

Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

SYLLABUS FOR BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (Effective from academic session 2018-19)

Subject Code : E	Category: Professional Elective Courses
Subject Name: Advanced Fluid Mechanics	Semester : Sixth
L-T-P : 3-0-0	Credit: 3
Pre-Requisites: Fluid Mechanics	

Course Objective:

1. To know about compressible fluid flow.
2. To learn about ideal fluid flow.
3. To know about free surface flow.
4. To know about unsteady flow.

Course Content:

Module No.	Description of Topic	Contact Hrs.
1	Compressible Flow: review of thermodynamic principles for perfect gases, adiabatic and isentropic relations; steady flow energy equation; speed of propagation of a small disturbance through a compressible fluid, sonic velocity, Mach number, mach cone and Mach wave; isentropic flow, stagnation properties of a compressible flow, isentropic pressure, temperature and density ratios; compressibility correction factor in the measurement of air speed; area– velocity relationship for compressible flow through a variable area duct, mass flow rate through a duct, critical condition and choking; flow through convergent-divergent nozzle, over expansion and under expansion, performance of propulsive nozzles; normal shock, normal shock relations, wave drag.	12
2	Ideal Fluid Flow: rotation of a fluid particle, vorticity, rotational and irrotational motion; velocity potential function, circulation, stream function, flownet; governing equation for two dimensional irrotational motion, simple two dimensional irrotational flows like uniform flow, plane source, plane sink etc; superimposition of simple irrotational flows, combination of a source and a sink, combination of uniform flow and a source (Rankine half body), combination of a uniform flow and a source-sink pair (Rankine oval), doublet and its strength, superimposition of an uniform flow and a doublet (flow past a stationary cylinder); vortex motion– free and forced vortex, strength of a vortex; combination of a uniform flow, a doublet and a free vortex (flow over a rotating cylinder), Magnus effect, Kutta-Joukowski's theorem.	12
3	Free Surface Flow: flow in open channel, Chezy's equation, Manning's equation, economical cross section, specific energy,	8

	hydraulic jump.	
4	Unsteady flow– water hammer.	4

Course Outcomes:

After completing this course, the students will

1. know about compressible fluid flow.
2. learn about ideal fluid flow.
3. know about free surface flow.
4. know about unsteady flow.

Learning Resources:

1. Sadhu Singh, Fluid Mechanics and Hydraulic Machines, Khanna Book Publishing, New Delhi, 2018.
2. R.K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publication, New Delhi, 2010.
3. S.K. Som, G. Biswas and S. Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, McGraw-Hill, 2012.