20PEB224					Heat and Mass Transfer					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To provide concept of heat and mas transfer, explain the different mode of heat transfer and their applications
- To provide the importance of various modes of heat and mass transfer to solve various engineering problems
- To explain the significance of heat and mass transfer in design of various industrial equipments

UNIT 1 Heat Transfer **7 Hrs.**

Conduction: Steady-state and transient flow through various geometries, Convection: LMTD and NTU, overall heat transfer coefficient. Application of dimensional analysis to convection. Heat transfer rate and Heat transfer coefficient calculations. Double pipe parallel and counter-flow heat exchangers, natural and forced convection through tubes and outside tubes, Shell and tube heat exchanger, and finned tube heat exchanger. Boiling of liquids and condensation of vapours.

UNIT 2 Radiation **7 Hrs.**

Radiation from black and real surfaces, radiation transfer between black and grey surfaces, view factor, radiation shield, and multi-sided enclosures., Thermal insulation, Economic and critical thickness of lagging.

UNIT 3 Mass Transfer **8 Hrs.**

Diffusion in gases: Fick's law, determination and estimation of diffusion coefficient; diffusion through stagnant gas and equimolecular counter-diffusion. Diffusion in liquids: Mass transfer across phase boundaries, two-film theory and mass transfer coefficient.

UNIT 4 **8 Hrs.**

Gas Absorption, adsorption, Extraction and Distillation (flash and differential): Basic principles, laws, and calculations. Equilibrium, co-current and counter-current operations. Ideal stage concept and calculation of number of ideal stages. Efficiency. Packed bed and tray columns.

Max 30 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Ability to understand conduction and convection heat transfer equations to various geometry and solve complex engineering problems

CO2 - Ability to investigate the phenomena of boiling and condensation and analyse the thermal coefficient of various heat exchanger configurations

CO3 - Ability to understand and analyse the radiation heat transfer.

CO4 - Ability to understand the diffusional mass transfer.

CO5 - Ability to understand and design the various mass transfer operations.

CO6 -

TEXT/REFERENCE BOOKS

1. Coulson and Richardson"s Chemical Engineering Vol-1, 6th Ed, Elsevier (Butterworth and Heinemann).
2. Warren L. McCabe, Julian C. Smith, Unit Operations of Chemical Engineering, McGraw Hill.
3. Donald Q. Kern, Process heat transfer, Tata-McGraw-Hill.
4. Badger and Banchero , Introduction to Chemical Engineering, McGraw-Hill

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

PART A: <Question: <Short Notes, Problems, Numerical> **20 Marks**

PART B: <Justification, Criticism, Long answers, Interpretation > **80 Marks**