

**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)**

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

<b>Module No.</b>	<b>Description of Topic</b>	<b>Contact Hrs.</b>
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.