GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Mechanical Engineering/Automobile Engineering
SUBJECT NAME: Oil Hydraulics and Pneumatics
SUBJECT CODE: 2171912
B.E. 7th SEMESTER

Type of course: Under Graduate
Prerequisite: None
Rationale: Course gives idea about the basic system working on fluid power and compressed air. Also different valves related to hydraulic and pneumatic systems are discussed in syllabus. Subject is also useful for designing the various hydraulic and pneumatic circuits for various engineering applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	0	2	5	70	30	20	10	10	10	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction:** Introduction, Global fluid power Scenario, Basic system of Hydraulics-Major advantages and disadvantages, Principles of Hydraulic Fluid power, Hydraulic Symbols, Electrical Elements used in hydraulic circuits.	5	10
2	**System Components, Hydraulic Oils, Fluid Properties and Filter:** Hydraulic & Pneumatic Symbols as per ISO/ANSI, Types, Properties, physical characteristics & functions of hydraulic Oils, Classification-Mineral based, Fire resistant& Biodegradable Oils, Filters, Contaminations, location of filter.	5	15
3	**Hydraulic Pumps, Motors and Actuators:** Construction, working principle and operation of rotary & reciprocating pumps like Gear, Vane, Generated-Rotor, Screw, Axial Piston, Radial Piston, Pump characteristics, Linear and Rotary Actuators, Hydrostatic Transmission Systems. Selection of components for applications.	6	20
4	**Hydraulic Valves and Hydraulic System Accessories:** Direction control valves, Pressure control valves, Flow control valves, Non-return valves, Reservoirs, Accumulators, Heating & cooling devices, Hoses. Selection of valves for circuits.	6	18
5	**Design of hydraulic circuits:** Basic hydraulic circuits, Industrial hydraulic circuits, Power losses in flow control circuits.	6	10
6	**Introduction to Pneumatic Systems:** Basic Requirements for Pneumatic System, Applications, Pneumatic fundamentals, Construction, working principle and operation of pneumatic power transmission system components like Power source, FRL unit, Actuators and control valves like DCV, FCV, PCV, time delay, quick exhaust, twin pressure, shuttle.	6	12

7	**Pneumatic circuits:** Basic pneumatic circuits, Development of single Actuator Circuits, Development of multiple Actuator Circuits, Cascade method for sequencing.	6	10
8	Introduction to Automation in hydraulic and Pneumatic Systems.	3	5

Reference Books:

1. Industrial Hydraulics by John Pippenger and Tyler Hicks, McGraw Hill.
2. Oil Hydraulic Systems, Principle and Maintenance by S R Majumdar, McGraw-Hill.
3. Fluid Power with Applications by Anthony Esposito, Pearson.
4. Fluid Power: Generation, Transmission and Control, Jagadeesha T., Thammaiah Gowda, Wiley.
5. The Analysis & Design of Pneumatic Systems by B. W. Anderson, John Wiley.
6. Control of Fluid Power Analysis and Design by Mc Clay Donaldson, Ellis Horwood Ltd.
7. Hydraulic and Pneumatic Controls: Understanding made Easy, K.Shanmuga Sundaram, S.Chand & Co Book publishers, New Delhi, 2006 (Reprint 2009)
8. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar**,** McGraw-Hill. 9. Basic fluid power Dudley, A. Pease and John J. Pippenger, , Prentice Hall, 1987

Course Outcome:

After learning the course, the students should be able to:

- Identify and analyse the functional requirements of a power transmission system for a given application. (Application involving fluid power transmission)
- Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro-hydraulics, electro-pneumatics for a given application. Develop a circuit diagram.
- Visualize how the hydraulic/pneumatic circuit will work to accomplish the function.
- Selection and sizing of components of the circuit.