Programme	B.Sc. (Engg.) Energy Engineering	Course Code	EE 213	Credit Hours	3+1=4
Course Title	**Fluid Mechanics**				

Course Introduction

This course in Fluid Mechanics covers engineering foundation and equips students with essential knowledge to comprehend and manipulate fluid behavior in engineering contexts. By mastering fundamental properties and the laws governing fluid motion, students will analyze systems using conservation equations. They will also solve practical engineering problems involving fluid statics, flow in pipes, pressure measurement, and pumping equipment. Through a structured curriculum that blends theory with application, students will develop proficiency in integral conservation equations. This will enable them to address challenges with confidence and competence in various fields requiring fluid mechanics expertise.

Mapped SDGs	SDG-7: Affordable and Clean Energy

Learning Outcomes

On the completion of the course, the students will:

1. Describe the fundamental properties and laws governing fluid systems. (C2)
2. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations. (C4)
3. Apply the knowledge to solve fluid mechanics engineering problems. (C3)

	Course Content	Assignments/Readings
Week 1	**Unit-I Introduction to Fluid Mechanics** 1.1 Fluid and its nature. 1.2 Properties of fluid. 1.3 Newton's law of viscosity 1.4 Concept of laminar and turbulent Flow. 1.5 Reynold's Number.	The teacher may assign home assignments/problem-based learning/reading materials/learning activity etc.
Week 2	1.6 Streamlines, streak lines and path lines. 1.7 Boundary layer, boundary layer separation and wake formation. 1.8 Dimensional analysis.	
Week 3	**Unit-II Fluid Statics** 2.1 Concept of pressure, head, and pressure gradient. 2.2 Pressure, independent of orientation and dependency on height. 2.3 Hydrostatic equilibrium.	
Week 4	2.4 Hydrostatic equilibrium in centrifugal Field 2.5 Application of fluid statics. 2.5.1 Manometers and inclined manometers. 2.5.2 Continuous gravity decanter.	
Week 5	**Unit-III Fluid Dynamic** 3.1 Stream lines flow 3.2 Bernoulli's Equation along the streamline and across the streamline 3.3 Applications of Bernoulli's Equation 3.4 Static, stagnation and total Pressure and pitot tube	

Week 6	**Unit-IV Boundary Layer and its Importance in Fluid Dynamics** 4.1 Flow of incompressible newtonian fluids in pipes & channels 4.2 Shear stress in a pipe. 4.3 Friction factor in laminar and turbulent flow in pipes	
Week 7	4.4 The Moody chart and its associated equations. 4.5 Losses in fittings and bend pipes. 4.6 Velocity distribution for turbulent flow in a pipe 4.7 Piping network analysis	
Week 8	**Unit-V Flow and Pressure Measurement.** 5.1 Conservation equations in fluid flow. 5.1.1 Haugen-Poiseuille equation 5.2 Flow measuring devices. 5.2.1 Orifice meter.	
Week 9	5.2.2 Venturi meter. 5.2.3 Rotameter. 5.2.4 Nozzle. 5.2.5 Notch and weir. 5.2.6 Electromagnetic flow meter. 5.2.7 Pitot tube	
Week 10	5.3 Flow control devices. 5.3.1 Flow coefficient chart and flow curve. 5.3.2 Valves and its types. 5.3.3 Valve gain. 5.3.4 Control valve sizing. 5.3.5 Cavitation and Flashing.	
Week 11	5.4 Pressure measuring devices. 5.4.1 Manometers and its types. 5.4.2 Bourdon tube.	
Week 12	**Unit VI: Fluid kinematics** 6.1 Velocity field. 6.2 Acceleration field. 6.3 Material derivative. 6.4 Control Volume.	
Week 13	**Unit VII: Finite Control Volume Analysis** 7.1 Fixed, Nondeforming Control Volume 7.2 Moving, Nondeforming Control Volume	
Week 14	7.3 Deforming Control Volume 7.4 Conservation of Mass for a control volume.	
Week 15	7.5 Derivation of linear momentum equation. 7.6 Application of linear momentum equation.	
Week 16	7.7 Derivation of Energy Equation. 7.8 Application of Energy Equation.	

Practical/Lab. Work

Practicals related to the topic covered in theoretical section will be performed in LAB.

Textbooks and Reading Material

1. Cengel, Yunus A., and Boles, Michael A. (2020), "Fluid Mechanics, fundamental and Applications", 9th Edition McGraw-Hill.
2. Smith J. C., Harriott P., (2013), Unit Operations of Chemical Engineering, 5th Ed., McGraw-Hill Professional Publishing.
3. Richardson, J. F., & Coulson, J. M. (2017). Chemical engineering, Vol 1, Elsevier.
4. Munson, Bruce R., Rothmayer, Alric P., Okiishi, Theodore H., (2013) 7th Edition., Fundamentals of Fluid Mechanics.
5. Bookboon. Kumar, D. S. (2020). Fluid mechanics and fluid power engineering.
6. Rajput, R. K. (2020). A Textbook of Fluid Mechanics and Hydraulics Machines.
7. Bodnár, T., Galdi, G. P., & Nečasová, Š. (Eds.). (2017). Particles in Flows. Birkhäuser.
8. Munson, B. R., Okiishi, T. H., Huebsch, W. W., & Rothmayer, A. P. (2013). Fluid mechanics (p. 147). Singapore: Wiley.
9. Al-Shemmeri, T. (2012). Engineering fluid mechanics.
10. Holland F. A., and Bragg R., (2008), Fluid Flow for Chemical Engineers, 3rd Ed., John Willey and Sons.

Teaching Learning Strategies

Teaching and learning strategies encompass a variety of methods designed to enhance the educational experience. Lectures are a fundamental approach, utilizing multimedia, white or blackboards, and online modes to deliver content effectively. Group discussions are another key strategy, aimed at fostering critical thinking through collaborative dialogue. Additionally, individual and group assignments, particularly those based on project-based learning, encourage students to apply and deepen their knowledge. Reading and writing assignments complement these strategies, helping to reinforce learning through active engagement.

Assignments: Types and Number with Calendar

Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Activity	-		-	-	Assignment 1	-	Quiz1	-

Week	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Activity	-	-	-	Assignment 1	-	Presentation	-	-

The abovementioned schedule of assignments/quizzes/presentations is tentative. The schedule will be provided to the students at the start of semester.

Assessment

Sr. No.	**Elements**	**Weightage**	**Details**
1.	Midterm Assessment	35%	Written assessment at the mid-point of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work, report writing, and viva-voce examination, etc.

2.	Sessional Assessment	25%	This assessment may include classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written assessment at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work, report writing, and viva-voce examination, etc.