SWARNANDHRA
COLLEGE OF ENGINEERING&TECHNOLOGY
(AUTONOMUS)
Seetharamapuram, NARASAPUR – Pin: 534 280

DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Course Code	CourseTitle	Semester	Branches	Conduct Periods /Week	A.Y	Date of commencement of Semester
23ME4T02	FMHM	IV	Mechanical Engineering	5	2024-25	16-12-2024

S.N	COURSE OUTCOMES	BTKL
CO1	Describe the basic concepts of fluid properties.	K2
CO2	Apply the mechanics of fluids in static and dynamic conditions.	K3
CO3	ApplytheBoundarylayertheory,flowseparationanddimensionalanalysis.	K3
CO4	Apply the hydrodynamic forces of jet on vanes in different positions.	K3
CO5	Describe the working Principles and performance evaluation of hydraulic pump and turbines.	K2
CO6	Analyze the working Principles and performance evaluation of pumps	K4

UNIT	Out Comes/ BTKL	Topics No.	Topics/Activity	Text Book /Reference	Conduct Hour	Delivery Method
I	CO1. Describe the basic concepts of fluid properties. (K2)		**1. Fluid statics:**			Chalk, Talk, PPT
		1.1	Physical properties of fluids - specific gravity, viscosity and its significance	T_1& T_2	1	
		1.2	Surface tension, capillarity	T_1&W_1	2	
		1.3	vapor pressure. Atmospheric, gauge and vacuum pressure	T_1	1	
		1.4	Measurement of pressure – Manometers - Piezometer	T_1& R_1	1	
		1.5	U-tube, inverted and differential manometers	T_1& R_1	1	
		1.6	Pascal's & hydrostatic laws	T_2& R_2	1	
		1.7	Buoyancy and floatation: Meta center, stability of floating body, Submerged bodies	T_2& R_2	1	
		1.8	Calculation of meta center height. Stability analysis and applications.	T1	2	
			Total		**10**	

			2. Fluid Kinematics, Fluid dynamics, Closed conduit flow			
II	CO2. Apply the mechanics of fluids in static and dynamic conditions. (K3)	2.1	**Fluid Kinematics:** Introduction, flow types.	T_1 & T_2	1	Chalk, Talk& PPT
		2.2	Equation of continuity for one dimensional flow,	T_1 & R_1	1	
		2.3	Circulation and vorticity	T_1 & R_1	1	
		2.4	Stream line, path line and streak lines and stream tube	T_1 & R_1	1	
		2.5	Stream function and velocity potential function, differences and relation between them	T_1 & T_3	1	
		2.6	Condition for irrotational flow, flownet, source and sink, double and vortex flow.	T_1 & T_2	1	
		2.7	**Fluid dynamics:** surface and body forces – Euler's equations	T_1 & R_1	2	
		2.8	Bernoulli's equations, momentum equation	T_1 & R_1	1	
		2.9	Applications, force on pipe bend	T_1 & R_1	1	
		2.10	**Closed conduit flow:** Reynold's experiment-Darcy Weisbach equation	T_1 & R_1	1	
		2.11	Minor losses in pipes		2	
		2.12	pipes in series and pipes in parallel		1	
		2.13	total energy line hydraulic gradient line	T_1 & R_1	1	
			Total		**15**	

			3. Boundary Layer Theory, Dimensional Analysis			
III	CO3. ApplytheBoundarylayertheory,flowseparationan ddimensionalanalysis (K3)	3.1	**Boundary Layer Theory:** Introduction, momentum integral equation	T_1 & T_2	1	Chalk, Talk& PPT
		3.2	displacement, momentum and energy thickness	T_1 & R_1	2	
		3.3	separation of boundary layer, control of flow separation	T_1 & R_1	1	
		3.4	Stream lined body, Bluff body and its applications	T_1 & R_1	2	
		3.5	basic concepts of velocity profiles	T_1 & T_3	1	
		3.6	**Dimensional Analysis:** Dimensions and Units, Dimensional Homogeneity	T_1 & T_3	1	
		3.7	Non dimensionalization of equations	T_1 & T_2	2	
		3.8	Method of repeating variables	T_1 & R_1	1	
		3.9	Buckingham Pi Theorem	T_1 & R_1	1	

Total	12

			4. Basics of turbo machinery, Hydraulic Turbines			
IV	CO4. Apply the hydrodynamic forces of jet on vanes in different positions. [K3]	4.1	**Basics of turbo machinery**:hydrodynamic force of jets on stationary flat, inclined, and curved vanes	T_1 & T_2	2	Chalk, Talk, &PPT, Experimental.
		4.2	hydrodynamic force of jets on moving flat, inclined, and curved vanes, jet striking centrally and at tip	T_1 & T_2	2	
		4.3	Velocity diagrams, work done and efficiency, flow over radial vanes.	T_1 & T_2	2	
		4.4	**Hydraulic Turbines**: classification of turbines, impulse and reaction turbines	T_2 & R_1	2	
		4.5	Pelton wheel -working proportions, work done, efficiencies, hydraulic design	T_1 & R_1	2	
		4.6	Francis turbine -working proportions, work done, efficiencies, hydraulic design	T_1 & R_1	2	
		4.7	Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube-theory-functions and efficiency.	T_1 & R_1	2	
				Total	12	
V	CO5: Describe the working Principles and performance evaluation of hydraulic pump and turbines. (K2), CO6:Analyze the working Principles and performance evaluation of pumps		5. Performance of hydraulic turbines, Centrifugal pumps, Reciprocating pumps			
		5.1	**Performance of hydraulic turbines:** Geometric similarity, Unit and specific quantities	T_1 & T_2	1	Chalk, Talk & PPT
		5.2	characteristic curves	T_1 & T_2	2	
		5.3	governing of turbines,	T_1 & T_2	2	
		5.4	selection of type of turbine, cavitation, surge tank, water hammer	T_1 & T_2	2	
		5.5	Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling.	T_1 & T_2	1	
		5.6	Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.	T_1 & T_2	2	
		5.7	**Centrifugal pumps**: classification, working	T_1 & T_2	1	
		5.8	work done – manometric head- losses and efficiencies-specific speed	T_1 & T_2	1	
		5.9	pumps in series and parallel-	T_1 & T_2	1	
		5.10	performance characteristic curves,	T_1 & T_2	1	
		5.11	Cavitation & NPSH.	T_1 & T_2	2	

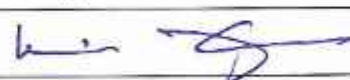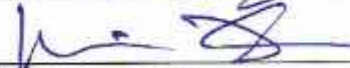|		5.12	**Reciprocating pumps**: Working, Discharge, slip		1	
		5.13	Indicator diagrams		1	
			Total		**18**	
			Cumulative Proposed Periods		**67**	

Text Books:

S.No	Authors, Book Title, Edition, Publisher, Year of Publication
T1	P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House. 2019
T2	K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Books:

S.No.	Authors, Book Title, Edition, Publisher, Year of Publication
R1	R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
R2	Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, UniversitiesPress Pvt Ltd, Hyderabad. 3rd Edition 2009.
R3	Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition ,2022.
Web-ref	1. https://archive.nptel.ac.in/courses/112/105/112105269/ 2. https://nptel.ac.in/courses/112104118 3. NPTEL :: Mechanical Engineering - NOC:Introduction to Fluid Mechanics 4. https://nptel.ac.in/courses/105103192

S.NO.	Details	Name	Signature with Date
i.	Faculty	Dr. R. Lalitha Narayana	
ii.	Course Coordinator	Dr. R. Lalitha Narayana	
iii.	Module Coordinator	Dr. R. Lalitha Narayana	
iv.	Program Coordinator	Dr. Francis Luther King	

Principal