

## DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEM

<b>V Semester: MECH</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME519	Elective	L	T	P	C	CIA	SEE	Total
		3	1	-	3	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 45</b>	
<p><b>COURSE OBJECTIVES:</b>  <b>The course should enable the students to:</b>            I. Understand of basic knowledge of hydraulic and pneumatic systems.            II. Classification of pumps based on the working phenomenon.            III. Use of hydraulic power pack in the hydraulic systems.            IV. Design of hydraulic circuits based on the application.</p> <p><b>COURSE OUTCOMES (COs):</b></p> <p>CO 1: To expose the student to the different types of hydraulic and pneumatic systems and their operating principle. To learn the fundamentals and working of different pumps used in the hydraulic system.            CO 2: Understanding the application of hydraulic power pack in the domain of a hydraulic system.            CO 3: To enhance the different hydraulic circuits and function of accumulator used in the hydraulic system. Applying the knowledge of hydraulic and pneumatic systems in the field of automation in the industries and various applications.            CO 4: To expose the student to the different types of hydraulic and pneumatic systems and their operating principle.            CO 5: To learn the fundamentals and working of different pumps used in the hydraulic system.</p> <p><b>COURSE LEARNING OUTCOMES (CLOs):</b></p> <ol style="list-style-type: none"> <li>1. Outline of various systems.</li> <li>2. Understand the principles.</li> <li>3. Understand the properties of hydraulic fluid.</li> <li>4. Define pump and its types.</li> <li>5. Understand the flow rate of pumps and efficiency.</li> <li>6. Selection and specifications of different types of pumps.</li> <li>7. Discuss about actuators and effect of pressure.</li> <li>8. Define elements of power pack systems.</li> <li>9. Discuss about the capacity of hydraulic systems.</li> <li>10. Understand the importance of safety systems.</li> <li>11. Define hydraulic circuits and valves.</li> <li>12. Explain about different hydraulic circuits.</li> <li>13. Discuss the various types of control valves.</li> <li>14. Understand the working of solenoid valve.</li> <li>15. Understand the hydraulic and pneumatic equipment in detailed.</li> <li>16. Describe the importance of filters, grills, registers and explain the working of fans and blowers.</li> <li>17. Discuss the maintenance and troubleshooting of hydraulic systems.</li> <li>18. Understand the hydraulic and pneumatic equipment in detailed.</li> </ol>								

<b>UNIT-I</b>	<b>OIL AND HYDRAULIC SYSTEMS</b>	<b>Classes: 09</b>
Introduction, history of fluid power, Pascal's law, Bramah's press, Bernoulli's principle, Toricelli principle, fluid principle, fluid properties, viscosity, effect of temperature, dust and decay of oils, basic systems of hydraulic, physical units of fluid power, units of measurement, types of hydraulic fluid and selection criteria, properties of hydraulic fluid, physical characteristic, maintenance of hydraulic oils, oil hydraulic element and their representation in the circuits, comparison of mechanical, electrical, hydraulic and pneumatic systems for force and motion, analysis in automation.		
<b>UNIT -II</b>	<b>HYDRAULIC PUMPS</b>	<b>Classes: 09</b>
Classification of pumps, gear pump, types of gear pumps, screw pump, vane pump, types of vane pumps, piston pump, bent axis in line piston pump, internal and external gear pumps, selection and sizing specification of pumps, specification of pumps, pump and pressure pulsation, flow rate and power of hydraulic pump, power and pump efficiencies, pressure, flow efficiencies, oil compatibility, size, noise, pump ripple, checklist; Actuators, design of linear actuator, cushioning, seals, mounting details, piston rod diameter and its effect on the pressure, servo controlled valves, hydraulic balanced circuits, sequencing and synchronizing circuits, rotary actuators.		
<b>UNIT-III</b>	<b>HYDRAULIC POWER PACK</b>	<b>Classes: 09</b>
Element of power pack, design of hydraulic power pack, line pressure, discharge and motor.  Selection, power pack size and capacity, importance of pressure relief valve and safety systems, heating and cooling systems for hydraulic power pack.		
<b>UNIT-IV</b>	<b>HYDRAULIC CIRCUITS AND ACCUMULATOR</b>	<b>Classes: 09</b>
Hydraulic circuits, manual or automatic hydraulic system, regenerative circuit, use of check valves in hydraulic circuit, selection of pump, standard in circuit, circuit diagram representation, sequencing and synchronizing circuits; accumulator, low cost automation; meter-in circuit, meter-out circuit, bleed-off circuit, direction control valves, solenoid valves, flow control and pressure control valves, pressure compensation, accumulator.		
<b>UNIT-V</b>	<b>AUTOMATION</b>	<b>Classes: 09</b>
Hydraulic and pneumatic equipment in automation, low cost automation, relay circuit, programmable logic circuit, automation, micro controller; maintenance and troubleshooting of hydraulic and pneumatic circuit.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. S. R. Majumdar, —Oil Hydraulic Systems, Tata McGraw-Hill, 1<sup>st</sup> Edition, 2013.</li> <li>2. S. R. Majumdar, —Pneumatic Systems, Principles &amp; Maintenance, Tata McGraw-Hill, 1<sup>st</sup> Edition, 2013.</li> <li>3. T. Jagadeesha, —Hydraulic and Pneumatics, I.K Publishing House (Pvt).Ltd, 1<sup>st</sup> Edition, 2013.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Andrew Parr, —Hydraulic &amp; Pneumatic, Butterworth-Heinemann Ltd, 2<sup>nd</sup> Edition, 2013.</li> <li>2. Antony Esponssito, —Fluid Power with applications, Prentice Hall, 5<sup>th</sup> Edition, 2015.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://nptel.ac.in/courses/112105046">http://nptel.ac.in/courses/112105046</a></li> <li>2. <a href="http://www.nptel.ac.in/courses/112106175/Module%201/Lecture%201.pdf">http://www.nptel.ac.in/courses/112106175/Module%201/Lecture%201.pdf</a></li> </ol>		

3. <http://hydraulicspneumatics.com/fluid-power-basics>

**E-Text Books:**

1. [https://www.google.co.in/?gfe\\_rd=cr&ei=weV5V8HrNKLR8AeNgr7gBw&gws\\_rd=ssl#q=hydraulic+and+pneumatics+andrew+parr+pdf](https://www.google.co.in/?gfe_rd=cr&ei=weV5V8HrNKLR8AeNgr7gBw&gws_rd=ssl#q=hydraulic+and+pneumatics+andrew+parr+pdf)

2. [https://books.google.co.in/books/about/Oil\\_Hydraulic\\_Systems.html?id=NBMtphgTmxgC&redir\\_esc=y](https://books.google.co.in/books/about/Oil_Hydraulic_Systems.html?id=NBMtphgTmxgC&redir_esc=y)

3. [http://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aircraft/amt\\_airframe\\_handbook/media/ama\\_ch12.pdf](http://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/amt_airframe_handbook/media/ama_ch12.pdf)