GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (I.C.Engine & Automobile)

Subject Name Fluid Mechanics & Gas Dynamics

Sr.No	Course content
1.	Review of fundamentals; types of flow; Generalized continuity equation; momentum and energy equations, Euler and Navier-Stokes equations, integration of the momentum equation; the generalized Bernoulli's equation; velocity of sound and its importance; physical difference between incompressible, subsonic and supersonic flows; three reference speeds; dimensionless velocity; concepts of static and stagnation parameters.
2.	Two dimensional flow in rectangular and polar coordinates; stream function; irrotationality and the velocity potential function; vorticity and circulation; plane potential flow and the complex potential function; Sources, sinks, doublets and vortices; flow around corners; Rankine ovals; flow around circular cylinders with the without circulation; pressure distribution on the surface of these bodies; aerofoils theory; Joukowski transformation; circular arc, symmetrical aerofoil theory; Joukowski aerofoils; Joukowski hypothesis; drag, and lift forces.
3.	Flow in constant area duct; friction-governing equations; choking due to friction, performance of long ducts; isothermal flow in long ducts; Flow in constant area duct with heating and cooling; Normal shocks-Introductory remarks; governing equations; Rankine- Hugonout; Prandtl and other relations; weak shocks; thickness of shocks; normal shocks in ducts; performance of convergent-divergent nozzle with shocks; moving shock waves; shocks problems in one dimensional supersonics diffuser; supersonic pilot tube.
4.	Dimensional analysis and similitude: Buckingham π theorem; Van driest theorem; dimensional analysis; model study; compressible flow of viscous fluids.

List of Experiments:

1. To study calibration characteristics of Rotameter.
2. Study of flow passing through Shocks.
3. Performance and testing of orifice plate, nozzle and Venturimeter.
4. To study different types of Wind tunnel.
5. To study the effect of angle of attack on Lift and Drag force.
6. To study the loss of energy in wake region behind the aerofoil in the wind tunnel.
7. To study the loss of energy in wake region behind various models (car, jeep, bus etc.) in the wind tunnel.
8. To draw profile of NASA Aerofoils.

Reference Books:

1. Advanced Fluid Mechanics, Raudkiri & Callander Edward Ronald
2. Fundamentals of Mechanics, Currie McGraw Hill of Fluids
3. Fluid Mechanics, Landau & Lifshitz Addition Wesley
4. Fluid Mechanics, Som & Biswas Tata McGraw Hyde antic Machinery
5. Gas dynamics, Ali Campbell & lennings.
6. Gas dynamics, Radha Krishnan , PHI
7. Fundamentals of compressible flow, S.M. Yahya, New Age Pub
8. The Phenomena of Fluid, Brodkey Addition Wesley Motion
9. Foundation of Fluid, Yuan Prentice Hall Mechanics