SCHEME OF COURSE WORK

Course Details:

Course Title	**:** Fluid Mechanics and Hydraulic Machines		
Course Code	**: 13CE1157**	**L T P C**	**: 4 0 0 3**
Program:	**: B. Tech.**		
Specialization:	**: Electrical and Electronics Engineering**		
Semester	**: III**		
Prerequisites	**: Nil**		
Courses to which it is a prerequisite	**: Power Generation Engineering**		

Course Outcomes (COs):

At the end of the course, the student will be able to:

1	Understand various fluid properties in the fluid problems and various types of fluid flows
2	Analyze the 2-D fluid flow motion and differentiate turbulent and laminar fluid flows and also understand the laws of fluid friction
3	Determine the required hydro power for a given catchment and determine the hydrodynamic forces exerted by the fluid jet on various surfaces and calculate the work done
4	Describe the functioning of various turbines and do the hydraulic design of the turbines and analyze the performance of various turbines under different operating conditions and understand governing of turbines
5	Describe and determine the performance of pumps under different operating conditions

Program Outcomes (POs):

The graduate of Electrical and Electronics Engineering will be able to:

1	Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.
2	Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communications Technology.
3	Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.
4	Design and conduct experiments, analyze and interpret experimental data for performance analysis.
5	Apply appropriate simulation tools for modeling and evaluation of electrical systems.
6	Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.
7	Demonstrate electrical engineering principles for creating solutions for sustainable development.
8	Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.
9	Develop leadership skills and work effectively in a team to achieve project objectives.
10	Communicate effectively in both verbal and written form.
11	Understand the principles of management and finance to manage project in multidisciplinary environments.
12	Pursue life-long learning as a means of enhancing the knowledge and skills.

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	M			M								S
CO-2	M			S								M
CO-3	M		M	S					M			S
CO-4	M		M	S	M				M			S
CO-5	M		M	S	M				M			M

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*

Assessment Methods:	Assignment / Seminar / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week No.	TOPIC / CONTENTS	Course Outcomes	**Sample questions**	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Physical properties of fluids specific gravity, viscosity, surface tension, vapor Pressure and their influences on fluid motion, pressure at a point,	CO-1	Discuss various physical properties of fluids.	Lecture Problem solving	
2	Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers.	CO-1	Define Hydrostatic law. Explain various types of pressure gauges and manometers.	Lecture Problem solving	
3	Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, nonuniform, laminar, turbulent, rotational and irrotational flows, Equation of continuity, Flow visualization	CO-1	Write about classification of flows. Define streamline,streak line, path line.	Lecture Problem solving	
4	Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line	CO-1	Problems on Bernoulli's equation	Lecture Problem solving	Assignment
5	Momentum equation and its application – forces on pipe bend.	CO-2	Problems on Momentum equation	Lecture Problem solving	
6	Reynold's experiment, Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel, Total energy line and hydraulic gradient line.	CO-2	Describe the Reynold's experiment.	Lecture Problem solving	
7	Measurement of flow- Pitot tube, Venturi meter and orifice meter	CO- 2	Deduce the expression for discharge of Orifice meter	Lecture Problem solving	
8	types – concept of pumped storage plants – storage requirements, mass curve, estimation of storage capacity for a uniform demand, estimation of power developed from a given catchment area, heads and efficiencies.	CO-3	Explain the various types of hydel plants.	Lecture	

9	**MID TEST - I**				
10	Hydrodynamic force of jets on stationary and moving flat and inclined and curved vanes	CO-3	Problems on inclined and curved vanes.	Lecture Problem solving	
11	Jet strikes centrally and at the tip. Velocity triangles at inlet and outlet.Expression for work done and efficiency – angular momentum principle, applications to radial flow turbines.	CO-3	Problems on Impact of jet.	Lecture Problem solving	
12	Layout of typical hydro power installation – heads and efficiency – classification of turbines – principle of working, working proportions, velocity diagrams, work done and efficiency, hydraulic design-Pelton wheel.	CO-4	Working principle of Pelton wheel with neat sketch	Lecture Problem solving	
13	Francis turbine Kaplan turbine – principle of working, working proportions, velocity diagrams, work done and efficiency, hydraulic design.	CO-4	Problems on Francis turbine	Lecture Problem solving	
14	Draft tube-Unit quantities – performance under unit head – Governing of turbines - specific speed – performance characteristics – cavitation-surge tank.	CO-4	Explain the governing of impulse turbine.	Lecture Problem solving	
15	Pump installation details – classification – work done – manometric head -Minimum starting speed – losses and efficiencies – specific speed.	CO-5	Explain the classification of pumps. Explain the losses and efficiencies in pumps.	Lecture Problem solving	
16	Multistage pumps – pumps in series and parallel – performance of the pump – characteristics curves – NPSH – cavitation.	CO-5	Explain about Pumps in series and parallel	Lecture Problem solving	Assignment
17	Working of reciprocating pumps, discharge, slip, percentage slip.	CO-5	Explain the working of reciprocating pump.	Lecture Problem solving	
18	**MID TEST - II**				
	END EXAM				