

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B.E. SEMESTER : VI**  
**ENVIRONMENTAL SCIENCE & TECHNOLOGY**

**Subject Name: : Fluid Flow & Heat Transfer**

**Subject Code: 163503**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam(E)	University Exam(P)	Mid Sem Exam(Theory) (M)	Practical (Internal)
4	0	3	7	70	0	30	50

Sr No	Course Contents
	<b>Fluid Flow</b>
1	Introduction to engineering principles of fluid mechanics. Units & conversions. Basics of fluid statics & dynamics.
2	Definition of fluid, Newtonian & Non-Newtonian fluids, viscosity, density, pressure, surface tension. Hydrostatic equation, manometry, capillarity, buoyancy & pressure measurements. Principle of momentum transfer & balances.
3	Flow characteristics, laminar & turbulent flows. Significance of Reynolds number. Bernoulli's theorem & its significance Flow through ducts – pipes & open channels, concept of friction factor. Pipe fitting & valves. Flow measurement – orifice meter, venturimeter, rotameter, pilot – tube, notches & weirs, hot wire anemometer. Flow past immersed bodies, packed & fluidized beds.
4	Turbomachinery – principles of operation & selection of pumps, compressors, blowers, fans, ejectors, etc. for chemical & allied process industries.
5	Mixing of fluids – types of mixers & blenders for Newtonian & non-Newtonian fluids in single & multiphase systems in chemical & allied process industries.
	<b>Heat Transfer</b>
6	Mechanism of heat transfer by conduction, convection & radiation. Concept of individual & overall heat transfer coefficient, Significance of Prandtl number.
7	Applications of the principles of heat transfer to design equipment such as heat exchangers. Condensers, jacketed kettles & coils, boilers. Evaporation. Refrigeration. Drop wise & film wise condensation. Boiling. Unsteady state heat transfer. Heat transfer media.

**Reference Books:**

1. Chemical Engineering, Volumes 1 &2, Coulson & Richardson, 6<sup>th</sup> Ed.,1986
2. Transport Phenomena, Bird R.B Stewart & Lightfoot, 2<sup>nd</sup> Ed., 2005
3. Process Heat Transfer ,D.Q.Kern, 2<sup>nd</sup> Ed. , 1998.
4. Unit Operations of Chemical Engineering, Warren McCabe, Jubian Smith and Peter Harriot, Mc Graw Hill, 7<sup>th</sup> Ed., 2004
5. Transport Processes & Unit Operations in Chemical Engineering ,Gean Koplis, Prentice Hall, 2003

6. Coulson and Richardson's Chemical Engineering Volume 1 - Fluid Flow, Heat Transfer and Mass Transfer , Coulson, J.M.; Richardson, J.F.; Backhurst, J.R.; Harker, J.H. Elsevier, 6<sup>th</sup> Ed., 1999
7. Coulson and Richardson's Chemical Engineering Volume 2 – Particle Technology and Separation Processes, B J Blackhurst & J H Harker, Elsevier, 5<sup>th</sup> Ed., 2002
8. Coulson and Richardson's Chemical Engineering Volume 3 – Biochemical Reactors & Process Control, B J Blackhurst & J H Harker, Elsevier, 3<sup>rd</sup> Ed., 1994
9. Coulson and Richardson's Chemical Engineering Volume 4 – Solutions to the Problems in Chemical Engineering from Vol- 1, B J Blackhurst & J H Harker, Elsevier, 2001
10. Coulson and Richardson's Chemical Engineering Volume 5 – Solutions to the Problems in Chemical Engineering from Vol- 2 and Vol-3, B J Blackhurst & J H Harker, Elsevier, 2001
11. Chemical Engineering Design Volume 6, R K Sinnott, Coulson and Richardson's Chemical Engineering Elsevier, 4<sup>th</sup> Ed, 2005