



S.No.	Topic	No of Practicals
7.	PLC programming	2
8.	Water level controller using programmable logic controller	1
9.	Batch process reactor using programmable logic controller	1
10.	Speed control of AC servo motor using programmable logic controller	1
	<b>Total</b>	<b>14</b>

## X. Suggested Reading

- <https://nptel.ac.in/downloads/108105063/>
- Manesis S and Nikolakopoulos G. 2018. *Introduction to Industrial Automation. 1st Edition*, CRC Press. Textbook-ISBN 9781498705400-CAT#K24766

**I. Course Title : Principles of Hydraulic and Pneumatic Systems**

**II. Course Code : FMPE 512**

**III. Credit Hours : 2+1**

### IV. Aim of the course

To understand the principles behind operation of hydraulic and pneumatic systems and their components and design simple hydraulic and pneumatic circuits and select components for the same.

### V. Theory

#### Unit I

Hydraulic power, its advantages, applications, properties of hydraulic fluids, viscosity, bulk modulus, density. Concepts of energy of hydraulic systems, laws of fluid flow.

#### Unit II

Hydraulic pump and motors, principle, capacity, classifications, working, performance. Design of various types of pumps and motors.

#### Unit III

Actuators, types, design of linear actuator and rotary actuators. Hydraulic rams, gear motors, piston motors and their performance characteristics. Hose, filters, reservoirs, types of circuits, intensifier, accumulator, valves. Valve types: Direction control, deceleration, flow, pressure control, check valve and their working etc.

#### Unit IV

Hydraulic circuit design. Applications in farm power and machinery: Tractor, combine, farm machinery systems, hydrostatic system etc.

#### Unit V

Power pack, pneumatic circuits, properties of air. Compressors, types. Design of pneumatic circuits.

### VI. Practical

Study of various hydraulic pumps, motors, valves, directional control valves, cylinder piston arrangements, engineering properties of hydraulic fluids, hydraulic system of tractor, power steering system.



### VII. Learning outcome

Ability to design simple hydraulic and pneumatic circuits and to select the components for the same. To design hydraulic and pneumatic systems of farm Machinery.

### VIII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Introduction to hydraulic power, its advantages, applications.	1
2.	Properties of hydraulic fluids, viscosity, bulk modulus, density.	2
3.	Concepts of energy of hydraulic systems, laws of fluid flow.	1
4.	Introduction to hydraulic pump and motor.	1
5.	Principle of hydraulic pump and motor, capacity, classifications, working, performance.	1
6.	Design of various types of hydraulic pumps.	1
7.	Design of various types of hydraulic motors.	1
8.	Actuators, types, design of linear actuator and rotary actuators.	3
9.	Hydraulic rams, gear motors, piston, motors and their performance characteristics.	3
10.	Hose, filters, reservoirs, types of circuits, intensifier, accumulator, valves.	3
11.	Valve types: Direction control, deceleration, flow, pressure control, check valve and their working etc.	4
12.	Hydraulic circuit design.	2
13.	Applications in farm power and machinery: Tractor, combine, farm machinery systems, hydrostatic system etc.	3
14.	Power pack, pneumatic circuits, components of pneumatic systems, properties of air.	3
15.	Compressors, types. Design of pneumatic circuits.	3
	<b>Total</b>	<b>32</b>

### IX. List of Practicals

S.No.	Practical	No. of Practicals
1.	Study of various hydraulic pumps	1
2.	Study of various hydraulic motors	1
3.	Study of various hydraulic valves	1
4.	Study of various hydraulic directional control valves	2
5.	Study of various hydraulic cylinder piston arrangements	1
6.	Engineering properties of hydraulic fluids	2
7.	Study of hydraulic system of tractor	1
8.	Study of power steering system	1
9.	Study of power pack, pneumatic circuits, components of pneumatic systems	2
10.	Practical examination	1
	<b>Total</b>	<b>13</b>

### X. Suggested Reading

- Anthony E. 2003. *Fluid Power with Applications*. Pearsons Education (Singapore) Pvt. Ltd.
- Krutz G. 1984. *Design of Agricultural Machines*. John Wiley and Sons.
- Majumdar S R. 2003. *Oil Hydraulics Systems: Principles and Maintenance*. Tata McGraw Hill Co.
- Merritt HE. 1991. *Hydraulic Control System*. John Wiley and Sons Inc.