SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Mechanical Engineering Department
B. Tech. Semester IV

Course Name:	**Fluid Mechanics**	**Course Code: BTME13402**
Type of course:	**Professional Core Course (PCC)**	
Prerequisite:	Fundamentals of Mechanical Engineering.	
Rationale of Course:	The students will able to understand basic concepts of engineering through the fundamental laws of conservation as well as emphasizes the role of fluid flows in real life engineering problems. This will benefit to those students who wants to pursue their career in fluid engineering sectors.	

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Fluid and their Properties:** Introduction, properties of fluids, viscosity, fluid classifications, hypothesis of continuum, thermodynamic properties, surface tension, capillary effect, vapor pressure, cavitation, compressibility and the bulk modulus.	**4**	**10%**
2.	**Pressures and Head:** Fluid pressure at a point, types of pressure, Pascal's law of pressure at a point, pressure variation in a fluid at rest, pressure and head, the hydrostatic paradox, pressure measurements using simple manometers and differential manometers.	**6**	**14%**
3.	**Static Forces on Surface and Buoyancy:** Fluid static, total pressure and center of pressure, vertical	**6**	**14%**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	plane surface sub-merged in liquid, horizontal plane surface sub-merged in liquid, inclined plane surface sub-merged in liquid, curved surface sub-merged in liquid, buoyancy, centre of buoyancy, meta-centre, meta-centric height, analytical method for meta-centre height, conditions of equilibrium of a floating and sub-merged bodies, stability of a sub-merged body, stability of a floating body.		
4.	**Kinematics of Flow:** Methods of describing fluid motion, different types of fluid flow, rate of flow or discharge, continuity equation in three-dimensions, velocity and acceleration, velocity potential function and stream function, types of motion.	**6**	**14%**
5.	**Dynamics of Fluid Flow:** Introduction, equations of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, Bernoulli's equation for real fluid, practical applications of Bernoulli's equation: venturimeter, orifice meter or orifice plate, pitot-tube, rotameter; the momentum equation, moment of momentum equation, classification of notches, discharge over a rectangular notch, discharge over a triangular notch, discharge over a trapezoidal notch.	**8**	**18%**
6.	**Dimensional Analysis and Similarities:** Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π-theorem, significance of dimensionless, use of dimensionless numbers in experimental investigation, geometric similarity, dynamic similarity, and kinematic similarity.	**5**	**10%**
7.	**Viscous Flow:** Introduction, flow of viscous fluid through circular pipe and between two parallel plates, kinetic energy correction and momentum correction factors, loss of head due to friction in viscous flow.	**5**	**10%**
8.	**Turbulent Flow:** Reynolds experiment, frictional loss in pipe flow, velocity distribution in turbulent flow in pipes.	**5**	**10%**

Percentage Distribution of Marks as per Bloom's Taxonomy (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	**15**	**25**	**25**	**20**	**0**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Publication year	Publication edition
1.	Introduction to Fluid Mechanics and Fluid Machines	S.K. Som and G. Biswas	Tata McGraw Hill, New Delhi	2017	3rd
2.	Fluid Mechanics	F.M. White	Tata McGraw Hill, New Delhi	2015	8th
3.	Fluid Mechanics	Y. Cengel	Tata McGraw Hill, New Delhi	2010	4th
4.	Introduction to Fluid Mechanics	P.J. Pritchard, A.T. McDonald and R.W. Fox	John Wiley & Sons	2012	7th
5.	Fluid Mechanics and Hydraulic Machines	R.K. Bansal	Laxmi Publications	2018	10th

Course Outcomes (CO's):

CO. No.	CO Statements After learning this subject, students will be able to	Marks % weightage
CO-1	Identify the basic concept of fluid mechanics and relationship between fluids.	15
CO-2	Differentiate statics, kinematics and dynamics approaches to fluid mechanics.	20
CO-3	Apply the various fluid concepts in real life engineering applications.	20
CO-4	Analyze the various types of flows in pipes.	20
CO-5	Evaluate the performance of various fluid apparatuses and their working principle.	25

Mapping of (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	0	2	2	0	0	0	3	0	2	1	2	2	1
CO-2	2	1	0	1	1	0	0	0	2	0	1	1	2	2	0
CO-3	2	1	0	0	1	0	0	0	2	0	1	1	1	2	1
CO-4	1	1	0	0	1	0	0	0	1	0	0	0	1	2	3
CO-5	3	3	0	3	1	0	0	0	2	0	3	1	2	2	3
Rationale*	**11**	**9**	**0**	**6**	**6**	**0**	**0**	**0**	**10**	**0**	**7**	**4**	**8**	**10**	**8**

Rationale - Mapping of CO's with PO's and CO's with PSO's: This course highly maps with PO 1, 9 and PSO 2 as it will help to understand fundamentals of fluid properties and its applications in fluid operated machineries in industries.

List of Practicals:

1. To study pressure measurement procedure and related instruments/devices.
2. To determine metacentric height of floating body.
3. To perform and verification of Bernoulli's theorem.
4. To measure the velocity of flow using Pitot tube.
5. To determine the Coefficient of discharge through Orifice meter.
6. To determine the Coefficient of discharge through Venturimeter.
7. To determine the Coefficient of discharge through open channel flow over a Notches.
8. To determine the different types of flow patterns by Reynolds's experiment.

Major Equipment's and Machines available:

1. Manometers
2. Metacentric height apparatus
3. Bernoulli apparatus
4. Pitot tube
5. Orifice meter
6. Venturimeter
7. Notches
8. Reynold's apparatus

List of open learning website:

1. https://onlinecourses.nptel.ac.in/noc19_ce28/preview