

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V

MECHANICAL ENGINEERING

Subject Name: **Fluid Power Engineering**

Subject Code: **151903**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
3	0	2	5	70	30	50

Sr. No.	Course content
1.	Flow Through Pipes: Darcy-Weisbach formula, Major energy losses, Minor energy losses, Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Flow through nozzle at end of pipe, Water hammer in pipes.
2.	Impact of Jet : Introduction, Force exerted on stationary plate held normal and inclined to jet, Force exerted on curved plate, Force exerted on moving plate held normal and inclined in direction of moving jet, Force exerted on curved plate when vane is moving in direction of jet, Jet striking on curved vane tangentially at one tip and leaving at other end, Jet propulsion in ships.
3.	Hydraulic Turbines: General Lay out and essential components of hydro power plant, Classification of turbines, Impulse and reaction, Radial and axial, Tangential and mixed flow turbines, major components of different turbines, Expressions for work done and efficiency of Pelton wheel, Design aspects of Pelton wheel, Reaction Turbine, Francis turbine, Kaplan turbine and propeller turbines, Expressions for work done and efficiency, Draft tube-theory and types, model relationship scale effect, Specific speed, Range of specific speed for different turbines, performance curves of turbine, Selection of turbines according to available head, Discharge and load, governing of turbines.
4.	Pumps: Roto-dynamic pumps, Centrifugal pumps and axial flow pumps, Constructional features and working theory, Pressure rise through impeller, Characteristic curves of centrifugal pumps, priming, maximum suction limit - minimum starting speed to deliver the discharge, Multistage pumps, cavitation, pump selection, Reciprocating pumps, Discharge work done and power required to drive reciprocating pumps, Indicator Diagram, air vessels, Testing of pumps as per BIS. Submersible pumps, Deep well pumps, ejector pump, Mud pump, Chemical pumps.
5.	Compressors: Reciprocating compressors: Construction and working, Multistage conditions for minimum work, Intercooling, Heat rejected in compressors and intercoolers, Efficiency and control of air compressors, Reciprocating air motors, Testing of compressors

	<p>Rotary Compressors: Introduction, Classification, roots blower, Vane type, Screw compressor, Scroll compressor, centrifugal and axial flow compressors.</p> <p>Centrifugal Compressor : Construction and Operation, Ideal energy transfer (Euler's work) velocity diagram, Isentropic efficiency, Static and total temperatures, Power input factor, Slip and slip factor, Pressure coefficient, Pre-whirl, Effect of blade shape on performance, Losses in centrifugal compressors, blade angles, Impeller diameter, Impeller width, Surging and choking.</p> <p>Axial Flow Compressors : Introduction, Construction and operation, Velocity diagram and work done factor, Pressure ratio and static pressure rise, Degree of reaction, Choice of reaction, Blade loading and flow coefficient, Aerofoil blading, Drag and lift co-efficients, stall, Stalling, Radial equilibrium theory, Free vortex, forced vortex, Characteristics of curves of centrifugal and axial flow compressors.</p>
6.	<p>Miscellaneous Machines: Construction and working of hydraulic press, Hydraulic accumulator, Hydraulic intensifier, Hydraulic crane, Hydraulic jack, hydraulic lift, Hydraulic ram, Fluid couplings, Fluid torque converter and air lift pump.</p>

Term Work:

The term work shall be based on the topics mentioned above.

Practical / Oral:

The candidate shall be examined on the basis of term-work.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria & Sons.
2. Fluid Power Engineering by R.N. Patel and V.L. Patel Mahajan Publication.
3. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Prakashan.
4. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
5. Thermodynamics and Heat Engines, Vol. II and Vol III by R. Yadav., Central Pub. House.
6. Fundamentals of Turbo machinery B.K.Venkanna Prentice Hall of India.
7. Turbo Machines by A. Valan Arasu Vikas Publishing House Pvt Ltd.
8. Turbines, Compressors and Fans by S.M. Yahya., TMH Publishers.