SARVAJANIK UNIVERSITY

Sarvajanik College of Engineering and Technology

Bachelor of Technology

Mechanical Engineering Department

B. Tech. Semester V

Course Name: **Fluid Mechanics** **Course Code: BTME15504**

Type of course: **Open Elective Course**

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.	8	18%
2.	**Pressures and Head:** Fluid pressure at a point, types of pressure, Pascal's law of pressure at a point, pressure and head, the hydrostatic paradox, pressure measurements using simple manometers and differential manometers.	8	18%

Sr. No.	Topics	Teaching Hrs.	Module Weightage
3.	**Static Forces on Surface and Buoyancy:** Fluid static, total pressure and center of pressure, vertical 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.	**8**	**18%**
4.	**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; classification of notches, discharge over a rectangular notch, discharge over a triangular notch, discharge over a trapezoidal notch.	**8**	**18%**
5.	**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.	**7**	**16%**
6.	**Viscous and Turbulent Flow:** Introduction, flow of viscous fluid through circular pipe and between two parallel plates, Reynolds experiment, frictional loss in pipe flow.	**6**	**12%**

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**
10	**15**	**25**	**25**	**20**	**5**

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.	Engineering Fluid Mechanics	K.L. Kumar	S. Chand Publications	2016	-
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

SARVAJANIK UNIVERSITY

Sarvajanik College of Engineering and Technology

Bachelor of Technology

Mapping of (CO's) with Program Outcomes (PO's) and Program Specific Outcome (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			
CO-2	2	1	0	1	1	0	0	0	2	0	1	1			
CO-3	2	1	0	0	1	0	0	0	2	0	1	1			
CO-4	1	1	0	0	1	0	0	0	1	0	0	0			
CO-5	3	3	0	3	1	0	0	0	2	0	3	1			
Rationale*	**11**	**9**	**0**	**6**	**6**	**0**	**0**	**0**	**10**	**0**	**7**	**4**			

Rationale - Mapping of CO's with PO's and CO's with PSO's:

It will help to understand fundamentals of fluid properties and its applications in fluid operated machineries in industries.

This course highly maps with Program outcomes 1,2,4,5,9,11. it states that the course will develop Engineering knowledge, Problem analysis, Conduct investigations of complex problems, Modern tool usage, Individual and teamwork, Project management and finance.

List of Practical:

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:

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**