

4 <sup>th</sup> Semester	RAU4C003	Fluid Mechanics and Hydraulic Machines	L-T-P 3-0-0	3 CREDITS
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**MODULE- I (12 hrs)**

**Introduction:** Scope of fluid mechanics and its development as a science Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

**Fluid statics:** Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer. Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

**MODULE - II (07 hrs)**

**Fluid kinematics:** Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net.

**MODULE - III (10 hrs)**

**Fluid dynamics:** Introduction to N-S equation and non-dimensional number, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube. Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

**Module- IV (9 hrs)**

**Impact of Jets:** Flat, inclined and curved plates with stationary and moving case.

**Hydraulic turbines:** Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine. Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.

**Reaction Turbines:** Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation.

**MODULE-V (07 hrs)**

**Centrifugal Pump:** constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation. Positive displacement pumps: Reciprocating Pump, working principle, Discharge, work done and power requirement, Slip, Indicator diagram.

**Books :**

- Fluid Mechanics, Y A Cengel, TMH
- Fluid Mechanics and Hydraulic Machines, Modi & Seth
- Introduction to Fluid Mechanics and Fluid Machines, S.K.Som and G. Biswas, TMH

B.Tech (Automobile Engineering) Syllabus from Admission Batch 2018-19 *4<sup>th</sup> Semester*

- Fluid Mechanics and Machinery, Mohd. Kareem Khan, OXFORD
- Introduction to Fluid Mechanics, Fox, McDonald, Willey Publications
- Fluid Mechanics and Fluid Machines by A.K.Jain, Khanna Publishers
- Fluid Mechanics and Machinery, CSP Ojha and P.N. Chandramouli, Oxford University Press
- Fluid Mechanics by Kundu, Elsevier
- An Introduction to Fluid Dynamics, G.K.Batchelor, Cambridge University Press
- Engineering Fluid Mechanics by Garde et. al., Scitech
- First course in Fluid Mechanics by Narasimhan, University press
- Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson Education
- Fluid Mechanics and Machines, SukumarPati, TMH