

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B. E. SEMESTER: VI**  
**Mechatronics Engineering**

Subject Name: **Hydraulic and Pneumatic Systems**  
Subject Code: **162004**

<b>Teaching Scheme</b>				<b>Evaluation Scheme</b>		
<b>Theory</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Total</b>	<b>University Exam (Theory) (E)</b>	<b>Mid Sem Exam (Theory) (M)</b>	<b>Practical (I)</b>
4	0	2	6	70	30	50

<b>Sr. No</b>	<b>Course Content</b>	<b>Total Hrs.</b>
1.	<b>Introduction :</b>  Introduction, Global fluid power Scenario, Basic system of Hydraulics—Major advantages and disadvantages, Principles of Hydraulic Fluid power, Hydraulic Symbols	2
2.	<b>Hydraulic Oils ,Fluid Properties and Filter:</b>  Types, Properties, physical characteristics & functions of hydraulic Oils, ISO Viscosity grades, Classification- Mineral based, Fire resistant& Bio-degradable Oils, Filters, Contaminations, Filter rating, location of filter.	5
3.	<b>Hydraulic Pumps &amp; Motors:</b>  Classification of hydraulic pumps, Gear Pumps, Vane Pumps, Piston Pumps, Axial piston pumps, Hydraulic motors.	6
4.	<b>Hydraulic Valves:</b>  Direction control valves, Pressure control valves, Flow control valves, Non-return valves.	5
5.	<b>Hydraulic Actuators:</b>  Linear and Rotary Actuators, Hydrostatic Transmission Systems.	3
6.	<b>Hydraulic system Accessories:</b>  Reservoirs, Accumulators, Heating & cooling devices, Pipes fittings, Hoses.	3

7.	<b>Design of hydraulic circuits:</b> Basic hydraulic circuits, Industrial hydraulic circuits, Power losses in flow control circuits.	6
8.	<b>Introduction to Pneumatics:</b> Basic Requirements for Pneumatic System, Applications	2
9.	<b>Air Compressor and Pipeline Layout:</b> Types & Selection criteria for Air Compressors, Air receiver, Pipeline Layout.	3
10.	<b>Service Unit:</b> Air filter, Pressure regulator and Lubricator (FRL unit)	2
11.	<b>Pneumatic Cylinders and Motors:</b> Types of Pneumatic Cylinders & Air motors, Cushion assembly, mounting arrangements	3
12.	<b>Pneumatic Valves:</b> Pneumatic Direction control valves, Quick exhaust, Time delay Shuttle, Twin pressure valves	3
13.	<b>Pneumatic circuits:</b> Basic pneumatic circuits, Development of single Actuator Circuits, Development of multiple Actuator Circuits, Conventional method, Cascade method	4
14.	<b>Automation:</b>	3

**Text Books:**

1. S R Majumdar  
Oil Hydraulic Systems  
Tata McGraw-Hill
2. S R Majumdar  
Pneumatic Systems  
Tata McGraw-Hill

## Reference Books:

1. John Pippenger & Taylor Hicks  
Industrial Hydraulics  
McGraw-Hill
2. Anthony Esposito  
Fluid Power  
Prentice Hall
3. Andrew Parr  
Hydraulics & Pneumatics  
Jaico Publications

## List of Experiments:

- (1) Graphical Symbol as per DIN-ISO: 1219
- (2) To understand working and construction of hydraulic components and basic circuits with using of Basic Hydraulic Software by Bosch web trainer.
- (3) To understand working and construction of pneumatic components and basic circuits with using of Basic Pneumatic Software by Bosch web trainer.
- (4A) To control Double acting pneumatic cylinder through 5/2 D.C. Valve
- (4B) To control Double acting pneumatic cylinder by 3/2 push button valves and Shuttle valve
- (5A) To understand use of Logic element 'OR' gate and 'AND' gate
- (5B) To understand use of Quick Exhaust & Flow control valve.
- (6A) To illustrate the use of Time Delay valve with 'OR' gate and 'AND' gate
- (6B) To illustrate pneumatic circuit involving two cylinders.
- (7A) Speed control of Hydraulic cylinder through Throttle valve.
- (7B) Speed control of Hydraulic cylinder through The Flow control valve in Bypass.
- (7C) Flow control valve in Meter-in & Meter-out circuit.
- (8) Electro Hydraulic circuit –Speed and Pressure control of double acting cylinder
- (9) Electro Hydraulic circuit—Sequential operation of double acting cylinder through Limit switches.
- (10A) To control double acting cylinder through 5/2 solenoid operated D.C. valve and PLC controller.
- (10B) To control double acting cylinder through 5/2 solenoid operated D.C. valve and PLC controller