material balance  |
|  | 2 <sup>nd</sup>                              | Construction and operation of different types of industrial screens and their effectiveness       |
|  | 3 <sup>rd</sup>                              | Construction and operation of air filters   |
|  | 4 <sup>th</sup>                              | Construction and operation of air separator   |
| 6 <sup>th</sup>  | 1 <sup>st</sup>                              | Construction and operation of cyclone separator   |
|  | 2 <sup>nd</sup>                              | Construction and operation of magnetic and Electromagnetic separation                             |
|  | 3 <sup>rd</sup>                              | Theory of settling  |
|  | 4 <sup>th</sup>                              | Stoke's law   |
| 7 <sup>th</sup>  | 1 <sup>st</sup>                              | Sedimentation   |
|  | 2 <sup>nd</sup>                              | Thickeners  |
|  | 3 <sup>rd</sup>                              | Clarifiers  |
|  | 4 <sup>th</sup>                              | Jigs  |
| 8 <sup>th</sup>  | 1 <sup>st</sup>                              | Principle & operation of froth floatation and its use   |
|  | 2 <sup>nd</sup>                              | Types of filtrations  |
|  | 3 <sup>rd</sup>                              | Theory of filtration  |
|  | 4 <sup>th</sup>                              | Types of cakes, cake resistance, pressure drop, filter medium, filter Aids and related derivation |

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| 9 <sup>th</sup>  | 1 <sup>st</sup> | Construction and working principle of filtration equipment                   |
|                  | 2 <sup>nd</sup> | Construction and working principle of thickeners                             |
|                  | 3 <sup>rd</sup> | Batch and continuous centrifuges   |
|                  | 4 <sup>th</sup> | Batch and continuous centrifuges with their construction, operation and uses |
| 10 <sup>th</sup> | 1 <sup>st</sup> | Flocculation   |
|                  | 2 <sup>nd</sup> | Role of coagulant in filtration  |
|                  | 3 <sup>rd</sup> | Objectives of mixing   |
|                  | 4 <sup>th</sup> | Mixing of liquid with liquid   |
| 11 <sup>th</sup> | 1 <sup>st</sup> | Mixing of liquid with solid  |
|                  | 2 <sup>nd</sup> | Mixing of viscous materials  |
|                  | 3 <sup>rd</sup> | Mixing of Solid with solid   |
|                  | 4 <sup>th</sup> | Mixing of gases with liquids   |
| 12 <sup>th</sup> | 1 <sup>st</sup> | The flow pattern in agitated vessel  |
|                  | 2 <sup>nd</sup> | Methods of prevention of swirling and vortex formation, baffling             |
|                  | 3 <sup>rd</sup> | Different impellers, propellers, paddles used in mixing operation            |
|                  | 4 <sup>th</sup> | Objectives of transportation and storage                                     |
| 13 <sup>th</sup> | 1 <sup>st</sup> | belt conveyor  |
|                  | 2 <sup>nd</sup> | Apron conveyor   |
|                  | 3 <sup>rd</sup> | Screw Conveyor   |
|                  | 4 <sup>th</sup> | Bucket elevators   |
| 14 <sup>TH</sup> | 1 <sup>st</sup> | Scrapers   |
|                  | 2 <sup>nd</sup> | Pneumatic conveyer   |
|                  | 3 <sup>rd</sup> | Storage and handling of solids   |
|                  | 4 <sup>th</sup> | Construction and uses of silos and bins                                      |
| 15 <sup>TH</sup> | 1 <sup>st</sup> | Objective Q&A discussion-I   |
|                  | 2 <sup>nd</sup> | Objective Q&A discussion-II  |
|                  | 3 <sup>rd</sup> | Objective Q&A discussion-III   |
|                  | 4 <sup>th</sup> | Objective Q&A discussion-IV  |

## GOVERNMENT POLYTECHNIC JAGATSINGHPUR

| <b>LESSON PLAN OF 3<sup>rd</sup> SEMESTER CHEMICAL ENGINEERING</b> |  |   |
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| Discipline :-<br><b>CHEMICAL</b>                                   | Semester:- <b>3<sup>RD</sup></b>                 | Name of the Teaching Faculty<br><b>Dr. SUSHANTA KUMAR BEHERA</b>                |
| Subject:-<br><b>INDUSTRIAL<br/>STOICHIOMETRY<br/>(TH 4)</b>        | <b>No of Days per<br/>Week Allotted<br/>:-04</b> | <b>SEMESTER: OCTOBER TO JANUARY<br/>No of Weeks:- 15</b>                        |
| Week   | Class Day  | Theory/ Practical Topics  |
| 1 <sup>st</sup>  | 1 <sup>st</sup>                                  | <b>CHAPTER-1: UNITS AND DIMENSIONS</b><br>Introduction                          |
|  | 2 <sup>nd</sup>                                  | Basic and derived units used in process industry.                               |
|  | 3 <sup>rd</sup>                                  | Units of physical and chemical properties                                       |
|  | 4 <sup>th</sup>                                  | Relation between units and dimension  |
| 2 <sup>nd</sup>  | 1 <sup>st</sup>                                  | Unit conversion and solve numerical   |
|  | 2 <sup>nd</sup>                                  | Concepts of unit operation and unit process                                     |
|  | 3 <sup>rd</sup>                                  | Application of various graphs in process calculation                            |
|  | 4 <sup>th</sup>                                  | Solve numerical   |
| 3 <sup>rd</sup>  | 1 <sup>st</sup>                                  | <b>CHAPTER-2: MOLE CONCEPT</b><br>Atomic number, atomic weight of elements      |
|  | 2 <sup>nd</sup>                                  | Mol. Wt., mole unit, mole fraction (or percent) and mass fraction (or percent), |
|  | 3 <sup>rd</sup>                                  | Relation between mole and mass fraction   |
|  | 4 <sup>th</sup>                                  | Mole concept with respect to chemical equation.                                 |
| 4 <sup>th</sup>  | 1 <sup>st</sup>                                  | Principle of atom conservation.   |
|  | 2 <sup>nd</sup>                                  | Mole calculation from reaction  |
|  | 3 <sup>rd</sup>                                  | Methods of expressing composition of mixtures and solutions                     |
|  | 4 <sup>th</sup>                                  | <b>Solve related numerical</b>  |
| 5 <sup>th</sup>  | 1 <sup>st</sup>                                  | <b>CHAPTER-3: STOICHIOMETRY</b><br>Introduction                                 |
|  | 2 <sup>nd</sup>                                  | Concept of limiting reactant, Atomic weight,                                    |
|  | 3 <sup>rd</sup>                                  | Concept of Molecular weight and empirical formula                               |
|  | 4 <sup>th</sup>                                  | Solved numerical based on limiting reactant, mass-mass and mass volume basis    |
| 6 <sup>th</sup>  | 1 <sup>st</sup>                                  | Concepts of Eq. weight, valence of molecule                                     |
|  | 2 <sup>nd</sup>                                  | Solve related numerical   |
|  | 3 <sup>rd</sup>                                  | Concepts of preparation of solution   |
|  | 4 <sup>th</sup>                                  | Weight and volume percent of solutions  |
| 7 <sup>th</sup>  | 1 <sup>st</sup>                                  | Basics of Normality, molarity and molality                                      |
|  | 2 <sup>nd</sup>                                  | Numerical on solution preparation   |
|  | 3 <sup>rd</sup>                                  | Solve related numerical   |
|  | 4 <sup>th</sup>                                  | <b>CHAPTER-4: GASES AND GASEOUS MIXTURES</b><br>Introduction                    |



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

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| <b>LESSON PLAN OF 3<sup>rd</sup> SEMESTER CHEMICAL ENGINEERING</b> |   |  |
|--|---|--|
| Discipline :-<br><b>CHEMICAL</b>                                   | Semester:- <b>3<sup>RD</sup></b>          | <u>Name of the Teaching Faculty</u><br><b>KIRAN NAIK</b>   |
| Subject:-<br><b>Environmental STUDIES (TH 5)</b>                   | No of Days per Week Allotted :- <b>04</b> | <b>SEMESTER: OCTOBER TO JANUARY</b><br><b>No of Weeks:- 15</b>   |
| Week   | Class/Day                                 | Theory/ Practical Topics   |
| 1 <sup>st</sup>  | 1 <sup>st</sup>                           | <b>CHAPTER-1: The Multidisciplinary nature of environmental studies</b><br>Introduction  |
|  | 2 <sup>nd</sup>                           | Definition, scope and importance.  |
|  | 3 <sup>rd</sup>                           | Need for public awareness.   |
|  | 4 <sup>th</sup>                           | <b>CHAPTER-2: Natural Resources:</b><br>Forest resources: Use and over-exploitation, deforestation, case studies,                          |
| 2 <sup>nd</sup>  | 1 <sup>st</sup>                           | Timber extraction mining, dams and their effects on forests and tribal people.   |
|  | 2 <sup>nd</sup>                           | Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. |
|  | 3 <sup>rd</sup>                           | Mineral Resources: Use and exploitation,   |
|  | 4 <sup>th</sup>                           | Environmental effects of extracting and using mineral resources.   |
| 3 <sup>rd</sup>  | 1 <sup>st</sup>                           | Food Resources: World food problems, changes caused by agriculture and over grazing  |
|  | 2 <sup>nd</sup>                           | Effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity   |
|  | 3 <sup>rd</sup>                           | Energy Resources: Growing energy need  |
|  | 4 <sup>th</sup>                           | Renewable and non-renewable energy sources, use of alternate energy sources, case studies.   |
| 4 <sup>th</sup>  | 1 <sup>st</sup>                           | Land Resources: Land as a resource, land degradation,  |
|  | 2 <sup>nd</sup>                           | Landslides, soil erosion, and desertification.   |
|  | 3 <sup>rd</sup>                           | Role of individual in conservation of natural resources  |
|  | 4 <sup>th</sup>                           | Equitable use of resources for sustainable life styles.  |
| 5 <sup>th</sup>  | 1 <sup>st</sup>                           | <b>CHAPTER-3: Systems:</b><br>Concept of an eco-system.  |
|  | 2 <sup>nd</sup>                           | Structure and function of an eco-system  |
|  | 3 <sup>rd</sup>                           | Producers, consumers, decomposers.   |
|  | 4 <sup>th</sup>                           | Energy flow in the eco systems.  |
| 6 <sup>th</sup>  | 1 <sup>st</sup>                           | Ecological succession.   |
|  | 2 <sup>nd</sup>                           | Food chains, food webs and ecological pyramids   |
|  | 3 <sup>rd</sup>                           | Introduction, types, characteristic features of eco system:  |
|  | 4 <sup>th</sup>                           | structure and function of the following ecosystem:   |
| 7 <sup>th</sup>  | 1 <sup>st</sup>                           | Forest ecosystem:  |
|  | 2 <sup>nd</sup>                           | Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).  |
|  | 3 <sup>rd</sup>                           | <b>CHAPTER-4: Biodiversity and it's Conservation:</b>  |

|                  |                 |  |
|------------------|-----------------|--|
|                  |                 | Introduction   |
|                  | 4 <sup>th</sup> | Definition: genetics, species and ecosystem diversity.   |
| 8 <sup>th</sup>  | 1 <sup>st</sup> | Biogeographically classification of India.   |
|                  | 2 <sup>nd</sup> | Value of biodiversity: consumptive use, productive use,  |
|                  | 3 <sup>rd</sup> | Value of biodiversity in social ethical, aesthetic and optin values.                                   |
|                  | 4 <sup>th</sup> | Biodiversity at global, national and local level.  |
| 9 <sup>th</sup>  | 1 <sup>st</sup> | Threats to biodiversity: Habitats loss, poaching of wild life  |
|                  | 2 <sup>nd</sup> | Threats to biodiversity: man wildlife conflicts.   |
|                  | 3 <sup>rd</sup> | <b>CHAPTER-5: Environmental Pollution:</b><br>Definition Causes, effects and control measures of:      |
|                  | 4 <sup>th</sup> | Air pollution.   |
| 10 <sup>th</sup> | 1 <sup>st</sup> | Water pollution  |
|                  | 2 <sup>nd</sup> | Soil pollution   |
|                  | 3 <sup>rd</sup> | Marine pollution   |
|                  | 4 <sup>th</sup> | Noise pollution.   |
| 11 <sup>th</sup> | 1 <sup>st</sup> | Thermal pollution  |
|                  | 2 <sup>nd</sup> | Nuclear hazards.   |
|                  | 3 <sup>rd</sup> | Solid waste Management: Causes   |
|                  | 4 <sup>th</sup> | Effects and control measures of urban and industrial wastes.   |
| 12 <sup>th</sup> | 1 <sup>st</sup> | Role of an individual in prevention of pollution.  |
|                  | 2 <sup>nd</sup> | Disaster management: Floods, earth quake, cyclone and landslides.                                      |
|                  | 3 <sup>rd</sup> | <b>CHAPTER-6: Social issues and the Environment:</b><br>Form unsustainable to sustainable development. |
|                  | 4 <sup>th</sup> | Urban problems related to energy.  |
| 13 <sup>th</sup> | 1 <sup>st</sup> | Water conservation, rain water harvesting, water shed management                                       |
|                  | 2 <sup>nd</sup> | Resettlement and rehabilitation of people; its problems and concern                                    |
|                  | 3 <sup>rd</sup> | Environmental ethics: issue and possible solutions   |
|                  | 4 <sup>th</sup> | Climate change, global warming, acid rain,   |
| 14 <sup>th</sup> | 1 <sup>st</sup> | Ozone layer depletion, nuclear accidents and holocaust, case studies.                                  |
|                  | 2 <sup>nd</sup> | Air (prevention and control of pollution) Act.   |
|                  | 3 <sup>rd</sup> | Water (prevention and control of pollution) Act.   |
|                  | 4 <sup>th</sup> | Public awareness.  |
| 15 <sup>th</sup> | 1 <sup>st</sup> | <b>CHAPTER-7: Human population and the environment:</b>  |
|                  | 2 <sup>nd</sup> | Population growth and variation among nations.   |
|                  | 3 <sup>rd</sup> | Population explosion- family welfare program.  |
|                  | 4 <sup>th</sup> | Environment and human health.  |
| 16 <sup>th</sup> | 1 <sup>st</sup> | Human rights.  |
|                  | 2 <sup>nd</sup> | Value education  |
|                  | 3 <sup>rd</sup> | Role of information technology in environment and human health   |