SARVAJANIK UNIVERSITY

Sarvajanik College of Engineering and Technology

Bachelor of Technology

Mechanical Engineering Department
B. Tech. Semester V

Course Name: **Fluid Power Engineering** **Course Code: BTME13503**
Type of course: **Professional Core Course**
Prerequisite: Fundamentals of Mechanical Engineering and Fluid Mechanics.
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.	**Impact of Jet:** Introduction, Force exerted on stationary plate held normal and inclined to jet, Force exerted on curved plate, force exerted on moving plate held normal and inclined in direction of moving jet, Force on a plate when vane is moving in direction of jet, jet striking on curved vane tangentially at one tip and leaving at other end, jet propulsion in ships.	**10**	**24%**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
2.	**Flow Through Pipes:** Major energy losses, Minor energy losses, Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Flow through nozzle at end of pipe, Water hammer in pipes.	8	18%
3.	**Hydraulic Turbines:** Introduction, Classification of turbines, Impulse and reaction turbines, construction, working and performance of Pelton, Francis and Kaplan Turbines, Draft tube, Governing of hydraulic turbines, Cavitation.	8	18%
4.	**Centrifugal Pumps:** Pump classification and selection criterion, Centrifugal pumps, Velocity vector diagrams, Pump losses and efficiencies, Net positive suction head, Pressure rise in impeller, Characteristic curves of centrifugal pumps, priming, maximum suction limit - minimum starting speed to deliver the discharge.	7	16%
5.	**Reciprocating Pumps:** Operation of Reciprocating pumps, discharge coefficient, volumetric efficiency, slip, work done and power required to drive reciprocating pumps, effect of air vessels, effect of friction on performance of reciprocating pump.	6	12%
6.	**Hydraulic Machines:** Construction and working of hydraulic press, Hydraulic accumulator, Hydraulic intensifier, Hydraulic crane, Hydraulic jack, hydraulic lift, Hydraulic ram, Fluid couplings.	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

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

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 1,2,4,10,11 and Program Specific Outcomes 1 and 3. It states that the course will develop engineering knowledge, problem analysis, conduct investigations of complex problems, communication, project management and finance and finally it will lead to convert conceptual knowledge of mechanical engineering to real life application and apply their technical, managerial and other soft skills in their professional life.

List of Practical:

1. To verify Impulse-momentum principle for impact of jet on stationary vane.
2. Performance test on Pelton turbine.
3. Performance test on Kaplan turbine.
4. Performance test on Francis turbine.
5. Performance test on Centrifugal pump.
6. To study hydraulic machines.

Major Equipment:

1. Impact of jet apparatus
2. Test rig of Pelton turbine
3. Test rig of Kaplan turbine
4. Test rig of Francis turbine
5. Test rig of Centrifugal pump

List of open learning website:

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