

GOVERNMENT POLYTECHNIC JAGATSINGHPUR

LESSON PLAN OF 3rd SEMESTER CHEMICAL ENGINEERING

Discipline :- CHEMICAL	Semester:-3 RD	Name of the Teaching Faculty DR. SUSHANTA KUMAR BEHERA
Subject:- PHYSICAL CHEMISTRY (TH 1)	No of Days per Week Allotted :- 04	SEMESTER: AUGUST TO DECEMBER No of Weeks:- 15
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
	2 nd	Relation between Vapour pressure & Osmotic pressure
	3 rd	Relation between Vapour pressure & Osmotic Pressure
	4 th	Simple problems
9 th	1 st	Surprise Test on chapter-1,2,3
	2 nd	DISTRIBUTION LAW Introduction
	3 rd	Nernst's Distribution Law
	4 th	Equilibrium constant from distribution law
10 th	1 st	Solvent Extraction
	2 nd	Multiple Extraction
	3 rd	Concept of liquid-liquid Chromatography
	4 th	Application of Distribution law
11 th	1 st	Application of Distribution law
	2 nd	Application of Distribution law
	3 rd	Numerical problems related to Distribution law
	4 th	COLLOIDS Colloids and Types of colloidal system
12 th	1 st	Characteristics of solutions
	2 nd	Applications of colloids
	3 rd	Methods of preparation of sols & purifications of sols
	4 th	Optical ,kinetic and electrical properties of sols
13 th	1 st	Emulsion and types of emulsion
	2 nd	Roles of Emulsifier
	3 rd	Preparation of Emulsions and there properties
	4 th	Gel, types of gel,
14 th	1 st	Properties and Application of gel
	2 nd	ADSORPTION Introduction
	3 rd	Types of Adsorption
	4 th	Physical adsorption and Chemisorption
15 th	1 st	Application of Adsorption
	2 nd	Ion – exchange adsorption
	3 rd	Compare absorption and adsorption
	4 th	Ion – exchange application.

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

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

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

LESSON PLAN OF 3rd SEMESTER CHEMICAL ENGINEERING

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

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

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Discipline :- CHEMICAL	Semester:- 3RD	<u>Name of the Teaching Faculty</u> SANJUKTA NAYAK
Subject:- INDUSTRIAL STOICHIOMETRY (TH 4)	No of Days per Week Allotted :-04	SEMESTER: AUGUST TO DECEMBER No of Weeks:- 15
Week	Class Day	Theory/ Practical 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 numerical
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
6 th	4 th	Solved numerical based on limiting reactant, mass-mass and mass volume basis
	1 st	Concepts of Eq. weight, valence of molecule
	2 nd	Solve related numerical
	3 rd	Concepts of preparation of solution
7 th	4 th	Weight and volume percent of solutions
	1 st	Basics of Normality, molarity and molality
	2 nd	Numerical on solution preparation
	3 rd	Solve related numerical
7 th	4 th	CHAPTER-4: GASES AND GASEOUS MIXTURES Introduction

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

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LESSON PLAN OF 3rd SEMESTER CHEMICAL ENGINEERING

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

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