TEACHING PLAN FOR THEORY

Subject Teacher: Mr. R.T. Jyoti

Subject: Fluid Mechanics-I	**Class: S.E.(A)**	**Branch: Civil**	**Year 2017-2018**
Lecture No	**Scheduled Date**	**Topics to be covered on the scheduled date**	
1		Syllabus Discussion, Discussion on course objective & course outcome	
Unit-1: Properties of Fluids & Dimensional Analysis (08 Hrs)			
2		Definition of fluid and fluid mechanics: examples and practical applications involving fluids at rest and in motion, physical properties of fluids: density, specific weight, specific Volume.	
3		Relative density and viscosity. Newton's law of viscosity, classification of fluids, Rheological diagram.	
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5		Capillarity, vapour pressure, problems involving use of above fluid properties.	
6		Dimensions of physical quantities, dimensional homogeneity	
7		Dimensional analysis using Buckingham's π theorem method, geometric kinematic and dynamic similarity,	
8		Important dimensionless parameters (Reynolds No., Froude No., Euler No., Mach no. and Weber No) and their significance ,	
9		Model Laws (Froude's Law and Reynolds law)	
10		Problems.	
Unit-II: Fluid Statics, Buoyancy			
11		The basic equation of hydrostatics, concept of pressure head,	

12		measurement of pressure (absolute, gauge), application of the basic equation of hydrostatics, Pressure measuring devices
13		simple manometers, differential manometers: U tube, inclined, Mechanical gauges and precision manometers, pressure transducers and their types),
14		Centre of pressure, total pressure on plane and curved surfaces, practical applications.
15		Principle of floatation and buoyancy,
16		equilibrium of floating and submerged bodies,
17		Stability of floating and submerged bodies.
18		Metacentre and metacentric height and its determination (experimental& analytical methods).
Unit III : Fluid Kinematics		
19		Methods of describing the motion of fluid, velocity and acceleration,
20		Components in Cartesian co-ordinates, stream line, stream tube, path line, and streak line,
21		Control volume. Classification of flow: steady and unsteady; uniform and non-uniform; laminar and turbulent; One, two, and three-dimensional flows; compressible and
22		Incompressible; rotational and irrotational; critical, sub critical and supercritical flows.
23		Equation of continuity for three dimensional flow in Cartesian co-ordinates,
24		equation of continuity for one-dimensional flow along a streamline, types of motion, rotational
25		irrotational motion, velocity potential, stream function

26		flow net, methods of drawing flow net (graphical and electrical analogy), uses and limitations of flow net.
UNIT IV: Fluid dynamics, Bernoulli's equation		
27		Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration,
28		assumptions of Bernoulli's equation, Modified Bernoulli's equation, its applications and limitations,
29		Hydraulic grade line and total energy line. Linear momentum equation
30		kinetic energy correction factor, momentum correction factor (Only information).
31		Venturimeter, Orifice and orifice meter
32		Rotameter, Flow through sharp edged circular orifice discharging free,
33		Hydraulic coefficients for orifice,
34		Pitot tube, Problems.
UNIT V: Laminar flow & boundary layer theory		
35		Reynolds experiment, laminar flow through a circular pipe, flow between two fixed parallel plates: Couette flow (only introduction),
36		methods of measurement of viscosity (Newton's Law of Viscosity: Rotating cylinder viscometer:,
37		Stokes' law: Falling sphere viscometer, Hagen Poiseuille Equation :
38		Redwood Viscometer), Darcy's law, Transition from laminar to turbulent flow.
39		Concept of boundary layer, development of boundary layer on a flat plate,
40		nominal, displacement, momentum, energy thicknesses, laminar, transitional and turbulent boundary layer,

41		laminar sub layer, Local and mean drag coefficients, hydrodynamically smooth and rough boundaries
42		Boundary Layer separation and its control.
Unit VI : Turbulent flow & Flow through Pipes		
43		Characteristics of flow,
44		instantaneous velocity, temporal mean velocity
45		scale of turbulence and intensity of turbulence
46		Prandtl's mixing length theory
47		Flow through pipes: energy losses in pipe flow (major losses and minor losses),
48		Darcy Weisbach Equation, variation of friction factor for laminar flow and for turbulent flow,
49		Nikuradse's experiments on artificially roughened pipes, resistance to flow in smooth and rough pipes, friction factor for commercial pipes, Moody's diagram,
50		flow through pipes such as simple, compound, series parallel, Dupits equations, branched pipes, Three reservoir and pipe net work analysis: only theory, flow through siphon.