

Course Code	Course Title	L	T	P	C
1151BT116	Unit Operations and Transport Phenomena	3	0	0	3

- Course Category** : *Program elective*
- a. Preamble** : *To know the fundamental concepts of fluid mechanics, heat, mass transfer and design/operate the heat exchange equipment*
- b. Prerequisite Courses:** *NIL*
- c. Related Courses** : *nil*
- d. Course Outcomes** : *Upon the successful completion of the course, students will be able to:*

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Will understand the basic principle of Fluid mechanics.	K2
CO2	Will learn about flow measurements & different mechanical operations involved in fluid mechanics.	K2
CO3	Will be able to understand the modes and principles of heat transfer.	K2
CO4	Students will be studying about heat transfer equipments & basics of mass transfer and its numerical calculations.	K3
CO5	Students will be studying about different types of Mass transfer operation techniques.	K3

e. Course Content:

UNIT-I Fluid definition and classification, Rheological behavior of fluids & Newton's Law of viscosity. Fluid statics, Types of flow - laminar and turbulent; Reynolds experiment; Flow through circular and non circular conduits. Flow past immersed bodies – drag and drag co-efficients, Flow through stagnant fluids – theory of Settling and Sedimentation.

UNIT-II Different types of flow measuring devices, flow measurements, Pumps – types of pumps. Properties and handling of particulate solids – characterization of solid particles, average particle size, screen analysis-

Conceptual numerical of differential and cumulative analysis. Size reduction, Mixing, Filtration & types, filtration equipments.

UNIT-III Modes of heat transfer, Insulation, Convection- Forced and Natural convection, principles of heat transfer co-efficients, log mean temperature difference, individual and overall heat transfer co-efficients, Condensation.

UNIT-IV Heat transfer equipments, Diffusion-Fick's law of diffusion. Types of diffusion. Steady state molecular diffusion in fluids at rest and laminar flow, Mass, heat and momentum transfer analogies. Measurement of diffusivity, Mass transfer coefficients and their correlations. Interphase mass transfer- equilibrium, diffusion between phases.

UNIT-V Distillation—Methods of distillation, distillation of binary mixtures using McCabe Thiele method. Liquid-liquid extraction—equilibrium, stage type extractors, Drying- drying operations, batch and continuous drying.

TEXT BOOKS

1. Unit operations in Chemical Engineering by Warren L. McCabe, Julian C. Smith & Peter Harriot, McGraw-Hill Education (India) Edition 2014.
2. Transport Process Principles and Unit Operations by Christie Geankoplis, Prentice Hall of India.
3. Fluid Mechanics by K L Kumar, S Chand & Company Ltd.
4. Introduction to Chemical Engineering by Badger W.I. and Banchemo, J.T., Tata McGraw Hill New York, 1997.
5. Mass Transfer Operations by Robert E. Treybal. McGraw-Hill Education