CHEMICAL ENGINEERING LESSON PLAN FOR 3RD SEM (2025-26)

Subject: **Introduction to Chemical Engineering**		Name of the Teaching Faculty: **Satya Sankar Raj**
Subject Code:**TH1 (CHEPC201)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Class Day**	**Theory/Practical Topics**
1st	1st	Definition of Chemical Engineering and Chemical Industry
	2nd	Role of Physical Sciences, Life Sciences, Mathematics and Economics in Chemical Engineering
	3rd	Duties and Responsibilities of a Chemical Engineer
2nd	1st	Difference between Chemical Engineering and Chemistry
	2nd	Introduction to Unit Operations: Definition and Examples
	3rd	Introduction to Unit Processes: Definition and Examples
3rd	1st	Batch and Continuous Processes
	2nd	Block Diagram and Flowsheet: Concepts and Examples
	3rd	Introduction to PFD and P&ID
4th	1st	Role of Process Control Engineering in Plants
	2nd	Control Systems: DCS, PLC, SCADA
	3rd	Model, Prototype and Pilot Plant: Concepts and Use Cases
5th	1st	Engineering, Procurement and Construction (EPC) Contracts
	2nd	Case Studies of EPC Projects
	3rd	Revision and Practice Exercises
6th	1st	Interdisciplinary Nature of Chemical Engineering
	2nd	Chemical Engineers in Food and Pharmaceutical Industries
	3rd	Chemical Engineers in Energy and Environmental Sectors
7th	1st	Chemical Engineers in Biochemical and Electronics Sectors
	2nd	Importance of Quality Check in Chemical Industry
	3rd	Quality Control Methods and Applications
8th	1st	Simulation and Modeling: Definition and Importance
	2nd	Applications of Simulation and Modeling in Industry
	3rd	Software: ASPEN, HYSYS, CHEMCAD, etc.
9th	1st	Software: ANSYS, PRO/II, DWSIM
	2nd	Introduction to IoT in Chemical Engineering
	3rd	Applications of AI in Chemical Engineering
10th	1st	Traditional vs Modern Chemical Engineering
	2nd	Opportunities for a Chemical Engineer
	3rd	Scope and Future of Chemical Engineering
11th	1st	Greatest Achievements in Chemical Engineering
	2nd	Major Contributors and Innovators in the Field
	3rd	Landmark Developments and Case Studies
12th	1st	Professional Bodies: AIChE, ACS, IIChE
	2nd	Roles and Contributions of Professional Bodies

	3rd	Membership and Benefits of Joining These Bodies
13th	1st	Overview of Chemical Engineering Industries in India
	2nd	Key Companies and Operations in Indian Industry
	3rd	Product Segments and Markets
14th	1st	Chemical Engineering Industries in Odisha
	2nd	Raw Materials, Products and End Uses
	3rd	Case Studies from Odisha Industry
15th	1st	Summary of Course and Open Discussion
	2nd	Future Trends in Chemical Engineering
	3rd	Class Test / Assessment

Subject: **Industrial Chemistry**		Name of the Teaching Faculty: **Siddhibinayak Pradhan**
Subject Code:**TH2 (CHEPC203)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Class Day**	**Theory/Practical Topics**
1st	1st	Introduction to Organic Chemistry and Nomenclature
	2nd	Functional Groups and Classification of Organic Compounds
	3rd	Aliphatic vs Aromatic Compounds, Open vs Closed Chain
2nd	1st	Alkanes - Structure and Properties
	2nd	Alkenes - Structure and Properties
	3rd	Alkynes - Structure and Properties
3rd	1st	Cycloalkanes - Structure and Properties
	2nd	Methane and Ethane: Preparation & Reactions
	3rd	Industrial Applications of Methane and Ethane
4th	1st	Ethylene: Preparation and Reactions
	2nd	Methanol & Ethanol: Preparation and Properties
	3rd	Industrial Applications of Alcohols
5th	1st	Acetic Acid: Properties and Applications
	2nd	Formaldehyde and Acetone
	3rd	Revision and Problem Solving on Aliphatic Compounds
6th	1st	Introduction to Aromatic Compounds and Aromaticity
	2nd	Structure of Benzene
	3rd	Properties and Reactions of Benzene
7th	1st	Halogenation and Hydrogenation of Benzene
	2nd	Pyrolysis and Substitution Reactions
	3rd	Classification of Alkyl Halides
8th	1st	Isomerism in Alkyl Halides
	2nd	Properties and Reactions of Alkyl Halides
	3rd	Elimination Reactions
9th	1st	Alcohols: Classification and Preparation
	2nd	Properties and Reactions of Alcohols
	3rd	Phenols: Structure and Classification

10th	1st	Preparation of Phenols
	2nd	Properties and Reactions of Phenols
	3rd	Revision and Quiz on Aromatic Compounds
11th	1st	Introduction to Colloids: Types and Properties
	2nd	Methods of Preparation and Purification
	3rd	Applications of Colloids
12th	1st	Emulsion: Types and Properties
	2nd	Role of Emulsifier and Preparation
	3rd	Applications of Emulsions
13th	1st	Gel: Types and Properties
	2nd	Applications of Gel
	3rd	Introduction to Polymers
14th	1st	Addition and Condensation Polymerization
	2nd	Methods of Polymerization
	3rd	Thermoplastic and Thermosetting Polymers
15th	1st	Properties and Applications of Common Polymers
	2nd	Revision and Summary
	3rd	Class Test / Assessment

Subject: **Chemical Process Calculations**		Name of the Teaching Faculty: **Yayati Kishore Mohanta**
Subject Code:**TH3 (CHEPC205)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Class Day**	**Theory/Practical Topics**
1st	1st	Introduction to Process Calculations
	2nd	Dimensions and Systems of Units
	3rd	Fundamental and Derived Quantities
2nd	1st	Unit Conversions in MKS and SI Systems
	2nd	Numerical Problems on Unit Conversion
	3rd	Importance of Basis of Calculation
3rd	1st	Concept of Mole, Atom, Atomic Weight, Molecular Weight
	2nd	Composition of Solid, Liquid and Gas: Mass, Mole, Volume
	3rd	Percentage, Ratio and Fraction Representation
4th	1st	Molarity, Molality, Normality: Definitions
	2nd	Simple Numerical Problems on Composition
	3rd	Concept of Partial Pressure and Vapour Pressure
5th	1st	Boyle's Law, Charles's Law, Avogadro's Law
	2nd	Gay-Lussac's Law, Amagat's Law, Dalton's Law
	3rd	Ideal Gas Law and its Application
6th	1st	Numerical Problems on Gas Laws
	2nd	Difference between Ideal and Real Solutions
	3rd	Raoult's Law and Henry's Law

7th	1st	Numerical Problems on Raoult's and Henry's Law
	2nd	Introduction to Material Balance and Conservation of Mass
	3rd	Material Balance Equation and Block Diagrams
8th	1st	Material Balance on Distillation
	2nd	Material Balance on Evaporation
	3rd	Material Balance on Drying
9th	1st	Material Balance on Mixing
	2nd	Numerical Problems on Material Balance
	3rd	Concept of Excess and Limiting Reactants
10th	1st	Conversion, Yield, and Selectivity: Definitions
	2nd	Numerical Problems on Conversion and Yield
	3rd	Revision on Material Balance and Stoichiometry
11th	1st	Introduction to Heat Effects in Reactions
	2nd	Standard Heat of Reaction and Combustion
	3rd	Standard Heat of Formation
12th	1st	Hess Law of Constant Heat Summation
	2nd	Numerical Problems on Heat of Reaction
	3rd	Numerical Problems on Heat of Combustion
13th	1st	Numerical Problems on Heat of Formation
	2nd	Combined Numerical Problems
	3rd	Practice Problems and Concept Reinforcement
14th	1st	Recap of Unit Systems and Stoichiometry
	2nd	Recap of Gas Laws and Material Balance
	3rd	Recap of Heat Effects in Chemical Reactions
15th	1st	Mock Test or Quiz
	2nd	Doubt Clearing and Concept Revision
	3rd	Final Assessment or Class Test

Subject: **Momentum Transfer**		Name of the Teaching Faculty: **Siddhibinayak Pradhan**
Subject Code:**TH4 (CHEPC207)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Class Day**	**Theory/Practical Topics**
1st	1st	Introduction to Fluid Mechanics; Difference between Solids and Fluids
	2nd	Properties of Fluid: Mass Density, Weight Density, Specific Volume, Specific Gravity
	3rd	Surface Tension and Viscosity (Dynamic and Kinematic); Newton's Law of Viscosity
2nd	1st	Simple Numerical Problems on Fluid Properties
	2nd	Types of Fluids: Ideal, Real, Newtonian, Non-Newtonian

	3rd	Fluid Pressure and its Measurement: Pascal's Law, Hydrostatic Equilibrium
3rd	1st	Manometers: Piezometer, U-Tube, Differential
	2nd	Barometer and Concept of Buoyancy
	3rd	Archimedes' Principle and Numerical Problems
4th	1st	Types of Fluid Flow: Steady, Unsteady, Uniform, Non-Uniform
	2nd	Compressible vs. Incompressible, Rotational vs. Irrotational
	3rd	Equation of Continuity, Mass Flow Rate, Volumetric Flow Rate
5th	1st	Simple Numerical Problems on Flow Types and Continuity
	2nd	Reynolds Experiment and its Significance
	3rd	Laminar, Transition, and Turbulent Flows, Critical Velocity
6th	1st	Bernoulli's Theorem and Practical Applications
	2nd	Derivation of Bernoulli's Equation for Ideal Fluids
	3rd	Derivation for Real Fluids and Simple Numerical Problems
7th	1st	Pressure Drop and Frictional Losses in Pipes: Skin and Form Friction
	2nd	Effect of Roughness, Friction Factor, Fanning Equation
	3rd	Hagen-Poiseuille Equation and Simple Numerical Problems
8th	1st	Flow Measurement: Introduction and Venturimeter Principle
	2nd	Venturimeter Construction, Working, Co-efficient, Formula
	3rd	Numerical Problems on Venturimeter
9th	1st	Orificemeter: Principle, Construction, Working
	2nd	Orificemeter Co-efficient, Formula and Numerical Problems
	3rd	Pitot Tube: Working Principle and Diagram
10th	1st	Rotameter: Working Principle and Diagram
	2nd	Numerical Problems on Flow Rate Measurement
	3rd	Revision and Practice Problems
11th	1st	Pipe vs Tube, Standard Sizes and Wall Thickness
	2nd	Schedule Number, Nominal Diameter, BWG Number
	3rd	Types of Joints and Pipe Fittings
12th	1st	Valves: Gate, Globe, Ball, Needle
	2nd	Valves: Non-return, Butterfly, Diaphragm, Pressure Relief
	3rd	Applications of Different Valves
13th	1st	Classification of Pumps; Centrifugal Pump: Definition and Construction
	2nd	Working, Advantages, Disadvantages of Centrifugal Pump
	3rd	Characteristic Curves, Priming, NPSH, Cavitation
14th	1st	Losses in Centrifugal Pumps; Reciprocating Pump Applications
	2nd	Piston Pump, Plunger Pump: Construction and Working
	3rd	Diaphragm Pump and Gear Pump: Construction and Applications
15th	1st	Fluidisation: Conditions and Types
	2nd	Applications of Fluidisation
	3rd	Revision, Summary and Class Test

Subject: **Mechanical Operation**		Name of the Teaching Faculty: **Satya Sankar Raj**
Subject Code:**TH5 (CHEPC209)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Class Day**	**Theory/Practical Topics**
1st	1st	Introduction to Size Reduction and its Objectives
	2nd	Size Reduction Methods: Impact, Compression, Attrition, Shear
	3rd	Laws of Comminution: Kick's, Rittinger's and Bond's Law
2nd	1st	Power Consumption in Crushing
	2nd	Coarse Crushers: Jaw Crusher - Principle, Construction, Working
	3rd	Gyratory Crusher and Crushing Roll - Diagram and Applications
3rd	1st	Intermediate Grinders: Hammer Mill - Principle and Working
	2nd	Fine Grinders: Ball Mill - Principle and Working
	3rd	Applications of Ultrafine Grinders, Closed and Open Circuit Grinding
4th	1st	Dry vs Wet Grinding, Free vs Choke Grinding
	2nd	Numerical Problems on Size Reduction
	3rd	Introduction to Size Separation and Solid Particle Characterization
5th	1st	Sphericity, Sauter Mean Diameter, Mass and Volume Mean Diameter
	2nd	Screening: Definition, Ideal vs Actual Screen, Standard Sizes
	3rd	Factors Affecting Screening, Capacity and Effectiveness
6th	1st	Screening Equipment: Grizzlies, Trommels
	2nd	Vibrating and Gyratory Screens - Working and Diagram
	3rd	Classifier: Principle, Diagram, Applications
7th	1st	Jig and Froth Flotation Cell - Principle and Applications
	2nd	Electrostatic Precipitator and Magnetic Separator
	3rd	Cyclone Separator and Scrubber - Diagram and Applications
8th	1st	Clarifier and Thickener - Working and Applications
	2nd	Introduction to Filtration
	3rd	Constant Rate vs Constant Pressure Filtration
9th	1st	Numerical and Conceptual Problems on Size Separation
	2nd	Introduction to Mixing of Solids
	3rd	Difference between Mixing and Agitation
10th	1st	Agitated Vessel: Design and Function
	2nd	Types of Agitators: Impeller, Propeller, Paddle, Turbine Blade
	3rd	Concept of Swirling and Vortex, Function of Baffles
11th	1st	Power Consumption in Stirred Vessels
	2nd	Numerical Problems on Mixing
	3rd	Introduction to Transportation of Solids
12th	1st	Belt and Screw Conveyors: Diagram, Working, Application
	2nd	Bucket Elevator, Scraper Conveyor: Diagram and Applications
	3rd	Pneumatic Conveyor: Principle and Application
13th	1st	Introduction to Storage of Solids: Objective

	2nd	Storage Equipment: Hopper, Bin, Silo
	3rd	Concept of Angle of Repose
14th	1st	Revision on Size Reduction and Size Separation
	2nd	Revision on Mixing and Transportation
	3rd	Numerical Practice and Discussion
15th	1st	Mock Test or Quiz
	2nd	Doubt Clearing and Conceptual Recap
	3rd	Final Assessment / Class Test

Subject: **Industrial Chemistry Lab**		Name of the Teaching Faculty: **GF**
Subject Code:**PR1 (CHEPC211)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Expt No.**	**Practical Topic**
1st	1	Detection of Nitrogen in Organic Compounds
2nd	1	Detection of Sulphur in Organic Compounds
3rd	1	Detection of Halogen in Organic Compounds
4th	2	Determine Carboxylic Functional Group
5th	2	Determine Phenolic Functional Group
6th	2	Determine Alcoholic Functional Group
7th	3	Laboratory Preparation of Oxalic Acid
8th	3	Laboratory Preparation of Benzoic Acid
9th	3	Laboratory Preparation of Methyl Orange
10th	4	Laboratory Preparation of Urea-Formaldehyde Resin
11th	4	Laboratory Preparation of Urea-Formaldehyde Resin
12th	5	Laboratory Preparation of Bakelite (Phenol-Formaldehyde Resin)
13th	5	Laboratory Preparation of Bakelite (Phenol-Formaldehyde Resin)
14th	6	Laboratory Preparation of Nylon 6-6
15th		Final Lab Assessment / Viva / Record Submission

Subject: **Momentum Transfer Lab**		Name of the Teaching Faculty: **Siddhibinayak Pradhan**
Subject Code:**PR2 (CHEPC213)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Expt No.**	**Practical Topic**
1st	1	Demonstration of Operation of Different Types of Manometers
2nd	2	Demonstration of Reynold's Apparatus
3rd	2	Demonstration of Reynold's Apparatus
4th	3	Verification of Bernoulli's Equation
5th	3	Verification of Bernoulli's Equation
6th	4	Demonstration of Operation of Venturimeter
7th	4	Demonstration of Operation of Venturimeter
8th	5	Demonstration of Operation of Orificemeter
9th	6	Experiment on Losses in Pipe Flow
10th	6	Experiment on Losses in Pipe Flow
11th	7	Demonstration of Operation of Centrifugal Pump
12th	8	Flow Through Fluidized Bed - Observation and Analysis
13th	9	Basic Plumbing Practice: Tools and Jointing
14th	9	Basic Plumbing Practice: Tools and Jointing
15th		Final Lab Assessment / Viva / Record Submission

Subject: **Mechanical Operation Lab**		Name of the Teaching Faculty: **Satya Sankar Raj**
Subject Code:**PR3 (CHEPC215)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Expt No.**	**Practical Topic**
1st	1	Demonstrate the Operation of Blake Jaw Crusher
2nd	2	Demonstrate the Operation of Ball Mill and Determine Critical Speed
3rd	2	Demonstrate the Operation of Ball Mill and Determine Critical Speed
4th	2	Demonstrate the Operation of Ball Mill and Determine Critical Speed
5th	3	Demonstrate the Operation of Vibrating Screen
6th	4	Demonstrate the Operation of Gyratory Sieve Shaker
7th	4	Demonstrate the Operation of Gyratory Sieve Shaker
8th	5	Demonstrate the Operation of Froth Floatation Cell
9th	6	Demonstrate the Operation of Cyclone Separator
10th	7	Demonstrate the Operation of Bucket Elevator
11th	8	Demonstrate the Operation of Belt Conveyor
12th	9	Demonstrate the Operation of Plate and Frame Filter Press
13th	10	Demonstrate the Operation of Paddle Mixer
14th		Practical beyond syllabus
15th		Final Assessment / Lab Viva / Record Submission

Subject: **Chemical Engg. Drawing Lab**		Name of the Teaching Faculty: **Yayati Kishore Mohanta**
Subject Code:**PR4 (CHEPC217)**		Commencement of Class:**14th July 2025** Closing of Attendance: **15th November 2025**
Week	**Expt No.**	**Practical Topic**
1st	1	Pipe Joints and Fittings: Welded, Screw, Union Joints; Socket, Bends, Elbow, Tee
2nd	1	Pipe Fittings Continued: Expander, Plug, Welded Neck Flange, Slip-On Flange
3rd	2	Valve Symbols and Schematic Diagram: Gate, Globe, Ball, Diaphragm Valves
4th	2	Valve Symbols Continued: Butterfly, Plug, Check, Control Valves
5th	3	Process Pipeline Symbols: Pipe, Thermally Insulated, Jacketed, Heated, Flexible Pipes
6th	4	Equipment Symbols: Centrifugal Pump, Gear Pump, Compressor, Turbine, Vacuum Pump
7th	4	Equipment Symbols Continued: Screw Conveyor, Elevator, Condenser, Boiler, Cyclone Separator
8th	4	Equipment Symbols Continued: Filter, Thickener, Crystallizer, Crusher, Dryer
9th	5	Vessel Symbols: Vessel, Open/Closed Tank, Column, Tray Column, Clarifier, Bin, Gas Cylinder
10th	6	Instrumentation Symbols I: Flow & Level Controllers, Indicators, Meters, Recorders, Transmitters
11th	6	Instrumentation Symbols II: Pressure and Temperature Controllers, Indicators, Transducers
12th	7	Schematic Diagram of Double Pipe and Shell & Tube Heat Exchangers
13th	8	Schematic Diagram of Distillation Column
14th	9	Preparation of PFD of a Basic Chemical Engineering Plant
15th		Final Assessment: Drawing Review, Viva, and Record Submission