GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (23)

INDUSTRIAL HYDRAULICS AND PNEUMATICS

SUBJECT CODE: 2142302

B.E. 4th SEMESTER

Type of Course: Core

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	3	6	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	General Hydraulics: Introduction - Pascal's law - Advantages and Disadvantages of hydraulic systems - Requirements of hydraulic oil - Maintenance of hydraulic oils: Heat exchanges, Filters and Strainers etc. - Reservoir design criteria - Principle hydraulic jack - Pipes, Packing and Seals.	**5**	**9.25**
2	Hydraulic Pumps and Motors: Various types of pumps and motors like Gear type,Piston type ,(radial &axial),Vane type (intra vane etc.) - Selection criteria for a specific application like Injection molding machines, Extrution,Blow molding etc. - Working principles and Performance.Definitations like Vol. efficiency, Rating (Temp. And pressure); Displacement.	**10**	**18.51**
3	Hydraulic valves:Types - Classification - Details of pressure control - Flow control ; Methods of flow control, Meter in, Meter out, Bleed off, Flow control valves like pressure compensated and non pressure compensated in detail with applications. Directional control valves; One way (check valves) of various types inline, right angle, restriction, pilot operated etc., two way valves rotary type, spool type, operating controls, spool central conditions, deceleration valves. Pressure controls - relief valves of types simple and compound, venting and relief valves, unloading valves, sequence valves and its applications, counter balance valve, brake valve, pressure reducing valves like direct acting and pilot operated etc. Principles of operation - Application in molding machines	**10**	**18.51**
4	Accumulators and Pressure Intensifiers: Types like weight loaded, spring loaded, gas charge with and without separator, piston type - with advantages and limitations and applications - intensifiers - its purpose, type like single acting and double acting, applications with various circuits.	**5**	**9.25**
5	Servo valves:-Introduction - Construction and its mechanism –Various types of valves like Mechanical , Electrohydraulic, single stage/two	**9**	**16.67**

	stage spool type, High performance servo valves with torque motors , Its application in industries		
6	Proportional Hydraulics : Introduction and Principle of Proportional Valves , Proportional Directional control/Pressure control and Flow control valves, Solenoid valves.,etc. Importance of Proportional hydraulics in current scenario	**5**	**9.25**
7	Pneumatics in Plastic Industry : Applications, types of valves, principles and comparison with hydraulic systems	**10**	**18.51**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
20%	20%	20%	20%	20%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Industrial Hydraulics Manual like Vickers
2. Hydraulics Manual by Rexroth
3. Injection Moulding – Theory and Practice by I.Rubin

Course Outcomes:

After successful completion of the course students should be able to:

1. Read the Hydraulic circuits
2. Identify the components from symbols
3. Recommend suitable circuits for specific applications

List of Experiments:

1. To Study the components of a typical hydraulic tank .
2. To study the various types of pumps used in plastic industry
3. To study the motors used in hydraulic systems
4. To study the directional control valves used in hydraulic circuits
5. To study the pressure control valves used in hydraulic ciscuits
6. To understand the functioning of accumulator
7. To understand the operation of Pressure Intensifier
8. To study flow control valves
9. To read an actual hydraulic circuit
10. To read an actual pneumatic circuit.

Design based Problems (DP)/Open Ended Problem:

1. Design a hydraulic circuit for operation of cylinder.
2. Design a hydraulic circuit for rotation of motor in injection moulding machine
3. Design a hydraulic circuit for opening of mould.
4. Design a pneumatic circuit for movement of robot to pick up moulded part from mould

Major Equipment: Hydraulic trainer kit with all valves, motors and pump.
Pneumatic trainer kit with all features

List of Open Source Software/learning website: www.wikipedia.org

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.