

Course No.: ENR 139
 Course title: **Fluid Mechanics and Turbomachinery**
 Number of credits: 3
 Number of lectures-tutorial-lab: 36-6-0
 Course coordinator: Dr. Najmur Rahman

Course outline:

The aim of this core course is to make the student understand basic principals and equations of fluid mechanics and its various engineering applications e.g. flow in pipes, drag and lift generated in stationary and rotating impellers and blades, energy requirements of pumps, blowers and fans, centrifugal compressors and power generation from gas and steam turbines.

Evaluation procedure:

- Assignments: 10%
- Minor tests: 40%
- Major test: 50%

Details of course contents and allotted time

S. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
1	Introduction: Classification of fluid flows, system and control volume, fluid properties, fluid statistics, hydrostatic forces on submerged surfaces, fluids in rigid-body motion, fluid kinematics, Reynolds transport theorem	3	1	
2	Mass, Bernoulli and energy equations, energy analysis of steady flows, conservation of momentum, linear momentum equation, angular momentum equation Differential analysis and modeling	4	1	
3	Flow through pipes: Entrance region, laminar and turbulent flows in pipes, minor losses, piping systems and pump selection, flow rate and velocity measurement devices	6	1	
4	Differential analysis of fluid flow: Continuity equation, divergence theorem, stream function, Navier-Stokes equation and its approximate solutions	3	1	
5	Flow over bodies: Drag and lift, friction and pressure drag, flow separation, parallel flow over flat plates, flow over cylinders and spheres	5	1	

S. No.	Topic	Allotted time (hours)		
		Lectures	Tutorials	Practicals
6	Compressible flow: Stagnation properties, Mach number and shock waves, one dimensional isentropic flow, nozzles and diffusers, adiabatic duct flow with friction	4	1	
7	Turbomachinery: Pumps: centrifugal, axial, dynamic and positive displacement pumps and their characteristics, cavitation, serial and parallel combination, affinity laws, specific speed, open and ducted axial fans, centrifugal blowers, compressors Turbines: impulse, reaction, dynamic and positive displacement turbines, gas and steam turbines	11		
	Total	36	6	

The course is reviewed and commented by the following experts.

1. Prof S C Mullick, IIT, Delhi
2. Mr Mahesh Vipradas, Suzlon, Delhi

Suggested readings

1. Fluid Mechanics: Fundamentals and Applications by YA Cengel and JM Cimbala: Tata McGraw Hill