

Course Type	Course Code	Name of the Course	L	T	P	Credit
DE	OMED616	Industrial Hydraulics and Automation	3	0	0	3

Prerequisites
UG Level: Mathematics and Fluid Mechanics
Course Objective
The broad objectives of the course are summarized as: 1. To design fluid power circuits with standard symbols. 2. To demonstrate working principles and constructional details of major components used in Fluid Power Systems. 3. To understand and analyze system components and drives. 4. To develop the dynamic model of the hydraulic systems and their control. 5. To design and develop low-cost automation circuits for industrial problems. 6. To understand the various faults in hydraulic machinery and their troubleshooting.
Learning Outcome
1. Understand fluid power principles and components. 2. Design and analyze hydraulic circuits using standard symbols. 3. Develop dynamic models of hydraulic systems and controls. 4. Create low-cost automation solutions for industry. 5. Identify and troubleshoot faults in hydraulic machinery. 6. Gain skills for advanced studies or industrial roles in hydraulics and automation.

Unit No.	Topics to be Covered	No. of Lecture Videos	Video Time (Minutes)	Learning Outcomes
1.	Introduction to Hydraulics and Hydraulic Fluids: Introduction to power hydraulics, Fundamental theory of power hydraulics, Hydraulic fluid	5	150	Students will understand the basics of power hydraulics, the role of hydraulic fluids, and their importance in system efficiency and safety.
2.	Hydraulic Pumps: Introduction to hydraulic pumps, Construction, operation, and application of hydraulic pumps	5	150	Students will understand the types, construction, operation, and applications of hydraulic pumps in hydraulic systems.
3.	Hydraulic Pumps: Performance characteristics of hydraulic pumps	5	150	Students will learn the key performance characteristics of hydraulic pumps, including flow rate, pressure, efficiency, and their impact on system performance.
4.	Hydraulic Actuators: Introduction to hydraulic actuators, Rotary actuators	5	150	Upon completing this topic, students will understand the basic principles and functions of hydraulic actuators, with a focus on rotary actuators, including their construction, operation,

				and applications in fluid power systems.
5.	Hydraulic Actuators: Linear actuators, Performance characteristics of hydraulic actuators	5	150	Students will understand the working principles of linear hydraulic actuators and gain insight into their key performance characteristics, such as speed, force, and efficiency, enabling them to assess their suitability for industrial applications.
6.	Hydraulic Valves: Introduction to hydraulic valves, Theory of control valves – I, Theory of control valves – II, Theory of control valves – III	5	150	Students will gain a fundamental understanding of hydraulic valves, including their types, functions, and control theories, enabling them to analyze and apply appropriate valve configurations in hydraulic systems.
7.	Hydraulic Valves: Theory of control valves – IV, Theory of proportional valves, Theory of servo valves	5	150	Students will gain an understanding of the operating principles of control valves, including proportional and servo valves, and their roles in precise control of pressure, flow, and direction in hydraulic systems.
8.	Hydraulic Accessories: Introduction to hydraulic accessories, Hydraulic accumulator, Hydraulic reservoirs, Hoses, Filters and Coolers, Performance analysis of hydraulic accumulators and hydraulic reservoirs	5	150	Students will learn the functions and applications of key hydraulic accessories such as accumulators, reservoirs, hoses, filters, and coolers, and understand the performance analysis of hydraulic accumulators and reservoirs in fluid power systems.
9.	Hydraulic Systems: Hydrostatic Transmission System (HST), Hydraulic system for industrial equipment - I	5	150	Students will gain an understanding of hydrostatic transmission systems and their components, and learn to analyze hydraulic systems used in industrial equipment for efficient power transmission and control.
10.	Hydraulic Systems: Hydraulic system for industrial equipment – II, Performance evaluation of hydraulic system	5	150	Students will learn the components and operation of industrial hydraulic systems and develop the ability to evaluate their performance based on efficiency, responsiveness, and reliability.
11.	Control System: Introduction to control system, Control system analysis – I	5	150	Students will gain a basic understanding of control

				systems and learn fundamental analysis techniques to evaluate system behaviour and performance.
12.	Control System and Digital Hydraulics: Control system analysis – II, Digital hydraulics	5	150	Students will learn the fundamentals of control system analysis and understand the principles and applications of digital hydraulics for precise and efficient fluid power control.
Total Number of Video Lectures and Video Time		60	1800	

Textbooks:

1. Watton, J. (2009). *Fundamentals of fluid power control*. Cambridge University Press.
2. Pinches, A. (1988). *Power hydraulics*. Prentice Hall.
3. Majumdar, S. R. (2013). *Hydraulic systems: Principles and maintenance*. Tata McGraw-Hill Education.

Reference Books:

1. Merritt, H. E. (1967). *Hydraulic control systems*. John Wiley & Sons.
2. Manring, N. D. (2005). *Hydraulic control systems*. Wiley.
3. Cundiff, J. S. (2001). *Fluid power circuits and controls: Fundamentals and applications*. CRC Press.
4. Majumdar, S. R. (2010). *Pneumatic systems: Principles and maintenance*. Tata McGraw-Hill Education.