UTKALMANI GOPABANDHU INSTITUTE OF ENGINEERING, ROURKELA

DEPARTMENT OF CHEMICAL ENGINEERING

LESSON PLAN

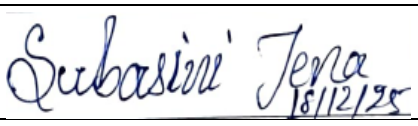
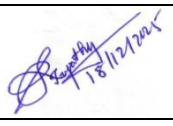
SUBJECT	**PROCESS HEAT TRANSFER**
SUBJECT CODE	**CHEPC202**
SEMESTER	**4TH**
SESSION	**2025-2026 Semester (22.12.2025 -18.04.2026)**
NAME OF FACULTY	**SUBASINI JENA**

WEEK	TOPICS COVERED
WEEK 1	Concept of Heat, Importance of Heat Transfer Operations
	Basic modes of Heat Transfer (Conduction, Convection and Radiation)
	Steady state and Unsteady state heat transfer
WEEK 2	Fourier's Law of heat conduction, Thermal Conductivity of materials
	Steady state heat conduction through plane single wall
	problems on heat conduction through plane single wall
WEEK 3	Steady state heat conduction through composite wall
	problems on heat conduction through composite wall
	Steady state heat conduction through cylinder
WEEK 4	problems on heat conduction through cylinder
	Concept of critical thickness of insulation
	Thermal Insulation and insulating materials
WEEK 5	Practical applications of fins
	Nature of heat transfer by Convection, Natural Convection vs. Forced Convection
	Concept of Individual Heat Transfer Coefficient
WEEK 6	Concept of Overall Heat Transfer Coefficient
	Reynolds No., Nusselt No., Prandtl No., Grashoff No & Dimensionless Numbers and their significance
	Simple numerical problems using Dittus-Boelter equation
WEEK 7	Simple numerical problems using convective heat transfer coefficient
	Concept of Radiation, Nature of Thermal Radiation
	Surface Emission properties

WEEK 8	Total Emissive Power, Monochromatic Emissive Power
	Emissivity, Absorptivity, Reflectivity and Transmissivity
	Concept of Black Body
WEEK 9	Concept of White Body, Opaque Body, Gray Body
	Laws of Radiation: Stefan-Boltzmann Law, Kirchoff‟s Law,
	Planck‟s Law, Wien‟s Displacement Law
WEEK 10	Definition of Boiling and Condensation, Boiling Regimes
	Interface Evaporation, Nucleate Boiling and Film Boiling
	Condensation, Film Condensation and Dropwise Condensation
WEEK 11	Difference between Sensible heat and Latent heat
	Relative direction of fluid motion and their applications: Parallel Flow, Counter-current Flow and Cross flow
	Construction, Working, Application of Double Pipe Heat Exchanger
WEEK 12	Construction, Working, Application of Shell & Tube Heat Exchanger & Passes in Shell-side and Tube-side
	Guidelines for directing the fluids in Shell and Tubes & Applications of Extended Surface Exchanger and Plate-Type Heat Exchanger
	Concept of LMTD
WEEK 13	Concept of Overall Heat Transfer Coefficient
	Correction factor, Fouling/scaling
	Simple calculation of overall heat transfer coefficient in heat exchangers & heat transfer area
WEEK 14	Simple calculation of overall heat transfer coefficient in heat exchangers & heat transfer area
	Definitions of cooler, chiller, reboiler, condenser
	Difference between Evaporation and Boiling; Objective of Evaporation
WEEK 15	Performance of Evaporator: Capacity and Economy; Boiling Point Elevation
	Feeding mechanism in a Multiple Effect Evaporator: Forward Feed, Backward Feed and Fixed Feed
	Single Effect Evaporator vs. Multiple Effect Evaporator

BOOKS FOR REFERENCE:

- DC. Sikdar, “Process Heat Transfer and Chemical Equipment Design”, Revised Ed., Khanna Publishing House
- W. L. McCabe and J. C. Smith, “Unit Operations in Chemical Engineering”, 7th Edition McGraw Hill Publishing Co.
- Binay K. Dutta, “Heat Transfer Principles and applications” Prentice Hall of India Pvt. Ltd.

	Prepared by	**Approved by**
Signature		
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SESSION	**2025-2026 (Semester from Date: 22.12.2025 to Date : 18.04.2026)**	