C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Mechanical Engineering
SEMESTER: - V
CODE: - 4TE05FPE1
NAME – Fluid Power Engineering

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
		Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05FPE1	Fluid Power Engineering	3	0	2	5	4	30	1.5	70	3	---	20	30	**150**

Objectives:-

- To have knowledge of Impact momentum principle and their application.
- To learn basic concepts, working performance of turbines, pumps & compressors.

Prerequisite:-

- Students should have a basic concept of Fluid mechanics and type of fluid flow.

Course Outline:-

Sr. No.	Course Content	Hours
1	**Impact of Jet:** Impact momentum principle, 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.	09
2	**Hydro turbines:** Classification of turbines, Impulse and reaction, Radial, Axial, and mixed flow turbines, Major components of different turbines, Expressions for work done and efficiency of Pelton wheel, Bucket of Pelton wheel, Size and number of buckets, Single jet and multi jet Pelton wheel, Francis turbine, Kaplan turbine and Propeller turbines. 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.	10
3	**Pumps:** Working principles; classification of pumps. **Centrifugal Pumps:** Roto-dynamics pumps; construction and working; velocity vector diagrams and work done; mano-metric efficiency; vane shape; pump losses; minimum starting speed; design considerations; multi-stage pumps. Similarity relations and specific speed; net positive suction head; cavitation and maximum suction lift; performance characteristics. **Reciprocating Pumps:** Construction and operational details; work and power input; volumetric efficiency and slip; separation; air vessels and their utility; maximum speed of the rotating crank; characteristic curves; centrifugal V/S reciprocating pumps.	10

	Rotary displacement pumps: Introduction, function, working operation, gear pump, vane pump, screw pump.	
4	**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 **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. **Rotary Compressors:** Introduction, Classification, roots blower, Vane type, Screw compressor, Scroll compressor, centrifugal and axial flow compressors. **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 co-efficient, Aerofoil blading, Drag and lift co-efficient. Stalling and surging of compressor, Radial equilibrium theory, Free vortex, forced vortex, Testing and Characteristics of curves of centrifugal and axial flow compressors, Fans & Blowers.	11
5	**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.	05

Learning Outcomes: After the successful completion of the course,

- Students will be able to understand the construction, working and performance of Hydraulic turbines, pumps, air compressors.
- Conduct the experiments on turbines, pumps, and compressors and to know about cavitation phenomena and its effect.

Teaching & Learning Methodology:

- Lecture method using standard teaching aids.
- Quiz/Seminar/Expert lectures.
- Performing and study the Experiments in Fluid power lab.

Books Recommended:

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. Turbo Machines by **A. Valan Arasu**, Vikas Publishing House Pvt Ltd.
6. Fluid Mechanics with Engineering Application – **Daugherty & Franizin**.
7. Hydraulic Machine – Theory & Design by **V.P.Vasandani**
8. Turbines, Compressors and Fans by **S.M. Yahya**., TMH Publishers.