



VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY

LESSON PLAN

Semester >>6th		Year >> 2015	Contact Hours per week >> 4
Fluid Dynamics and Hydraulic Machines (BME 315)		Branch >> MECHANICAL ENGINEERING	Total Credit >> 4
Course Instructor		A Mohanty	
Period		Jan 2015-April 2015	
Recommended books >>		<i>Text Book:</i> 1.Introduction to Fluid Mechanics and Fluid Machines by S K Som and G Biswas, TMH <i>Reference Book:</i> 1.Introduction to Fluid Mechanics by Fox and McDonald;Willey 2.Fluid Mechanics by FM White,McGrawhill	
Sl. No.	Lecture No.	Topics to be covered	
MODULE -I			
1	Lecture-01	Dimensional Analysis and Model Testing: Motivation, Nature of Dimensional analysis, Principle of Dimensional Homogeneity, Choice of variables and scaling parameters.	
2	Lecture-02	Raleigh's Method and Buckingham Pi theorem, Problem Solving	
3	Lecture-03	Important Dimensionless groups in fluid mechanics, Similarity Laws:Geometric,Kinematic and Dynamic similarity	
4	Lecture-04	Incomplete similarity, Examples and problem solving	
5	Lecture-05	Boundary Layers: Motivation, Boundary Layer concept ,Reynolds no and Geometry effects	
6	Lecture-06	Displacement thickness, Introduction of Momentum thickness and Energy thickness using Integral estimates.	
7	Lecture-07	Boundary layer assumptions, Derivation for Two Dimensional Boundary layer flow with scale analysis	
8	Lecture-08	Laminar and turbulent flow over flat plate	
9	Lecture-09	Pressure gradients in boundary layer flow, flow separation and its control	
10	Lecture-10	Problem solving	
MODULE -II			
11	Lecture-11	Drag and Lift : Motivation, Defining Drag and Lift of Immersed bodies, Friction and Pressure Drag	
12	Lecture-12	Introduction to potential flow, Elementary plane flows and its superposition	
13	Lecture-13	Drag and lift on a cylinder for irrotational flow without circulation(superposition of a uniform flow and a doublet); Comparison with viscous flow (obtained from experiment)	

14	Lecture-14	Drag and Lift on a cylinder for irrotational flow with circulation(superposition of a uniform flow, a doublet and a clockwise free vortex),Magnus effect
15	Lecture-15	Problem solving
16	Lecture-16	Drag over flat plate, Local and Average Drag coefficients
17	Lecture-17	Drag Characteristics of Sphere, Lift on Aerofoil, Stalling of Aerofoil
18	Lecture-18	Problem solving
MODULE-III		
19	Lecture-19	Hydraulic Turbines: Motivation, Classifications of fluid Machines, Basic Equation of Energy Transfer in Rotodynamic Machines
20	Lecture-20	Principle of Similarity and Dimensional Analysis in Rotodynamic Machines,Specific speed as a design input parameter.
21	Lecture-21	Schematic of Pelton Turbine, Analysis of force on the bucket and power generation, Blade efficiency, Mechanical and overall Efficiency
22	Lecture-22	Specific speed and wheel geometry,Governing of Pelton turbine
23	Lecture-23	Problem solving
24	Lecture-24	Schematic of a Reaction turbine, Net Head across a reaction turbine and purpose of providing a draft tube, Different types of Draft Tubes
25	Lecture-25	Runner of Francis turbine, Blade efficiency, power developed for a Francis Turbine
26	Lecture-26	Problem Solving
27	Lecture-27	Schematic of Axial flow reaction turbines(Kaplan and Propeller),Runner of Axial Turbines, Cavitation in Reaction Turbines
28	Lecture-28	Performance characteristics of Reaction Turbines, Governing of Reaction Turbines
29	Lecture-29	Problem Solving
MODULE-IV		
30	Lecture-30	Centrifugal Pump: General Pumping system, Different parts of a centrifugal Pump, Net head developed by a Pump
31	Lecture-31	Velocity Triangle, Work done on the Fluid, Manometric efficiency, Mechanical and Overall Efficiency
32	Lecture-32	Slip and velocity Distribution on the Impeller Blade of a centrifugal Pump, Losses in a centrifugal Pump, Characteristics of a centrifugal Pump
33	Lecture -33	Effect of Blade outlet angle, Flow through Volute Chambers, Vanned Diffuser, Cavitation in a Centrifugal Pump
34	Lecture -34	Problem Solving
35	Lecture -35	Reciprocating Pump: Schematic of Reciprocating Pump, Pressure Displacement Diagram, Analytical expression for accelerating Heads during Suction and Delivery strokes
36	Lecture -36	Rate of Delivery in single acting and Double acting Systems, Work Done,Use of Air Vessel, Flow Separation
37	Lecture -37	Problem Solving
38	Lecture -38	Miscellaneous Machines: Schematic and Working Principles of Hydraulic Intensifier and Ram, Ram efficiency
39	Lecture - 39	Schematic and Working Principles of Hydraulic Coupling and Press.
40	Lecture - 40	Schematic and Working Principles of Accumulator and Air Injection Pump
41	Lecture - 41	Problem Solving