

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

COURSE TITLE: HYDRAULIC & PNEUMATIC SYSTEMS

(Code: 3342303)

Diploma Programme in which this course is offered	Semester in which offered
Plastic Engineering	4 th Semester

1. RATIONALE

A Plastic Diploma engineer has to supervise operations and maintenance of various molding machines like injection molding, blow molding, thermoforming, extruder, rotational molding. This competency requires the knowledge of construction and working of different components of hydraulic and pneumatic systems. Hence the course has been designed to develop this competency and its associated cognitive, practical and affective domain learning outcomes.

2. COMPETENCY

The course should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Identify and solve various Hydraulic and Pneumatic problems.**

3. COURSE OBJECTIVES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Draw symbols used in hydraulic systems.
- ii. Operate different types of valves used in hydraulic systems
- iii. Classify the valves used in hydraulic systems.
- iv. Maintain different valves and auxiliaries.
- v. Assemble pumps and motors to rectify problems.
- vi. Develop efficient hydraulic circuits.
- vii. Maintain the pneumatic and hydraulic system

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit
ESE - End Semester Examination; PA - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Basic Concepts of Hydraulics	1a. Define various concepts of hydraulics.	1.1 Introduction & Definitions of important terms like Hydraulics, Pressure, Force, Vacuum etc. 1.2 Pascal's Law and its Application to Hydraulics 1.3 Bernoulli's Principle 1.4 Hydraulic Jack 1.5 Hydraulic Symbols 1.6 Advantages and Disadvantages of Hydraulic System. 1.7 Hydraulic Oil 1.7.1 Purpose of Hydraulic Oil 1.7.2 Ideal Characteristics of Hydraulic Oil 1.7.3 Maintenance of Hydraulic Oil
Unit- II Accessories of Hydraulic System	2a. Classify the accessories use in hydraulic system	2.1 Connectors 2.1.1 Steel pipe 2.1.2 Tubing 2.1.3 Hose 2.2 Gauges 2.3 Packing & Seals 2.4 Filters & Strainers 2.5 Hydraulic Tank
Unit – III Hydraulic Valves And Auxiliaries	3a. Identify various valves and auxiliaries. 3b. Rectify the problems.	3.1 Directional Control Valves 3.2 Pressure Control Valves 3.3 Flow Control Valves 3.4 Pressure Intensifiers 3.5 Accumulators 3.6 Cartridge Valves
Unit – IV Hydraulic Pumps and Motors	4a. Describe the constructional details of pumps and motors. 4b. Identify the problems.	4.1 Pump Specifications 4.2 Construction & Working of 4.2.1 Gear Pump 4.2.2 Vane Pump 4.2.3 Radial Piston Pump 4.3 Pump Maintenance & Trouble Shooting 4.4 Hydraulic Motor Specifications 4.5 Construction & Working of 4.5.1 Gear Motor

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		4.5.2 Vane Motor 4.5.3 Radial Piston Motor
Unit – V Hydraulic Circuits	5a Classify the hydraulic circuits. 5b Develop Hydraulic Circuits.	5.1 Clamp Control Circuit 5.2 Injection Control Circuit 5.3 Reciprocating Screw Circuit 5.4 Oil Filtration Circuit 5.5 Deceleration Circuit 5.6 Prefill Circuit 5.7 Hydraulic Motor Circuit 5.8 Hi-Low Pump Circuit
Unit – VI Pneumatics	6a. Identify various components of pneumatic system. 6b. Differentiate pneumatic and hydraulic system.	6.1 Pneumatics 6.2 Comparison with Hydraulic System 6.3 Air Compressors: Single Acting and Double Acting 6.4 Components of Pneumatic System 6.5 Air receiver and pressure control 6.6 Stages of Air Treatment 6.6.1 Intercooler 6.6.2 Lubricator 6.6.3 Filter 6.6.4 Air dryer 6.7 Pneumatic Circuit for Plastic Processing Machine

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basic Concepts of Hydraulics	8	4	6	4	14
II	Accessories of Hydraulic System	5	3	4	0	7
III	Hydraulic Valves And Auxiliaries	12	7	7	7	21
IV	Hydraulic Pumps and Motors	5	2	3	2	7
V	Hydraulic Circuits	8	0	7	7	14
VI	Pneumatics	4	3	4	0	7
	Total Hrs	42	19	31	20	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's Revised 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.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

S. No.	Unit Number	Practical/Exercise (Outcomes' in Psychomotor Domain)	Approx Hours Reqd
1	I	Draw graphical symbols.	2
2	I	Demonstrate application of Pascal's law in hydraulic system.	2
3	II	Demonstrate various accessories and their uses in hydraulic system.	2
4	III	Demonstrate use of directional control valves	4
5	III	Demonstrate use of pressure control valves.	4
6	III	Demonstrate use of pressure intensifier.	2
7	III	Demonstrate application of flow control valves.	2
8	IV	Demonstrate applications of various types of pumps.	2
9	IV	Demonstrate use of hydraulic motors.	2
10	V	Demonstrate application of injection control circuit.	2
11	V	Demonstrate use of clamp control and reciprocating screw circuits.	2
12	VI	Demonstrate application of single stage compressors.	2
TOTAL			28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Students will prepare chart of different hydraulic symbols.
- ii. Students will collect information related troubleshooting various problems.
- iii. Students will search animations on internet for understanding functioning of various hydraulic and pneumatic components.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

Show video/animation films depicting working principles, constructional features and maintenance procedures of different hydraulic and pneumatic devices and systems.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No.	Title Of Book	Authors	Publication
1	Industrial Hydraulic Manual	-	Vickers (Second Edition)
2	Injection Moulding	Irvin I. Rubin	Wiley
3	Hydraulics and Pneumatics	Andrew Parr	Elsevier (Third Edition)
4	Injection Moulding Machine	Whelan	Elsevier Applied Science
5	Hydraulic and Pneumatic Power and Control	Franklin D. Yeaple	McGraw-Hill

B. List of major equipment/instruments

- i. Hydraulic Jack
- ii. Hydraulic Trainer

C. List of Software/Learning Websites

- i. www.redoaksys.com (for animations)
- ii. www.boschrexroth.com
- iii. www.eaton.in (Vickers)
- iv. www.compair.com/products/compressor_training_animations.aspx

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics:

- **Prof. A. S. Amin**, Lecturer in Plastic Engineering, Govt. polytechnic, Ahmedabad
- **Prof. J. R. Desai**, Lecturer in Plastic Engineering, Govt. polytechnic, Valsad
- **Prof. M. K. Thakarar**, Lecturer in Plastic Engineering, Govt. polytechnic, Valsad
- **Prof. B. I. Oza**, Lecturer in Plastic Engineering, Govt. polytechnic, Ahmedabad
- **Prof. N. C. Suvagya**, Lecturer in Plastic Engineering, G.P., Chhotaudepur

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Abhilash Thakur**, Associate Professor, Department of Applied Sciences
- **Dr. Bashirullah Shaikh**, Assistant Professor, Department of Applied Sciences