GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3724701
Semester – II
Subject Name: Advance Oil Hydraulic and Pneumatic System

Type of course: Engineering

Prerequisite: N.A.

Rationale: This course aims to present the oil hydraulic and pneumatic systems to advances the students. This course will offer the real time automation through Mechatronics engineer.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Basics of hydraulics, major advantages and disadvantages, principle of hydraulic system, comparison between mechanical, electrical, hydraulic and pneumatic power transmission systems.	03
2	**Hydraulic Oils, Fluid Properties and Filtration:** Oils: types, properties & functions, ISO viscosity grades, Classification: mineral based, fire resistant & biodegradable oils, contaminations, Filters: types, locations & rating.	05
3	**Hydraulic Components:** Pumps: Types & selection, direction control valves, pressure control valves, flow control valves, non-return valves, electro-hydraulic servo valves, linear and rotary actuators, reservoir, Accessories: pipes, tubes, hoses, accumulators, heating and cooling devices.	15
4	**Design of hydraulic circuits:** Basic hydraulic circuits & Industrial hydraulic circuits.	04
5	**Pneumatic System:**	08

	Introduction, pneumatic components: air compressors, FRL unit, pneumatic valves & actuators, selection criteria of pneumatic components	
6	**Design of Pneumatic circuits:** Basic pneumatic circuits, industrial pneumatic circuits & cascade circuits.	**03**
7	**Automation:** Automation of hydraulic and pneumatic systems using mechanical, electrical and electronics sensors with the help of Microcontrollers/PLC	**02**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**30**	**20**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. S R Majumdar, Oil Hydraulic Systems, Tata McGraw-Hill.
2. S R Majumdar, Pneumatic Systems, Tata McGraw-Hill.
3. John Pippenger & Taylor Hicks, Industrial Hydraulics, Tata McGraw-Hill.
4. Anthony Esposito, Fluid Power, Prentice Hall.
5. Andrew Parr, Hydraulics and Pneumatics, Jaico Publications.

Course Outcomes:

After learning the course the students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand basics of hydraulic and pneumatic systems.	15
CO-2	Understand the behavior of working fluid.	15

CO-3	Control the motion of actuators using control elements.	40
CO-4	Automate the motion of actuators by integration of sensors and controllers.	30

List of Experiments:

1. Introduction to graphical symbols as per DIN-ISO: 1219.
2. To understand working and construction of hydraulic components and basic circuits using Basic Hydraulic software by Bosch Web Trainer.
3. To understand working and construction of Pneumatic components and basic circuits using Basic Pneumatic software by Bosch Web Trainer.
4. Construction of Basic hydraulic circuit and speed control circuits (Meter-In, Meter-Out and Bypass circuits).
5. Electro hydraulic circuit-Speed control of double acting hydraulic cylinder.
6. Electro Hydraulic circuit-Sequential operation through Limit Switches.
7. Construction of Basic pneumatic circuit and to understand use of Logic Elements.
8. To understand use of Quick exhaust, Flow control and Time Delay valve in pneumatic circuit.
9. To illustrate pneumatic circuit involving two cylinders (sequential operation).
10. To control double acting pneumatic cylinder through 5/2 solenoid operated DCV and B&R controller.

Major Equipment:

1. Electro-Hydraulic trainer

2. Electro-Pneumatic trainer

3. PLC with B & R Automation Studio.

4. Web trainers for hydraulics and pneumatics

List of Open Source Software/learning website:

NPTEL.