No.	Information on Fluid Mechanics I	
1.	Unit Name: Fluid Mechanics I	
2.	Code: CE-31016	
3.	Classification: Engineering Subject	
4.	Credit Hour: 3	
5.	Semester and year Taught: 1/3	
6.	Pre-requisite (if any): None	
7.	Method of Delivery: Lecture, Tutorial and Practical	
8.	Assessment System and Breakdown of Marks	
	Practical	20%
	Tutorial	10%
	Final Examination	70%
	Total	100%
9.	Academic Staff Teaching Unit:	
10.	Objective of Unit: The main aim of this subject is to understand the properties and behavior of fluids in both static and motion conditions and apply the principles of fluid mechanics in engineering applications.	
11.	Learning Outcomes of Unit At the end of the unit, a student shall be able to: (a) Define the fluids and their properties and demonstrate motion of fluid particles and streams. (b) Apply Momentum, Energy, Continuity, Darcy and Bernoulli's equation, conservation of mass and energy and Newton's Second law of motion to the contents of a finite control volume, Buckingham pi theorem and the concepts of modeling and similitude to develop prediction equations. (c) Calculate and determine fluid pressure and force, discharge, velocity, pressure head and power losses and efficiency due to friction, dimensional analysis, similitude, and modeling	
12.	Synopsis: The unit is intended to understand Fluid properties, Fluid statics and to calculate Control volume analysis, Continuity, momentum and energy equations, Dimensional analysis and similitude, Flow in pipes and conduits.	

13.	**Topic 1. Fluids and their Properties** Fluids Shear stress in a moving fluid Differences between solids and fluids Newtonian and non-Newtonian fluids Liquids and gases Density Viscosity Surface tension Capillarity Cavitation
	Topic 2. Static Forces on Surfaces. Buoyancy Action of fluid pressure on a surface Resultant force and centre of pressure on a plane surface under uniform pressure Resultant force and centre of pressure on a plane surface immersed in a liquid Pressure diagrams Force on a curved surface due to hydrostatic pressure Buoyancy Equilibrium of floating bodies Stability of a submerged body Stability of floating bodies Determination of the position of the metacentre relative to the centre of buoyancy Stability of a vessel carrying liquid in tanks with a free surface
	Topic 3. Motion of Fluid Particles and Streams Fluid flow Uniform flow and steady flow Compressible and incompressible flow One-, two- and three-dimensional flow Motion of a fluid particle Laminar and turbulent flow Discharge and mean velocity Continuity of flow
	Topic 4. The Momentum Equation and its Applications Momentum and fluid flow Momentum equation for two- and three-dimensional flow along a streamline Force exerted by a jet striking a flat plate Force due to the deflection of a jet by a curved vane Force exerted when a jet is deflected by a moving curved vane Force exerted on pipe bends and closed conduits Reaction of a jet

	Topic 5. The Energy Equation and its Applications Mechanical energy of a flowing fluid Steady flow energy equation Kinetic energy correction factor Applications of the steady flow energy equation Representation of energy changes in a fluid system The Pitot tube Principle of the venturi meter Theory of small orifices discharging to atmosphere Theory of large orifices Elementary theory of notches and weirs The power of a stream of fluid Vortex motion
	Topic 6. Steady Incompressible Flow in Pipe and Duct Systems General approach Incompressible flow through ducts and pipes Incompressible flow through pipes in parallel Incompressible steady flow in duct networks Resistance coefficients for pipelines in series and in parallel The quantity balance method for pipe networks
	Topic 7. Finite Control Volume Analysis Conservation of Mass-The Continuity Equation Newton's Second Law-The Linear Momentum and Moment of-Momentum Equations First Law of Thermodynamics-The Energy Equation Second Law of Thermodynamics-Irreversible Flow
	Topic 8. Dimensional Analysis, Similitude, And Modeling Dimensional Analysis Buckingham Pi Theorem Determination of Pi Terms Common Dimensionless Groups in Fluid Mechanics Correlation of Experimental Data, Modeling and Similitude Some Typical Model Studies Similitude Based on Governing Differential Equations

14.	Main References: 1.John F.Douglas, Janusz M. Gasiorek, John A. Swaffield, Lynne B. Jack. Fluid Mechanics. (5^{th} edition) 2.Muson .Young.Okiishi.Huebsch, Fundamentals of Fluid Mechanics (6^{th} edition)
15.	Additional Reference: 1.R.S.Khurmi, A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines SI Units. (19^{th} edition)

Information on Lab Practical (Fluid Mechanics I)

Lab	Activity
M1	Topic: Fluid Properties Task: To calculate density of mass, to study the effect of capillary elevation between flat sheets and to study and measurement of the effect of capillary elevation inside capillary tubes Resources: Mechanical scale, displacement vessel, bucket and cylinder; Parallel sheet capillary module; Capillary tubes module
M2	Topic: Hydrostatic Pressure Task: To calculate center of pressure and equivalent force at $\alpha = 90^{o}$; $\alpha > 90^{o}$ & $\alpha < 90^{o}$ (Flat surface partially and totally submerged) Resources: Water tank, tray with weight, balance bridge, mobile counterweight, quadrant, adjustable lids
M3	Topic: Horizontal Osborne-Reynolds Demonstration Task: To determine visually the conditions which differential regimes Resources: Hydraulic bench, FME 31(Horizontal Osborne-Reynolds Demonstration), Coloring matter, Chronometer or Stopwatch

No.	Information on Fluid Mechanics II	
1.	Unit Name: Fluid Mechanics II	
2.	Code: CE-32016	
3.	Classification: Engineering Subject	
4.	Credit Hour: 3	
5.	Semester and year Taught: 2/3	
6.	Pre-requisite (if any): None	
7.	Method of Delivery: Lecture and Practical	
8.	Assessment System and Breakdown of Marks	
	Practical	20%
	Tutorial	10%
	Final Examination	70%
	Total	100%
9.	Academic Staff Teaching Unit:	
10.	Objective of Unit: The main aim of this subject is to understand the theories concerned with fluids, steady incompressible flow conditions through pipes in parallel or series, pressure head, losses of head in pipes, performance of turbines & pumps and apply the theory of fluid mechanics in engineering applications.	
11.	Learning Outcome of Unit At the end of the unit, a student shall be able to: 1. Explain and apply Darcy's and Chezy's formula, Momentum and Bernoulli's equation for loss of head in pipes, Characteristics, Significance and Specific of Turbines and Pumps, Theory of Machines. 2. Calculate and determine Pressure head and losses of head in pipes, Discharge, Velocity, Power, Efficiency and Speed for Turbines, Pumps and Machines.	
12.	Synopsis: The unit is intended to understand and apply Fluid measurements, Power transmission through pipe lines, Theory of hydraulic machines, pumps and turbines, Pump characteristics and selection.	

13.	**Topic 1. Steady Incompressible Flow in Pipe and Duct Systems** General approach Incompressible flow through ducts and pipes Incompressible flow through pipes in parallel Incompressible steady flow in duct networks Resistance coefficients for pipelines in series and in parallel The quantity balance method for pipe networks
	Topic 2. Fluid Pressure and its Measurement Introduction Pressure head Measurement of fluid pressure Tube gauges to measure fluid pressure Piezometer tube Manometer Simple manometer Micromanometer Differential manometer Inverted differential manometer Mechanical gauges Bourdon's tube pressure gauge Diaphragm pressure gauge Dead weight pressure gauge
	Topic 3. Flow Through Simple Pipes Introduction Loss of head in pipes Darcy's formula for loss of head in pipes Chezy's formula for loss of head in pipes Hydraulic gradient line Total energy line Transmission of power through pipes
	Topic 4. Performance of Turbines Introduction Characteristics of turbines Unit power Unit speed Unit discharge Significance of unit power, unit speed, unit discharge Specific speed of a turbine Selection of turbines Selection based on specific speed Selection based on head of water

	Topic 5. Performance of Pumps Introduction Variation in Speed and Diameter of a Centrifugal Pump Effect of Variation in Speed Effect of Variation in Diameter Specific Speed of a Centrifugal Pump Selection of Centrifugal Pumps Based on Specific Speed Suction Head Vapour Pressure Net Positive Suction Head (NPSH)
	Topic 6. Theory of Hydraulic Machine Impact of free jets Hydraulic Turbines Governing and Performance of Hydraulic Turbines Reciprocating Pumps Centrifugal Pumps Miscellaneous Hydraulic Devices and Machines
14.	Main References: 1. R.S.Khurmi , A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines SI Units . (19^{th} edition)
15.	Additional Reference: 1. John F. Douglas, Janusz M. Gasiorek, John A. Swaffield, Lynne B. Jack. Fluid Mechanics. (5^{th} edition) 2. Dr. K. R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines. (9^{th} edition)

Information on Lab Practical (Fluid Mechanics II)

Lab	Activity
M1	Topic: Basic Pipe Network Task: To study of the load losses in PVC pipes of 25mm diameter made of the same material and load losses in methacrylate pipe Resources: Pipe network equipment FME 23, Hydraulic bench, stop watch
M2	Topic: Energy Losses in Bends Task: To measure of the load losses for a short elbow of 90° and a middle elbow of 90° Resources: FME 05 Energy Losses in Bends, Chronometer
M3	Topic: Francis Turbine Task: To determine the operating features of the Francis Turbine Resources: Regulating device distributor, Braking system, Draft tube, Manometer, Tachometer, Hydraulic bench
M4	Topic: Impact of Jet Task: To determine impact against a flat surface, curve surface, semi-spherical Surface Resources: Water Jet apparatus, Hydraulic bench