

<b>LESSON PLAN OF 6<sup>TH</sup> SEMESTER CHEMICAL ENGINEERING</b>		
<b>DISCIPLINE:</b> CHEMICAL	<b>Semester:-6<sup>TH</sup></b>	<b>NAME OF THE TEACHING FACULTY</b> <b>PRATEEK KUMAR DAS</b>
<b>SUBJECT:</b> PLANT SAFETY MANAGEMENT (TH 1)	<b>No of days per Week</b> <b>Allotted : 04</b>	<b>SEMESTER: MARCH TO JUNE</b> <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>	Fundamental of safety
	2 <sup>nd</sup>	Unsafe act and unsafe condition
	3 <sup>rd</sup>	Integration of Safety, Health and Environment
	4 <sup>th</sup>	Integration of Safety, Health and Environment
2 <sup>ND</sup>	1 <sup>st</sup>	Objective and principle of Safety Management
	2 <sup>nd</sup>	Terms and definition used in safety management
	3 <sup>rd</sup>	Classification of accidents
	4 <sup>th</sup>	Good Housekeeping practice
3 <sup>rd</sup>	1 <sup>st</sup>	Work place safety
	2 <sup>nd</sup>	Safe working environment
	3 <sup>rd</sup>	Spot a hazard to stop an accident
	4 <sup>th</sup>	Spot a hazard to stop an accident
4 <sup>th</sup>	1 <sup>st</sup>	Precaution in use of ladder
	2 <sup>nd</sup>	Safety instruction during maintenance
	3 <sup>rd</sup>	Safety measures during handling of compressed system, cylinders and painting Equipment
	4 <sup>th</sup>	Safety measures during handling of compressed system, cylinders and painting Equipment
5 <sup>th</sup>	1 <sup>st</sup>	Permit to work system
	2 <sup>nd</sup>	Permit to work system
	3 <sup>rd</sup>	Requirement of personal protective equipment
	4 <sup>th</sup>	Requirement of personal protective equipment
6 <sup>th</sup>	1 <sup>st</sup>	Classification of Hazards
	2 <sup>nd</sup>	Personal protective equipment for different parts of body
	3 <sup>rd</sup>	Personal protective equipment for different parts of body
	4 <sup>th</sup>	Guideline to use personal protective equipment
7 <sup>th</sup>	1 <sup>st</sup>	Guideline to use personal protective equipment
	2 <sup>nd</sup>	Fundamentals of fire

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

**GOVERNMENT POLYTECHNIC JAGATSINGHPUR**

<b>LESSON PLAN OF 6<sup>TH</sup> SEMESTER CHEMICAL ENGINEERING</b>		
Discipline :- <b>CHEMICAL</b>	Semester:-6 <sup>th</sup>	<u>Name of the Teaching Faculty</u> <b>Dr. SUSHANTA KUMAR BEHERA</b>
Subject:- <b>Chemical Reaction Engineering and Catalysis (TH 2)</b>	<b>No of Days per Week Allotted :- 04</b>	<b>SEMESTER: MARCH TO JUNE</b> <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>	<b>CHAPTER-1: CHEMICAL KINETICS</b> Introduction
	2 <sup>nd</sup>	Classification of chemical reaction.
	3 <sup>rd</sup>	Rate of reaction, rate constant.
	4 <sup>th</sup>	Elementary and non-elementary reaction.
2 <sup>nd</sup>	1 <sup>st</sup>	Molecularity and order of reaction.
	2 <sup>nd</sup>	Arrhenius equation.
	3 <sup>rd</sup>	Concept of activation energy.
	4 <sup>th</sup>	Half-life reaction.
3 <sup>rd</sup>	1 <sup>st</sup>	Solve problems to determination of order of reaction and activation energy.
	2 <sup>nd</sup>	<b>CHAPTER-2: INTERPETATION OF BATCH REACTOR DATA</b> Introduction to reactor.
	3 <sup>rd</sup>	Derivation of integrated rate equation for zero order reactions with Conversion vs time
	4 <sup>th</sup>	Derivation of integrated rate equation for zero order reactions concentration vs time and half-life of reaction.
4 <sup>th</sup>	1 <sup>st</sup>	Derivation of integrated rate equation for irreversible unimolecular first order reaction with Conversion vs time and concentration vs time
	2 <sup>nd</sup>	Derivation for first order reaction for half-life reaction.
	3 <sup>rd</sup>	Solve numerical based on first order reaction
	4 <sup>th</sup>	Derivation of integrated rate equation for irreversible bimolecular second order reaction with Conversion vs time and concentration vs time
5 <sup>th</sup>	1 <sup>st</sup>	Derivation for second order reaction for half-life reaction.
	2 <sup>nd</sup>	Solve numerical based on second order reaction
	3 <sup>rd</sup>	Methods of interpretation of Batch reactor data.
	4 <sup>th</sup>	Derivation of equation for constant volume batch reactor.
6 <sup>th</sup>	1 <sup>st</sup>	Elementary idea about auto-catalytic reaction, reversible reaction
	2 <sup>nd</sup>	Concepts of variable volume batch reactor.(no derivation)
	3 <sup>rd</sup>	Solve numerical based on topics
	4 <sup>th</sup>	<b>CHAPTER-3: CATALYSIS</b> Introduction
7 <sup>th</sup>	1 <sup>st</sup>	Define and classify catalysis with example
	2 <sup>nd</sup>	Characteristics of catalytic reaction.

	3 <sup>rd</sup>	Concepts of catalyst Promoter, Inhibitors, Accelerators, carriers and their actions
	4 <sup>th</sup>	Catalytic poisoning.
8 <sup>th</sup>	1 <sup>st</sup>	Concepts of Autocatalysis, negative catalysis, enzyme catalysis.
	2 <sup>nd</sup>	Concepts of Deactivation of catalysis,
	3 <sup>rd</sup>	Role of activation energy and catalysis
	4 <sup>th</sup>	Discuss theories of catalysis
9 <sup>th</sup>	1 <sup>st</sup>	Preparation of catalyst
	2 <sup>nd</sup>	<b>CHAPTER-4: REACTORS</b> Introduction
	3 <sup>rd</sup>	General idea about batch reactor, semi batch reactor
	4 <sup>th</sup>	Construction and operation of Batch reactors
10 <sup>th</sup>	1 <sup>st</sup>	Derivation for Performance equation of Batch reactors
	2 <sup>nd</sup>	Solve numerical based on Batch reactors
	3 <sup>rd</sup>	Construction and operation of semi batch reactor
	4 <sup>th</sup>	Construction and operation continuous reactor or CSTR
11 <sup>th</sup>	1 <sup>st</sup>	Derivation for Performance equation of CSTR or MFR
	2 <sup>nd</sup>	Solve numerical based on CSTR
	3 <sup>rd</sup>	Construction and operation of Tubular Reactor or PFR
	4 <sup>th</sup>	Construction and operation of Fixed Bed Reactor
12 <sup>th</sup>	1 <sup>st</sup>	Derivation for Performance equation of PFR
	2 <sup>nd</sup>	Solve numerical based on PFR
	3 <sup>rd</sup>	Construction and operation of Fluidized bed Reactor
	4 <sup>th</sup>	Construction and operation of Spray column reactor
13 <sup>th</sup>	1 <sup>st</sup>	Construction and operation of Packed column Reactor
	2 <sup>nd</sup>	Construction and operation of Packed column Reactor
	3 <sup>rd</sup>	Space velocity, space-time, and residence time.
	4 <sup>th</sup>	Choice of a reactor and material of construction of reactor.
14 <sup>th</sup>	1 <sup>st</sup>	Optimum Reactor Design
	2 <sup>nd</sup>	<b>CHAPTER-5: CHEMICAL EQUILIBRIUM</b> Introduction of chemical kinetics
	3 <sup>rd</sup>	Reversible reaction and Irreversible reaction with example.
	4 <sup>th</sup>	Concepts of Chemical equilibrium, characteristic of chemical equilibrium.
15 <sup>th</sup>	1 <sup>st</sup>	Law of Mass action
	2 <sup>nd</sup>	Derivation of finding equilibrium constant
	3 <sup>rd</sup>	Le Chatelier's Principle.
	4 <sup>th</sup>	Application of laws of chemical equilibrium and Condition for maximum yield in industrial processes

## GOVERNMENT POLYTECHNIC JAGATSINGHPUR

<b>LESSON PLAN OF 6<sup>TH</sup> SEMESTER CHEMICAL ENGINEERING</b>		
Discipline :- <b>CHEMICAL</b>	Semester:-6 <sup>th</sup>	<u>Name of the Teaching Faculty</u> <b>Dr. SUSHANTA KUMAR BEHERA</b>
Subject:- <b>Petroleum Refining &amp; Petrochemical Technology (TH 3)</b>	<b>No of Days per Week Class Allotted :-04</b>	<b>SEMESTER: MARCH TO JUNE</b> <b>No of Weeks:- 15</b>
Week	Class Day	Theory/ Practical Topics
1 <sup>st</sup>	1 <sup>st</sup>	<b>CHAPTER-1: INTRODUCTION TO PETROLEUM INDUSTRIES</b> Introduction to petroleum
	2 <sup>nd</sup>	Define petrochemicals & describe the importance of petrochemical industry
	3 <sup>rd</sup>	Theories on Origin of petroleum,
	4 <sup>th</sup>	Pre-treatment of oil before refining,
2 <sup>nd</sup>	1 <sup>st</sup>	desalting and stabilization of crude
	2 <sup>nd</sup>	Classification and composition of petroleum
	3 <sup>rd</sup>	detection and production of petroleum
	4 <sup>th</sup>	Pre-treatment of oil before refining
3 <sup>rd</sup>	1 <sup>st</sup>	Transportation of crude oil for refining
	2 <sup>nd</sup>	<b>CHAPTER-2: FRACTIONATION OF CRUDE PETROLEUM OIL</b> Introduction
	3 <sup>rd</sup>	Principles of Cracking, necessity and types of cracking
	4 <sup>th</sup>	Reaction and parameters in thermal cracking
4 <sup>th</sup>	1 <sup>st</sup>	pyrolysis, visbreaking and coking
	2 <sup>nd</sup>	Catalytic cracking process, parameters, process in different catalytic crackers
	3 <sup>rd</sup>	Thermal and catalytic reforming
	4 <sup>th</sup>	Polymerization, Alkylation and isomerization
5 <sup>th</sup>	1 <sup>st</sup>	<b>CHAPTER-3: PETROLEUM REFINING</b> Introduction
	2 <sup>nd</sup>	Product from a refinery, temperature range and composition of crude oil
	3 <sup>rd</sup>	Uses of petroleum products
	4 <sup>th</sup>	Crude oil distillation system
6 <sup>th</sup>	1 <sup>st</sup>	Desalting of crude oil
	2 <sup>nd</sup>	Operation of distillation column
	3 <sup>rd</sup>	Two stages distillation units
	4 <sup>th</sup>	Operation of Three stages distillation units
7 <sup>th</sup>	1 <sup>st</sup>	Flow diagram of an integrated petroleum refinery
	2 <sup>nd</sup>	Safety, storage and handling of Petrochemical Products
	3 <sup>rd</sup>	Overviews of Refineries in India
	4 <sup>th</sup>	<b>CHAPTER-4: CHEMICAL FEED STOCK-FIRST GENERATION PETROCHEMICALS</b>

		History and growth of Petrochemical industries globally and in India
8 <sup>th</sup>	1 <sup>st</sup>	Petrochemical and different chemicals from petroleum
	2 <sup>nd</sup>	Petrochemical feed stock- category
	3 <sup>rd</sup>	composition and sources of naphtha
	4 <sup>th</sup>	Process of Steam reforming of naphtha
9 <sup>th</sup>	1 <sup>st</sup>	Separation of C4 cuts from naphtha crackers
	2 <sup>nd</sup>	Industrial method of cyclohexane manufacturing
	3 <sup>rd</sup>	Application of cyclohexane
	4 <sup>th</sup>	<b>CHAPTER-5: SECOND GENERATION PETROCHEMICALS</b> Introduction
10 <sup>th</sup>	1 <sup>st</sup>	Differentiate between first and second generation petrochemical
	2 <sup>nd</sup>	Manufacturing of methanol from synthesis gas
	3 <sup>rd</sup>	Manufacturing of ethanol from synthesis gas
	4 <sup>th</sup>	Application of synthesis gas
11 <sup>th</sup>	1 <sup>st</sup>	Manufacturing of vinyl monomer (Acrylonitrile)
	2 <sup>nd</sup>	Manufacturing of vinyl monomer (vinyl chloride)
	3 <sup>rd</sup>	Manufacturing of vinyl monomer (vinyl acetate)
	4 <sup>th</sup>	Application of vinyl monomer
12 <sup>th</sup>	1 <sup>st</sup>	Manufacturing of Polyester monomer (Phthalic Anhydride)
	2 <sup>nd</sup>	Manufacturing of Polyester monomer (Terephthalic acid)
	3 <sup>rd</sup>	Application of polyester
	4 <sup>th</sup>	<b>CHAPTER-6: THIRD GENERATION PETROCHEMICALS</b> Introduction
13 <sup>th</sup>	1 <sup>st</sup>	Properties of formaldehyde
	2 <sup>nd</sup>	Manufacturing of formaldehyde
	3 <sup>rd</sup>	Properties of acetaldehyde
	4 <sup>th</sup>	Manufacturing of acetaldehyde
14 <sup>th</sup>	1 <sup>st</sup>	Properties of Acetic acid
	2 <sup>nd</sup>	Manufacturing of Acetic acid
	3 <sup>rd</sup>	Properties of Aniline
	4 <sup>th</sup>	Manufacture of Aniline
15 <sup>th</sup>	1 <sup>st</sup>	Manufacture of BTX (Benzene, Toluene, Xylene).
	2 <sup>nd</sup>	Flow sheet Description of BTX
	3 <sup>rd</sup>	Manufacture of Melamine and linear alkyl benzene
	4 <sup>th</sup>	Application

<b>LESSON PLAN OF 6<sup>TH</sup> SEMESTER CHEMICAL ENGINEERING</b>		
<b>DISCIPLINE: CHEMICAL</b>	<b>Semester:-6<sup>TH</sup></b>	<b>NAME OF THE TEACHING FACULTY RAJESH KUMAR DUTTA</b>
<b>SUBJECT: NOBEL SEPARATION PROCESS (TH 4)</b>	<b>No of days per Week Allotted : 04</b>	<b>SEMESTER: MARCH TO JUNE 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>	What is a membrane?
	2 <sup>nd</sup>	Basic principle of membrane separation
	3 <sup>rd</sup>	Classification of membrane processes
	4 <sup>th</sup>	Classification of membrane processes
2 <sup>ND</sup>	1 <sup>st</sup>	Advantages and disadvantages of membrane processes
	2 <sup>nd</sup>	Major application area of membrane separation
	3 <sup>rd</sup>	Future processes of membrane separation
	4 <sup>th</sup>	Types of synthetic membrane
3 <sup>rd</sup>	1 <sup>st</sup>	Micro porous membrane
	2 <sup>nd</sup>	Asymmetric membrane
	3 <sup>rd</sup>	Thin film composite
	4 <sup>th</sup>	Electrically charged membrane
4 <sup>th</sup>	1 <sup>st</sup>	Inorganic membrane
	2 <sup>nd</sup>	Membrane module- Plate and frame
	3 <sup>rd</sup>	Membrane module- Tubular
	4 <sup>th</sup>	Membrane module- Spiral wound
5 <sup>th</sup>	1 <sup>st</sup>	Membrane module- Hollow fiber
	2 <sup>nd</sup>	Membrane material and Pore Characteristics
	3 <sup>rd</sup>	Membrane material and Pore Characteristics
	4 <sup>th</sup>	Types of flow pattern
6 <sup>th</sup>	1 <sup>st</sup>	Concept of Osmosis
	2 <sup>nd</sup>	Determination of osmotic pressure
	3 <sup>rd</sup>	Thermodynamic consideration of osmosis
	4 <sup>th</sup>	Isotonic solution
7 <sup>th</sup>	1 <sup>st</sup>	High Pressure and low pressure reverse osmosis
	2 <sup>nd</sup>	Advantages and disadvantages of reverse osmosis
	3 <sup>rd</sup>	Forward Osmosis- Elementary idea and application
	4 <sup>th</sup>	Forward Osmosis- Elementary idea and application
8 <sup>th</sup>	1 <sup>st</sup>	Membrane plugging
	2 <sup>nd</sup>	Application of reverse osmosis
	3 <sup>rd</sup>	Principle of Nano filtration
	4 <sup>th</sup>	Process limitation of Nano filtration.

9 <sup>th</sup>	1 <sup>st</sup>	Industrial application of Nano filtration
	2 <sup>nd</sup>	Principle of Ultra filtration and its advantages
	3 <sup>rd</sup>	Ultra filtration vis-à-vis conventional filtration
	4 <sup>th</sup>	Configuration of Ultra filtration unit
10 <sup>th</sup>	1 <sup>st</sup>	Configuration of Ultra filtration unit
	2 <sup>nd</sup>	Types of devices in Ultra filtration.
	3 <sup>rd</sup>	Factors affecting the performance of Ultra filtration
	4 <sup>th</sup>	Industrial application of Ultra filtration
11 <sup>th</sup>	1 <sup>st</sup>	Industrial application of Ultra filtration
	2 <sup>nd</sup>	Principle of Micro filtration
	3 <sup>rd</sup>	Fouling in Micro filtration membrane
	4 <sup>th</sup>	Application of Micro filtration
12 <sup>th</sup>	1 <sup>st</sup>	Basic principle of gas separation
	2 <sup>nd</sup>	Membranes for gas separation
	3 <sup>rd</sup>	Application of Gas separation
	4 <sup>th</sup>	Basic principle of Pervaporation
13 <sup>th</sup>	1 <sup>st</sup>	Membrane characteristics in pervaporation
	2 <sup>nd</sup>	mass transfer in pervaporation & Application
	3 <sup>rd</sup>	Principle of Ion exchange
	4 <sup>th</sup>	Principle of Ion exchange
14 <sup>TH</sup>	1 <sup>st</sup>	Characteristic of ion exchange resin
	2 <sup>nd</sup>	Application of ion exchange
	3 <sup>rd</sup>	Application of ion exchange
	4 <sup>th</sup>	Membrane Distillation
15 <sup>TH</sup>	1 <sup>st</sup>	Membrane reactors
	2 <sup>nd</sup>	Objective questions discussion
	3 <sup>rd</sup>	Objective questions discussion
	4 <sup>th</sup>	Objective questions discussion