



C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Mechanical Engineering
SEMESTER: - VI
CODE: - 4TE06HPS1
NAME –Hydraulic & Pneumatic Systems

Teaching & Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE06HPS1	Hydraulic & Pneumatic Systems	3	0	0	3	3	30	1.5	70	3	---	---	---	100

Objectives:-

1. The course aims to make student understand the structure and the properties of the fluid.
2. To understand the energy exchange process in fluid mechanics handling incompressible fluids.

Prerequisites: - Basic Knowledge of structure and the properties of the fluid

Course outline:-

Sr. No.	Course Contents	Hours
1	Introduction to Fluid Power: Classification, application of various fluids in engineering, various Symbols used in hydraulic and pneumatic (ISO/JIC), transmission of power at static and dynamic states.	04
2	Basic Concept & Properties: Fluid - definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressure measurements by manometers and pressure gauges.	04
3	Hydraulic system elements: Control of fluid power elements Requirement of pressure control, direction control, flow control valves. Principles of pressure control valves, direction control valves, and pilot operated relief valve, pressure reducing valve, quick exhaust valve, sequence valves. Types of direction control valves – two way two position, four way two position, four way three position, open center, close center, tandem center, manual operated, solenoid, pilot operated direction control valves, check valves. Flow control valves: principle and their types, meter-in and meter-out circuit and flow through circuit. Actuators – linear and rotary, hydraulic motors, types of hydraulic cylinders and their mountings. Calculation of piston velocity, thrust under static and dynamic operation & Application, consideration of friction and inertia loads.	08

4	Pneumatics: Principle of Pneumatics: (i) Laws of compression, types of compressors, selection of compressors. (ii) Comparison of Pneumatics with Hydraulic power transmissions. (iii) Types of filters, regulators, lubricators, mufflers, dryers. (iv) Pressure regulators – Fine & Coarse, Electro-pneumatic Pressure Regulators (I/P & E/P) with its applications (v) Direction control valves, two way, three way, four way valves. Solenoid operated valves, push button, lever control valves. (vi) Speed regulating - Methods used in Pneumatics. (vii) Pneumatic actuators-rotary, reciprocating – Power Clamps & its applications in BIW.(viii) Air motors- radial piston, vane, axial piston (ix) Basic pneumatic circuit, selection of components(x) Application of pneumatics in low cost Automation and in industrial automation Introduction to vacuum generators, vacuum regulators, vacuum filters & types of vacuum cups, vacuum measurement, Vacuum pumps, types, introduction to vacuum sensors and valves. Industrial application of vacuum in material handling & leak testing.	08
5	Hydraulic/Pneumatic Circuit: Basic pneumatic and Hydraulic circuit, impulse operation, speed control, pneumatic motor circuit, sequencing of motion, time delay circuits and their applications.	06
6	Typical Automotive Applications: Hydraulic tipping mechanism, power steering, fork lift hydraulic gear, hydro-pneumatic suspension (Air suspension), Clutch actuating System, Brakes – Hydraulic AND Pneumatic.	08
7	Maintenance and trouble shooting of hydraulic & pneumatic circuits.	03
8	Introduction to fluidics – study of simple logic gates, turbulence, amplifiers, pneumatic sensors and applications.	04

Learning Outcomes:-

1. At the end of the semester students will be understand appreciate the complexities involved in solving the fluid flow problems.
2. In-depth knowledge on various tools and techniques of Hydraulic and pneumatic problem.

Books Recommended:-

Text Books:-

1. Hydraulic & pneumatics- **Andrew Parr**-Jaico Publishing House.
2. Basic fluid power- **by D.A. Pease**-PHI
3. Industrial Hydraulic & pneumatics – **J.J. Pippenger** - McGraw Hill
4. Fluid Power with applications – **A. Esposito**- PHI
5. Oil Hydraulics – **B Lal**- Intl- Literature

Reference Books:-

1. Fluid Mechanics **by Streeter, V.L. and Wylie**, E.B, McGraw-Hill, 1983
2. Hydraulic Machines- Theory and Design by **Vasaadani, V.P.**, Khanna Publishers, 1992