GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Hydraulic and Pneumatic Devices (Elective-II)**
Subject Code: **2361917**

Sr. No.	Subject Content	Hrs.
1	**CONTROL SYSTEMS.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Hydraulic and Pneumatic Devices (HPD). 1.3 Need of attitude, knowledge & skill required for application of HPD. 1.4 Control system-concept, definition , need, important terminology used. 1.5 Open loop and close loop control systems-block diagrams, differences and applications. 1.6 Servo control system-concept and application.	3
2	**FUNDAMENTALS OF HYRAULICS.** 2.1 Hydrostatic and hydrodynamic-concept and definitions. 2.2 Laws governing fluid flows-Pascal's law, continuity equation and Bernoulli's theorem. 2.3 Flow through pipes-types, pressure drop in pipes. 2.4 Working fluids used in hydraulic systems-types, properties, designation, standards and selection criteria. 2.5 Hydraulic systems-concept, application areas, advantages and limitations.	3
3	**HYDRAULIC ELEMENTS.** 3.1 Hydraulic pipes-types, materials, designations and standards, properties, pressure ratings and selection criteria. 3.2 Piping layout – concept, guiding rules/norms/traditions. 3.3 Hydraulic pump- types, construction, working, mounting methods, applications and selection criteria. 3.4 Control valves – types, designations, standards, working, mounting methods, applications and selection criteria. 3.5 Actuators- types, designations, standards, working, mounting methods, applications, synchronization and selection criteria. 3.6 Other elements, fittings and accessories-types (such as strainers, filters, distributors, manifold, accumulator, coolers, heat exchangers, hoses, connectors, oil reservoir, oil purifier, oil level and pressure indicators, seals, etc.), designations, standards, working, mounting methods, applications and selection criteria.	5

	Note: Application type question/s of 4-6 marks out of 70.	
4	**HYDRAULIC CIRCUIT.** 4.1 Concept, meaning and ISO symbols used. 4.2 Basic hydraulic circuits-types, circuit diagrams, working and applications. 4.3 Logic circuits-types, symbols and truth tables. 4.4 Guiding rules/norms/steps/methods for designing hydraulic circuit. 4.5 Simple circuit design(at least two design based on given problems/situation and based on selection and arrangement of elements)-circuit diagram, list of elements with specifications, working, metering in and metering out control circuits. **Note**: Application type question/s (designing simple circuit)of 4-6 marks out of 70.	6
5	**HYDRAULIC DEVICES, INSTALLATION AND MAINTENANCE.** 5.1 Hydraulic devices-types(automotive hydraulic brake , material handling trolley/forklift, power pack, hydraulic jack, automotive power steering), working diagram, hydraulic circuit, working, major elements and their specifications, controls, performance variables/criteria, applications, general guidelines for operation. 5.2 Installation of hydraulic devices (covered in 5.1 above)-need, pre-preparation, connection methods for hydraulic circuit, procedure and testing. 5.3 Common troubles ,its causes and preventive/post remedial actions for hydraulic devices covered in 5.1 above. 5.4 Need for preventive maintenance and maintenance schedule for hydraulic devices, general guidelines for maintenance. 5.5 Critical spares and their need/importance for their stock for hydraulic devices. 5.6 Instruments/methods for common fault finding. **Note**: Application type question/s of 4-5 marks out of 70.	5
6	**FUNDAMENTALS OF PNEUMATICS.** 6.1 Compressible fluid flow-properties, applicable laws(Boyel's, Charles', Lussac's combined) , mass flow rate. 6.2 Compressible fluids-types, properties and applications. 6.3 Pneumatic systems-advantages and limitations.	2
7	**PNEUMATIC ELEMENTS.** 7.1 Pipe-materials, types, standards and designations, properties, applications. 7.2 Piping layout-concept, loop systems, guiding rules/norms/traditions,	5

	pressure drop. 7.3 Air compressor-types and selection criteria. 7.4 Air receiver-specification, working, capacity control. 7.5 Driers-types, working and selection criteria. 7.6 Pneumatic cylinders-types, cushion assemblies, types of mounts, construction materials, lubrication, installation and maintenance. 7.7 Air motors-types and working. 7.8 Pneumatic valves-types, standards and designations, working, mounting methods, applications and selection criteria. 7.9 Other fittings/elements and accessories-types and sub-types(such as filters, pressure regulator, lubricator, mufflers), working, standards and designations applications and selection criteria. **Note**: Application type question/s of 4-6 marks out of 70.	
8	**PNEUMATIC CIRCUIT.** 8.1 Concept, meaning and ISO symbols used. 8.2 Guiding rules/norms/steps/methods for designing pneumatic circuit. 8.3 Basic pneumatic circuits- types, circuit diagrams, working and applications. 8.4 Simple circuit design(at least two design based on given problems/situation and based on selection and arrangement of elements)-circuit diagram, list of elements with specifications and working. **Note**: Application type question/s (designing simple circuit)of 4-6 marks out of 70.	6
9	**PNEUMATIC DEVICES, INSTALLATION AND MAINTENANCE.** 9.1 Pneumatic devices-types,(pneumatic brake, air suspension system of automotive, pneumatic drill) working diagram, hydraulic circuit, working, major elements and their specifications, controls, performance variables/criteria, applications, general guidelines for operation. 9.2 Safety and cleanliness for pneumatic devices. 9.3 Installation of pneumatic devices mentioned at 9.1 above,- need, pre-preparation connection method for pneumatic circuit. 9.4 Common troubles ,its causes and preventive/post remedial actions for pneumatic devices covered in 9.1 above. 9.5 Need for preventive maintenance and maintenance schedule for pneumatic devices, general guidelines for maintenance. 9.6 Critical spares and their need/importance for their stock for pneumatic devices. 9.7 Instruments/methods for common fault finding. **Note:** Application type question/s of 4-6 marks out of 70.	5

10	**HYDROPNEUMATICS.** 10.1 Introduction, elements, working and applications. 10.2 Types of feed. 10.3 Introduction to integration of hydraulic/pneumatic circuit with microprocessor/microcontroller/programmable logic controller (PLC).	2
	Total	**42**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1.	Mechatronics	W.Bolten (Pearsons)
2.	Hydraulic and Fluid mechanics and Hydraulic machineries	Abdula Sharrif and others (Dhanapatrai publications)
3.	Hydraulic & Hydraulic machineries	TTTI,Madras.
4.	Automatic process control	Donald P. Eckman(Wiely Eastern)
5.	Hydraulic machines including fluidics	Dr.Jagdishlal(metropolitine book co., NewDelhi.
6.	Industrial pneumatic control	Z.J.Lansky(Marcel Dekker,Inc.

Additional Reference Books:

1.	Fluid power design handbook	Frank Yeaple
2.	Process control	Peter Harriott(TMGH)