LESSON PLAN OF 6TH SEMESTER(2023-24) CHEMICAL ENGINEERING		
DISCIPLINE: CHEMICAL ENGINEERING	**Semester:-6TH**	**NAME OF THE TEACHING FACULTY** **YK Mohanta**
SUBJECT: PLANT SAFETY MANAGEMENT	**No of days per Week Allotted : 04**	**No of Weeks:- 15** **16 JAN 2024 to 26 April 2024**
Week	**Class/ Day**	**Theory/ Practical Topics**
1ST	1st	Fundamental of safety
	2nd	Unsafe act and unsafe condition
	3rd	Integration of Safety, Health and Environment
	4th	Integration of Safety, Health and Environment
2ND	1st	Objective and principle of Safety Management
	2nd	Terms and definition used in safety management
	3rd	Classification of accidents
	4th	Good Housekeeping practice
3rd	1st	Work place safety
	2nd	Safe working environment
	3rd	Spot a hazard to stop an accident
	4th	Spot a hazard to stop an accident
4th	1st	Precaution in use of ladder
	2nd	Safety instruction during maintenance
	3rd	Safety measures during handling of compressed system, cylinders and painting Equipment
	4th	Safety measures during handling of compressed system, cylinders and painting Equipment
5th	1st	Permit to work system
	2nd	Permit to work system
	3rd	Requirement of personal protective equipment
	4th	Requirement of personal protective equipment
6th	1st	Classification of Hazards
	2nd	Personal protective equipment for different parts of body
	3rd	Personal protective equipment for different parts of body
	4th	Guideline to use personal protective equipment
7th	1st	Guideline to use personal protective equipment
	2nd	Fundamentals of fire

	3rd	Elements of fire
	4th	Terms and definition in Fire Management
8th	1st	Classification of fire and fire extinguishing technique
	2nd	Causes of fire and its prevention
	3rd	Different types of fire extinguisher and their application
	4th	Different types of fire extinguisher and their application
9th	1st	Precaution for prevention of fire
	2nd	Classification of Chemical Hazards
	3rd	Factors influencing effects of toxic chemicals
	4th	Terms related to concentration level as per industrial hygiene norm
10th	1st	Control measure for Chemical hazards
	2nd	Introduction to electrical safety
	3rd	Precaution and safety in use of electricity
	4th	Precaution and safety in use of electricity
11th	1st	Electrical hazards in Industrial system
	2nd	Electrical hazards in Industrial system
	3rd	Safety provision to prevent electrical hazards
	4th	Safety provision to prevent electrical hazards
12th	1st	Sources of mechanical hazards
	2nd	Machine Guard and Safety devices
	3rd	Machine Guard and Safety devices
	4th	Pressure hazards and pressure vessel
13th	1st	Pressure hazards and pressure vessel
	2nd	Safety measures in use of gas cylinders
	3rd	Safety measures in use of gas cylinders
	4th	Types of maintenance-Breakdown
14TH	1st	Types of maintenance-Annual
	2nd	Types of maintenance-Preventive
	3rd	Case Study regarding plant safety
	4th	Case Study regarding plant safety
15TH	1st	Objective Questions on Plant Safety Management
	2nd	Objective Questions on Plant Safety Management
	3rd	Objective Questions on Plant Safety Management
	4th	Objective Questions on Plant Safety Management

Discipline: Chemical	Semester: 6th	Name of Faculty: Sibasish Mahapatra	
Subject: Chemical Reaction Engineering	No of Days per week class allotted: 4	No of Weeks:- 15 16 JAN 2024 to 26 April 2024	
Week	Class days	Chapter	Theory Topic
1st	1st – 1	**1**	Brief idea about reaction engineering and reactors
	2nd -2		Classification of reactions on the basis of heat, catalyst and homogeneity
	3rd -3		Classification of reactions on the basis of molecularity, order and reversibility
	4th -4		Rate of reaction and the factors affecting it.
2nd	1st – 5		Rate constant and the different units of it
	2nd -6		Reaction mechanism
	3rd -7		Differentiate between elementary and non elementary reactions
	4th -8		Molecularity and Order of the reaction
3rd	1st – 9		Concept of Activation Energy
	2nd -10		Arrhenius equation and temperature dependency of rate constants
	3rd -11		Graphs on energy of molecules for endothermic and endothermic reactions
	4th -12		Half life of reaction and solve problems on it.
4th	1st – 13		Solve problems to determine order of a reaction.
	2nd -14		Solve problems to determine the activation energy
	3rd -15		Revision of the topic with PYQs
	4th -16	**2**	Interpretation of Batch reactor data
5th	1st – 17		Elementary idea about handling graphs and finding slopes.
	2nd -18		Elementary idea about differentiation and integration used in equations.
	3rd -19		Integral method for analyzing kinetic data
	4th -20		Differential method for analyzing kinetic data
6th	1st – 21		Initial rate method for analyzing kinetic data
	2nd -22		Half life method for analyzing kinetic data
	3rd -23		Ostwald's method for analyzing kinetic data
	4th -24		Integrated rate equation for irreversible unimolecular type 1st order reaction
7th	1st – 25		Solve problems on 1st order reaction data.
	2nd -26		Integrated rate equation for irreversible bimolecular type 2nd order reaction
	3rd -27		Solve problems on 2nd order reaction data
	4th-28		Derivation of equation for constant volume batch reactor
8th	1st – 29		Relation of conversion and concentration in Constant volume batch reactor
	2nd -30		Relation of conversion and concntration in variable volume batch reactor(w/o derivation)
	3rd -31		Elementary idea about Auto catalytic reaction
	4th -32		Elementary idea about reversible reaction
9th	1st – 33		Solve problems on constant volume batch reactors
	2nd -34		Revision of the topic
	3rd -35		Discussion of PYQs on the topic
	4th -36	**3**	Define and classify catalysis with example
10th	1st – 37		Discuss characteristics of catalytic reaction
	2nd -38		Promoter, Inhibitors, Accelerators, carriers and their actions
	3rd -39		Catalytic poisoning
	4th -40		Autocatalysis, negative catalysis, enzyme catalysis
11th	1st – 41		Deactivation of catalysis, Activation energy and catalysis

	2nd -42		Discuss theories of catalysis
	3rd -43		Preparation on catalyst
	4th -44		Discussion of PYQs on the topic
12th	1st – 45	**4**	Construction and operation of Batch reactors
	2nd -46		Fluidized bed Reactor, Spray column reactor, Packed column Reactor
	3rd -47		Construction and operation of Fixed Bed Reactor
	4th -48		Basic design equations for batch reacors
13th	1st – 49		Basic design equations for CSTR
	2nd -50		Basic design equations for Plug Flow Reactor
	3rd -51		Comprehend Space velocity, space-time, and residence time
	4th -52		Choosing a reactor for a reaction condition and the material of construction
14th	1st – 53		Optimum reactor design
	2nd -54		Solve problems to determine Space velocity, space-time, and residence time
	3rd -55		Discussion of PYQs on the topic
	4th -56	**5**	Reversible reaction with example
15th	1st – 57		Chemical equilibrium, characteristic of chemical equilibrium
	2nd -58		Law of Mass action, equilibrium constant and Le Chatelier's principle
	3rd -59		Condition for maximum yield in industrial processes
	4th -60		Discussion of PYQs on the topic

LESSON PLAN OF CHEMICAL ENGINEERING DEPARTMENT SUMMER 2024

Discipline: Chemical		Semester: 6TH	Name of Faculty: Satya Sankar Raj	
Subject: Theory-3 Petroleum Refining & Petrochemical Technology		No of Days per week class allotted	Semester From: 16th January 2024 - 26th April 2024 No of Week-15	
Week	Class No	Class days	Chapter	Theory Topic
			Chapter –1 INTRODUCTION TO PETROLEUM INDUSTRIES	
1st	1	1st	1.1	Development and growth of petrochemical industry in India
	2	2nd	1.2	Define petrochemicals & describe the importance of petrochemical industry
	3	3rd	1.3	Theories on Origin of petroleum
	4	4th	1.4	Detection and production of petroleum
2nd	5	1st	1.4	Pre treatment of oil before refining
	6	2nd	1.5	Desalting and stabilisation of crude
	7	3rd	1.5	Classification and composition of petroleum
	8	4th	1.6	Transportation of crude oil for refining
			Chapter-2 FRACTIONATION OF CRUDE PETROLEUM OIL	
3rd	9	1st	2.1	Cracking-Principle, necessity and types of cracking
	10	2nd	2.1	Thermal Cracking Reactions, parameters and Thermal Cracking Process
	11	3rd	2.1	Pyrolysis, Visbreaking and Coking
	12	4th	2.2	Catalytic cracking process, parameters, process in different catalytic crackers
4th	13	1st	2.2	Catalyst used in catalytic cracking, catalytic Cracking reactions
	14	2nd	2.3	Houdry's Fixed bed process, Thermofer Catalytic Cracking Moving bed process
	15	3rd	2.3	Fluidised Bed Catalytic Cracking Process
	16	4th	2.4	Hydrocracking, Hydrotreatment, Catalytic Hydrocracking
5th	17	1st	2.4	Thermal and catalytic reforming
	18	2nd	2.4	Fixed Bed platforming process, Catalytic Reforming process
	19	3rd	2.5	Polymerisation, Thermal Polymerisation, catalytic Polymerisation
	20	4th	2.5	Alkylation and isomerisation, catalytic alkylation
			Chapter-3 PETROLEUM REFINING	
6th	21	1st	3.1	Product from a refinery, temperature range and uses of petroleum products
	22	2nd	3.2	Crude oil distillation system- Operation in Single atmospheric distillation
	23	3rd	3.3	Two, Three stages of crude distillation units

	24	4th	3.4	Petroleum Refining Operations
Week	Class No	Class days	Chapter	Theory Topic
7th	25	1st	3.5	Overview of petroleum refining processes
	26	2nd	3.6	Discussion on distillation operation and main components in distillation tower
	27	3rd	3.7	Flow diagram of an integrated petroleum refinery
	28	4th	3.8	Special products from oil refinery and its commercial applications
	29	1st	3.9	Features of lubricant, wax and grease manufacturing process
8th	30	2nd	3.10	Safety of Petrochemical Products
	31	3rd	3.11	Storage and handling of Petrochemical Products
	32	4th	3.12	Overviews of Refineries in India
			Chapter-4	**CHEMICAL FEED STOCK-FIRST GENERATION PETROCHEMICALS**
9th	33	1st	4.1	History and growth of Petrochemical industries globally and in India
	34	2nd	4.2	Integrated petrochemical process and its product
	35	3rd	4.3	Petrochemical feed stock- category, composition and source
	36	4th	4.4	Process of Steam reforming of naphtha
10th	37	1st	4.5	Refining and products from naphtha cracker
	38	2nd	4.6	Separation of C4 cuts from naphtha crackers
	39	3rd	4.7	Ethane cracking and production of ethylene
	40	4th	4.8	Industrial method of cyclohexane manufacturing
11th	41	1st	4.9	Economics of petrochemical Industry
	42	2nd	4.10	Recent developments in petrochemical industry in India
			Chapter-5	**SECOND GENERATION PETROCHEMICALS**
	43	3rd	5.1	Manufacturing of methanol from synthesis gas
	44	4th	5.2	Manufacturing of ethanol from synthesis gas
12th	45	1st	5.3	Manufacturing of vinyl monomer-vinyl chloride and its use
	46	2nd	5.4	Manufacturing of vinyl monomer- vinyl acetate and its industrial application
	47	3rd	5.5	Manufacturing of vinyl monomer- Acrylonitrile and its industrial application
	48	4th	5.6	Manufacturing of Polyester monomer- Terephthalic acid and its industrial use
13th	49	1st	5.7	Manufacturing of Polyester monomer- Phthalic Anhydride and its use
	50	2nd	5.8	Manufacturing of Polyester monomer- Acrylonitrile and its industrial application
	51	3rd	5.9	Manufacturing of Isopropyl alcohol and its industrial application
	52	4th	5.10	Manufacturing of acetone and its industrial application
			Chapter-6	**THIRD GENERATION PETROCHEMICALS**
14th	53	1st	6.1	Introduction to third generation petrochemicals

	54	2nd	6.2	Manufacturing of formaldehyde and its industrial application
	55	3rd	6.3	Manufacturing of acetaldehyde and its industrial application
Week	Class No	Class days	Chapter	Theory Topic
	56	4th	6.4	Manufacturing of acetic acid and its industrial application
15th	57	1st	6.5	Separation of BTX- benzene, toluene and xylene
	58	2nd	6.6	Manufacturing of Aniline and its industrial application
	59	3rd	6.7	Manufacture of Melamine and its industrial application
	60	4th	6.8	Manufacture of linear alkyl benzene and its industrial application

Discipline: Chemical		Semester: 4th	Name of Faculty: Siddhibinayak Pradhan	
Subject: Theory-4 Nobel Separation Process		No of Days per week class allotted-4	Semester From: 16th January 2024 to 26Th April 2024 No of Week-15	
Week	Class No	Class days	Chapter	Theory Topic
			Chapter - 1 : INTRODUCTION TO NOBLE SEPARATION PROCESS	
1st	1	1st	1.1	Introduction to membrane
	2	2nd	1.1	Introduction to membrane
	3	3rd	1.2	Basic principle of membrane separation
	4	4th	1.3	Classification of membrane processes
2nd	5	1st	1.4	Advantages and disadvantages of membrane processes
	6	2nd	1.5	Major application area of membrane separation
	7	3rd	1.6	Future processes of membrane separation
	8	4th	1.6	Future processes of membrane separation
			Chapter - 2 : MEMBRANE TYPE, MODULE AND FLOW PATTERN	
3rd	9	1st	2.1	Types of synthetic membrane
	10	2nd	2.2	Micro porous membrane, Asymmetric membrane, thin film composite, Electrically charged, inorganic membrane
	11	3rd	2.2	Micro porous membrane, Asymmetric membrane, thin film composite, Electrically charged, inorganic membrane
	12	4th	2.3	Membrane module- Plate and frame, Tubular, Spiral wound, Hallow fiber
4th	13	1st	2.3	Membrane module- Plate and frame, Tubular, Spiral wound, Hallow fiber
	14	2nd	2.4	Membrane material and Pore Characteristic
	15	3rd	2.4	Membrane material and Pore Characteristics
	16	4th	2.5	Types of flow pattern
5th	17	1st	2.5	Types of flow pattern
	18	2nd	2.5	Types of flow pattern
			Chapter – 3 : REVERSE OSMOSIS	
	19	3rd	3.1	Concept of Osmosis, Determination of osmatic pressure, Thermodynamic
	20	4th	3.1	Concept of Osmosis, Determination of osmatic pressure, Thermodynamic
6th	21	1st	3.2	Isotonic solution
	22	2nd	3.3	High Pressure and low pressure reverse osmosis
	23	3rd	3.3	High Pressure and low pressure reverse osmosis
	24	4th	3.4	Advantages and disadvantages of reverse osmosis

7th	25	1st	3.5	Forward Osmosis- Elementary idea and application
	26	2nd	3.5	Forward Osmosis- Elementary idea and application
	27	3rd	3.6	Membrane plugging
	28	4th	3.7	Application of reverse osmosis
			Chapter - 4 : NANO FILTRATION, ULTRA FILTRATION AND MICRO FILTRATION	
8th	29	1st	4.1	Principle of Nano filtration.
	30	2nd	4.2	Process limitation of Nano filtration.
	31	3rd	4.3	Industrial application of Nano filtration
	32	4th	4.4	Principle of Ultra filtration and its advantages
9th	33	1st	4.5	Ultra filtration vis-à-vis conventional filtration
	34	2nd	4.6	Configuration of Ultra filtration unit
	35	3rd	4.7	Types of devices in Ultra filtration
	36	4th	4.8	Factors affecting the performance of Ultra filtration
10th	37	1st	4.9	Industrial application of Ultra filtration
	38	2nd	4.10	Principle of Micro filtration
	39	3rd	4.11	Fouling in Micro filtration membrane
	40	4th	4.12	Application of Micro filtration
			Chapter - 5 : GAS SEPARATION AND PERVAPORATION	
11th	41	1st	5.1	Basic principle of gas separation
	42	2nd	5.1	Basic principle of gas separation
	43	3rd	5.1	Basic principle of gas separation
	44	4th	5.2	Membranes for gas separation and Application of Gas separation
12th	45	1st	5.2	Membranes for gas separation and Application of Gas separation
	46	2nd	5.2	Membranes for gas separation and Application of Gas separation
	47	3rd	5.3	Basic principle of Pervaporation
	48	4th	5.3	Basic principle of Pervaporation
13th	49	1st	5.4	Membrane characteristics and mass transfer in pervaporation & Application
	50	2nd	5.4	Membrane characteristics and mass transfer in pervaporation & Application
			Chapter - 5 : ION EXCHANGE AND OTHER MEMBRANE APPLICATION	
	51	3rd	6.1	Principle of Ion exchange
	52	4th	6.1	Principle of Ion exchange
14th	53	1st	6.2	Characteristic of ion exchange resin
	54	2nd	6.2	Characteristic of ion exchange resin
	55	3rd	6.3	Application of ion exchange

	56	4th	6.3	Application of ion exchange
15th	57	1st	6.4	Membrane Distillation
	58	2nd	6.4	Membrane Distillation
	59	3rd	6.5	Membrane reactors
	60	4th	6.5	Membrane reactors