

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Diploma Engineering			Branch		Mechanical Engineering		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 2018	
Subject code		1ME2603	Subject Name		Hydraulics & Pneumatics				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	0	1	0	5	Theory	40	60	100
Hours	4	0	2	0	6	Practical	30	20	50

Pre-requisites:
Students must have knowledge of concepts of properties of liquids and gases. Students must aware with Fluid, its related concepts & applications.

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:
CO1. Differentiate hydraulic and pneumatic fluid based systems.
CO2. Select and operate various hydraulic and pneumatic elements.
CO3. Operate and maintain hydraulic and pneumatic circuits.
CO4. Operate and maintain various devices based on hydraulic and/or pneumatics.
CO5. Operate and maintain hydro-pneumatics circuit diagrams for given applications
The tutorial should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 Fundamentals of Fluid Power	1.1. Power transmission modes. 1.2. Basics of Hydraulic systems. 1.3. Basics of Pneumatic systems. 1.4. Laws governing fluid flow: Pascal's law, continuity equation, Bernoulli's theorem, Boyle's, Charles', Gay-lussec' laws. 1.5. Flow through pipes 1.6. Working fluids used in hydraulic and pneumatic systems-types, ISO/BIS standards and designations, properties.	1a. Distinguish between hydraulic and pneumatic systems 1b. Compare fluid power transmission with electrical and mechanical transmission. 1c. Describe various laws governing fluid flows. 1d. Select appropriate hydraulic fluid for given application.	5	6

<p>UNIT – 2 Hydraulic Elements</p>	<p>2.1. Pumping theory, Hydraulic Pumps - types, construction, working principle, applications, selection criteria and comparison.</p> <p>2.2. Hydraulic Actuators, Control valves, Accessories - their types, construction and working.</p> <p>2.3. Hydraulic Control valves - types, construction, working, materials and specifications.</p>	<p>2a. Describe the working of hydraulic control valves and actuators</p> <p>2b. Select, appropriate hydraulic device for given application.</p> <p>2c. Describe the working of Hydraulic control valves</p> <p>2d. Select hydraulic accessories with its location on hydraulic and pneumatic system.</p>	<p>8</p>	<p>10</p>
<p>Unit – 3 Hydraulic Circuits</p>	<p>3.1 ISO symbols used in hydraulic circuits.</p> <p>3.2 Circuit diagram, components, working and application of hydraulic circuits likes Control of single/double acting cylinder, Pump unloading, Intensifier, Regenerative, Synchronizing cylinders, Automatic Cylinder Reciprocation, Sequencing, Meter-in and Meter-out circuits.</p>	<p>3a. Describe ISO symbols and guiding rules for designing hydraulic system.</p> <p>3b. Describe the procedure for maintaining basic hydraulic circuit based on given system requirements.</p> <p>3c. Describe the procedure for maintaining basic hydraulic circuit based on given system requirements.</p>	<p>10</p>	<p>8</p>
<p>Unit – 4 Pneumatic Elements</p>	<p>4.1 Pneumatic piping layout</p> <p>4.2 Air compressors, Air receivers, Air Filters, Regulators, Lubricators (FRL unit): their types, construction, working, specifications and selection criteria of following air preparation and conditioning elements.</p> <p>4.3 Pneumatic Actuators – types, construction and applications.</p> <p>4.4 Pneumatic Control valves - types, construction, working, materials and specifications.</p>	<p>4a. Use and maintain FRL unit in pneumatics.</p> <p>4b. Identify the function of various cylinders and its mounting.</p> <p>4c. Describe the working of pneumatic control valves</p> <p>4d. Select hydraulic and pneumatic accessories with its location on hydraulic and pneumatic system.</p>	<p>8</p>	<p>6</p>
<p>UNIT – 5 Pneumatic Circuits</p>	<p>3.1 ISO symbols used in pneumatic circuits.</p> <p>3.2 Basic Pneumatic Circuits – Control of single and double acting cylinder, Speed control, Automatic cylinder reciprocation circuit, Quick exhaust, Two step feed control, Time delay circuit, circuit diagram, components, working</p>	<p>3a. Describe ISO symbols and guiding rules for designing pneumatic system.</p> <p>3b. Describe the procedure for maintaining basic pneumatic circuit based on given system requirements.</p> <p>3c. Describe the procedure for maintaining basic pneumatic</p>	<p>10</p>	<p>8</p>

	and applications. 3.1 Pneumatic Logic circuit design - classic method & cascade method	circuit based on given system requirements.		
UNIT – 6 Hydraulic and Pneumatic Applications	4.1 Hydraulic and Pneumatic devices – Concept and applications. 4.2 Construction, working principle, major elements, performance variables of: i. Automotive hydraulic brake, ii. Industrial Fork lift, iii. Hydraulic jack, iv. Hydraulic press, v. Automotive power steering, vi. Automotive pneumatic brake, vii. Automotive air suspension, viii. Pneumatic drill, ix. Pneumatic gun.	4a. Identify different parts in a given hydraulic and pneumatic device. 4b. Describe function and working of various parts in hydraulic and pneumatic devices.	10	10
UNIT – 7 Installation, Maintenance and Troubleshooting	5.1 Installation of hydraulic and pneumatic system. 5.2 Causes and remedies for common troubles arising in hydraulic elements. 5.3 Maintenance of hydraulic systems. 5.4 Causes and remedies for troubles arising in pneumatic elements. 5.5 Maintenance of pneumatic systems	5a. Describe different properties of the fluid. 5b. Identify the various faults in the hydraulic and pneumatic system and the remedial actions for them.	4	6
UNIT – 8 Hydro-Pneumatics Elements	6.1 Types, construction, working, circuit diagram and application of following hydro pneumatic elements: i. Air oil reservoir, ii. Hydraulic series check unit, iii. Hydraulic parallel check unit, iv. Hydro pneumatic cylinder, v. Air oil intensifier.	6a. Explain working of hydro pneumatic elements.	5	6
		Total	60	60

List of Practical		
No.	Unit	Name of Practical
1	1	TO STUDY ABOUT THE BASIC HYDRAULIC ELEMENTS.
2	3,5	TO RECIPROCATATE SINGLE ACTING CYLINDER USING 3/2 MANUAL OPERATED DCV.
3	3,5	TO RECIPROCATATE DOUBLE ACTING CYLINDER USING 4 WAY MANUAL OPERATED DCV.
4	3,5	PERFORM METER-IN AND METER-OUT CIRCUIT ON HYDRAULIC KIT.
5	3,5	TO OPERATE A DOUBLE ACTING CYLINDER USING 4 WAY SOLENOID OPERATED DCV.
6	3,5	TO PERFORM AN EXPERIMENT ON PRESSURE DEPENDENT SEQUENCE CONTROL OF CYLINDER.

7	3,5	PERFORM AN EXPERIMENT TO SYNCHRONISE TWO DOUBLE ACTING CYLINDER USING PARALLEL AND SERIES CONNECTIONS.	
8	2,3	TO PERFORM AN EXPERIMENT USING ACCUMULATOR	
9	2,3	TO PERFORM AN EXPERIMENT ON REGENERATIVE CONCEPT.	
10	8	STUDY AND WRITE A REPORT ON ANY ONE OF HYDRAULIC & PNEUMATIC DEVICES.	
List of Instruments/Equipment/Trainer Board			
1	Electro-hydraulic and Electro-pneumatic Trainer kit (with/without proportional valves) Components required: Pump, Reservoir, pressure relief valve, check valves, Directional control valves (manual and electrically operated), Flow control valves (fixed and variable), pressure reducing valve, Cylinders, Motor, Accumulator, hose pipes, accessories and setup for electro-hydraulic circuits		
2	Working model of pumps, valves and actuators.		
3	Cut section of various pumps, valves and actuators.		
Link of Text Books			
No	Title of Books	Authors	Publication
1	Hydraulic and Pneumatic Controls	R.Srinivasan	Vijay Nicole Imprints Private Limited, 2/e, 2008
List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Oil Hydraulic Systems	S. R. Mujumdar	Tata Mcgraw-Hill Publication, 3/e, 2013
2	Pneumatic Systems	S. R. Mujumdar	Tata Mcgraw-Hill Publication, 3/e, 2013
3	Hydraulics & Hydraulic Machinery	Patel.R.C. & Pandya.A.D.	Acharya Book Depot (1967)
Link of Learning Web Resource			
1	www.boschrexroth.co.in		
2	http://www.automationstudio.com/		
3	http://www.youtube.com/watch?v=xxoAm3X4iw0		
4	http://hyperphysics.phy-astr.gsu.edu/hbase/fluid.html#flucon		
5	http://www.youtube.com/watch?v=FVR7AC8ExIM		
6	http://www.youtube.com/watch?v=iOXRoYHdCV0		
7	http://www.youtube.com/watch?v=qDinpuq4T0U		