GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**INDUSTRIAL PNEUMATICS AND HYDRAULICS**
Course Code	ME/2020/013
Course Duration	50 Hours
Minimum Eligibility Criteria	ITI/10th/+2/Diploma/Graduates
Pre-requisites (if any)	-
Course Objectives	Training module has been designed for the participants to • Understand Fluid properties • Understand Pneumatic systems and its components • Understand working of Pneumatic and Hydraulic applications • Create, Connect and Execute Pneumatic and Hydraulic circuits
Course Outcomes	At the end of training, the participants will be able to • Explain the Fluid properties • Identify and classify the components of Pneumatic and Hydraulic systems • Explain the working of Pneumatic and Hydraulic applications • Create, Connect and Demonstrate the working of Pneumatic and Hydraulic circuits
Expected Job Roles	Operator / Supervisor

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of the Examination
				Min	Max	
ME/2020/013	**INDUSTRIAL PNEUMATICS AND HYDRAULICS**	Theory	20	10	20	3 Hours
		Practical	30	40	80	
		Total	50	50	100	

ME/2020/013 - INDUSTRIAL PNEUMATICS ANDHYDRAULICS

DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	**Fluid Properties**	**04 Hours**	
1.1	Industrial Automation fundamentals - Introduction – Definition – Classification	04	
1.2	Ideal and Real Fluids – Properties – Units – Pressure – Pascal's Law – Applications		
1.3	Pressure Measurement – Piezometer – Simple U – Tube Manometer		
1.4	Mechanical Gauges – Bourdon's Pressure Gauge		
II	**Pneumatic Systems**	**29 Hours**	
2.1	Introduction – Basic Concepts – Components – Compressor – Types	09	
2.2	Cylinders – Single Acting and Double Acting – Construction and Working Principles – Performance Characteristics		
2.3	Filters – Regulators – Lubricating System		
2.4	Valves – Pressure Control Valves, Pressure Relief Valves, Direction Control Valves – Types, Flow Valves, Flow Control Valves, Throttling Valves, Shuttle Valves, Quick Exhaust Valves, And Non-Return Valves		
2.5	Manifolds – Seals – Hoses – Types and Specifications		
2.6	Fundamentals of Designing, Testing and Simulating Fluid Power Circuits		
2.7	**Practical:** ➢ Study of structure of pneumatic system using single acting cylinder ➢ Direct operation of double acting cylinder ➢ Indirect control of single acting cylinder ➢ Indirect control of double acting cylinder ➢ The logic AND function ➢ The logic OR function ➢ Memory circuit and speed control of a cylinder ➢ Operation of double acting cylinder with quick exhaust valve ➢ Pressure dependent control ➢ Automatic operation of double acting cylinder using time delay valve ➢ Automatic operation of double acting cylinder using Reversing valves ➢ Speed control of double acting cylinder using Metering-in circuit ➢ Speed control of double acting cylinder using Metering-out circuit		20

	➢ Speed control of double acting cylinder using Metering-in and Metering-out circuits		
III	**Hydraulic Systems**	**17 Hours**	
3.1	Introduction – Basic Concepts – Components – Reservoir – Fluid Power Pumps – Types – External and Internal Gear Pumps, Vane Pumps and Radial Piston Pumps	07	
3.2	Cylinders – Single Acting and Double Acting – Construction and Working Principles		
3.3	Motors – Construction and Working Principles – Filters		
3.4	Valves – Pressure Control Valves, Pressure Relief Valves, Direction Control Valves – Types, and Flow Control Valves		
3.5	Accumulator – Weight of Gravity Type Accumulator – Gas Filled Accumulator – Seals – Hoses – Pressure Intensifier – Hydraulic Actuators		
3.6	**Practical**: ➢ Study of Structure of the hydraulic system ➢ Direct control of double acting cylinder ➢ Direct control of hydraulic motor ➢ Metering-in control of double acting cylinder ➢ Metering-out control of double acting cylinder ➢ Metering-in control of hydraulic motor ➢ Metering-out control of hydraulic motor ➢ Control of double acting cylinder with 4/2 way single solenoid valve ➢ Control of double acting cylinder with 4/3 way single solenoid valve ➢ Sequence control of double acting cylinder and motor ➢ Regenerative circuit control of a double acting cylinder		10
	Total Theory and Practical hours	**20**	**30**
	Total hours	**50**	

HARDWARE REQUIREMENT

S. NO.	LIST OF TOOLS / EQUIPMENTS
1.	Pneumatics Trainer Kit: Single Acting Cylinder Double Acting Cylinder 3/2 Way DC Valve 5 /3 way DC Valve Flow Control Valve Pneumatic Motor with Speed Regulation Pressure Relief Valve Profile Plate Pressure Gauges Check Valve Quick Exhaust Valve Pressure Reducing Valve Proximity sensors, capacitive sensors, photo-electric sensors FRL Unit Timer Unit Solenoid Valve Pressure Switch Counter Unit Connecting hoses
2.	Hydraulics Trainer Kit with accessories Trolley with frame & caster wheels Hydraulic tank with filter & breather Single phase flange mounted electric motor Pressure Gauges Gear Pump Bell Housing Flexible Coupling Pressure Relief Valve Flow Control Valve Pressure Sequence Valve 4/3 way manually operated direction control valve Single Acting Cylinder Double Acting Cylinder Check Valve Needle Valve Hydraulic Motor Valve Mounting Plate Hoses Quick Coupling
3.	Desktop Computer: Intel Core i7-9700,(8 Core, 12MB Cache, 3.0Ghz, 4.7 Ghz Turbo w/UHD Graphics 630) DirectX Graphics card 16GB, 2X8G, DDR4 2666MHz Non-ECC Memory M.2 256GB PCIe NVMe Class 40 SSD 3 Button Optical mouse with scroll option 101MM Keyboard ergonomically deigned

4.	Laser Printer
5.	1.5 HP Air Compressor

REFERENCE BOOKS

S. NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
01	Hydraulics and Pneumatics (1st Edition)	Andrew Parr	Jaico Publishing House , First Edition , 1 June 1993
02	Hydraulics and Pneumatics (3rd Edition)	Andrew Parr	Elseveir India, India 3rd Edition, January 2011
03	Hydraulics and Pneumatics: A Technicians and Engineers Guide	Andrew Parr	Elseveir India, India 3rd Edition, January 2011
04	Industrial Hydraulics and Pneumatics	C.P. Murgudkar	Nirali Prakashan, Pune First Edition , December2019
05	Applied Hydraulics and Pneumatics	Dr.V. Jayakumar	Lakshmi Publications, Chennai 2016
06	Hydraulic and Pneumatic Controls	K. Shanmuga Sundaram	S. Chand Publishing, New Delhi 2006
07	Introduction to Hydraulics and Pneumatics	Ilango Sivaraman	PHI Learning Pvt. Ltd., New Delhi 3 Edition, July 2017
08	Basic Fluid Mechanics and Hydraulic Machines	Zoeb Husain, Zulkifly Abdullah and Zainal Alimuddin	BS Publications, Hyderabad 2008
09	Pneumatic and Hydraulic Systems	K. Hiraniya Singh	I.K. International Publishing House Pvt. Ltd., New Delhi 2016

ASSESSMENT AND CERTIFICATION

S. No.	Criteria for Assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training , Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max.Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Aim and Procedure	20
	b)Demonstration / Execution	25
	c) Result & Viva Voce	15
	d)Record	20
	Total Marks	**100**

THEORY MODEL QUESTION PAPER

ME/2020/013- INDUSTRIAL PNEUMATICS AND HYDRAULICS

(Maximum Marks: 20)

(N.B: Answer any **Twenty** questions) **20x1= 20 Marks**

1. Which one has low compressibility
2. Which one has less corrosiveness
3. State the application of FRL system
4. State the name of the fluid free which is freely available
5. Which one fluid is used in power steering of Automobile
6. State the name of the fluid used to control the Aircraft.
7. How ship arbor can be use Hydraulic oil for loading & Unloading
8. What is mean by Pour point of oil.
9. What is mean 3/2 DCV of Pneumatics.
10. Where is most applicable of 5/3 DCV
11. Which one system mostly useful in automobile painting industry
12. Where fire resistance property is most applicable
13. What is the name of the fluid acting as a lubricant while power transmission?
14. Which one has Low flash point in Hydraulics & Pneumatics system
15. Which one DCV is most suitable to control the function of single acting cylinder
16. State the name of fluid which one is most powerful for mining industry
17. What is the name of the fluid used in Boring industry?
18. Which one system is mostly used in material handling, drilling, sawing, filling and packaging industries.
19. How the valves are controlled in Mobile Hydraulics
20. State the name of the systems used in food processing industry
21. What is the name of the valve used to allow the air in one direction?
22. State the name of the valve used if one of the actuator requires a lesser pressure than the main system pressure
23. State the motor name used in lift
24. Which law is basic of Hydraulic jack?
25. In a closed container if the pressure at the bottom fluid is 10 bar then find the pressure value at the top of fluid.