Lok Jagruti Kendra University
University with a Difference

Diploma in Mechanical Engineering

LJ Polytechnic

Subject Code: 025060601

Hydraulic & Pneumatics

Programme / Branch Name			Diploma in Mechanical Engineering			
Course Name	Hydraulic and Pneumatics				**Code**	025060601
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week				**Evaluation Scheme**			
L	**T**	**L**	**T**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Applied Mechanics.
- ✓ Fluid Mechanics and Hydraulic Machines.

3. Rationale

Hydraulics and pneumatics machines are widely used in industrial and automotive sectors due to their versatility in automation. Mechanical Engineering is required to maintain such systems efficiently in different industrial sectors. This required the knowledge competency of different working components of hydraulic and pneumatic systems. This course will give the basic skills and knowledge to use and maintain different types of hydraulic and pneumatic systems.

4. Objectives

- ✓ To identify various components of hydraulic & pneumatic systems.
- ✓ Select Pumps and actuators for given practical applications based on fluid systems.
- ✓ Select the most appropriate control valves for the different operating industrial mechanisms of fluid-operated systems.
- ✓ Develop a Conceptual understanding of the Hydraulic and Pneumatic circuits for simple Mechanisms.
- ✓ Develop Conceptual flow dynamics in Hydraulic circuits by Simulation software of hydraulic circuits.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weightage	Hours
1.	**Introduction to Hydraulics and Pneumatics**	1.1. Fundamental Principles (Hydraulic systems and Pneumatic Systems) 1.2. Pressure Measurement (Gauges and Pressure Intensity). 1.3. ISO and SAE grade hydraulic oils 1.4. ISO based symbols used in hydraulic and Pneumatic Systems. 1.5. Hazards and Safety in industrial Environments.	• Understand about the desired properties of oil used in the given hydraulic system. • Describe about the general routine maintenance of hydraulic and pneumatic system. • Know about safety precautions required for handling hydraulic and pneumatic systems .	10	5
2.	**Hydraulic Machines and Actuators**	2.1. Classification of Pumps 2.2. Construction and Working (Gear, Vane, Screw). 2.3 Performance and characteristics of pumps followed by Numerical of Discharge head, work done and efficiency of pump. 2.4 Actuators (Linear and Rotary) Construction and working. 2.5 Air Vessel	• To be able for comparison between the pumps for a given criteria. • Classify given types of actuators with justification. • Describe sketches of construction and working of air vessel and actuators.	15	6
3.	**Valves and Hydraulic System**	3.1. Classification of control valves. 3.2. Pressure Control Valves (Relief Value, Counter balance valve, Pressure Reducing valve. 3.3. Direction control Valve (3/2 – Valve, 5/2 Valve). 3.4. Flow control Valves (Pressureand Temperature	• To understand about the actuation method of valves for the given application. • To Know about the routine maintenance procedure of the given type valve. • To understand about latest advancement of hydrodynamic power transmission	30	13

		Compensated, Non-Compensated) 3.5. FRL Unit Construction and working. 3.6. Hydrodynamic Transmission (Torque Converter) 3.7. Hydraulic Motors and Accumulators	devices and Power storing devices.		
4.	**Hydraulic Circuits**	4.1. Simple Oil-Hydraulic Circuit (Single and DoubleActing Hydraulic cylinders). 4.2. Speed control meter in-out circuits. 4.3. Sequencing Circuits 4.4. Hydraulic Circuits (MillingMachine, Press,Shaper Machine)	• To know hydraulic circuit with sketches. • Develop conceptual understanding about required components relevant to hydraulic circuits. • Describe Routine maintenance and procedure of oil hydraulic circuits	25	10
5.	**Pneumatic Circuits**	5.1. Direct/Indirect Control of single acting and double acting air Cylinders. 5.2. SpeedControl Circuits 5.3. Sequencing Circuits 5.4. Maintenance of hydraulic&Pneumatic System	• To understand about relevant components required for given pneumatic circuit. • To develop conceptual understanding of pneumatic circuits. • To have a knowledge for maintenance of hydraulic and pneumatic systems	20	8
				Total Hours	**42**

6. List of Practicals / Exercise

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/Programme outcomes. Following is the list of practical exercises for guidance.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	Identification of components used in Hydraulic and Pneumatic circuits.	To study about different components used in building of hydraulic system circuits.	2
2.	Symbol List used in Hydraulic and Pneumatics.	To understand industrial grade ISO Based symbols used in Designing Circuits.	2
3.	Use of Actuators mounted on Hydraulic System.	Learn about different types of actuators application.	4
4.	Use of Control Valves in H&P circuits.	Learn about control Valves types and applications in Hydraulic Circuits.	2
5.	Construct and Actuate SAC and DAC Drive Circuits.	Understand the application of control valve in circuits to operate hydraulic Cylinders.	6
6.	Construct and Actuate Hydraulic Braking System.	To study and design simple braking system used in simple mechanisms for braking.	6
7.	Develop Circuits of simple Hydraulic & pneumatics System.	To understand the actual working circuits hydraulic or pneumatic system.	4
8.	Demonstration of Pneumatic Circuit for speed control of double acting cylinders.	To learn about the mechanism working by double acting cylinder for speed Control.	2
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Chapter Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	Ap %	C %	E %	An %
1.	Introduction to Hydraulics and Pneumatics	44	33	11	0	12	0
2.	Hydraulic Machines and Actuators	25	38	0	0	12	25
3.	Valves and Hydraulic Systems	18	36	26	0	8	12
4.	Hydraulic Circuits	20	20	40	20	0	0
5.	Pneumatic Circuits	25	30	30	15	0	0

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Hydraulic and Pneumatic Controls by Sundaram K. Shanmuga S. Chand Publication
2) Hydraulics and Pneumatics by Jagadeesh T, Wiley India
3) Hydraulics and Pneumatics by A.K. Upadhyay, S.K kataria & Sons.

9. Reference Books

1) Hydraulics and Pneumatics (A Technician Maintain Engineer Guide), Parr Andrew, Butterworth-Heinemann Publisher.
2) Pneumatic System Principles and Maintenance, Majumdar, S.R, McGraw Hill, New Delhi.
3) Oil Hydraulics System Principles and Maintenance Majumdar, S.R, McGraw Hill, New Delhi.
4) Hydraulics and Pneumatics, Stewart, Harry, Taraporewala Publication.

10. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/watch?v=mFsw3o3KSS8
2) https://www.youtube.com/watch?v=m1NN_LAIMF4
3) https://www.youtube.com/watch?v=OP8n0KR4hA4
4) https://www.e4training.com/simulate/index.php
5) https://www.youtube.com/watch?v=4UdY5RtWJ3Y
6) https://www.youtube.com/watch?v=bXXL-0sf8gs
7) https://www.youtube.com/watch?v=K-z8F2wQqkQ
8) https://www.youtube.com/watch?v=fu08KCospiY