GUJARAT TECHNOLOGICAL UNIVERSITY

MECHATRONICS (47)

ADVANCE OIL HYDRAULIC AND PNEUMATIC SYSTEMS

SUBJECT CODE: 2724701

ME 2ND SEMESTER

Type of course: Engineering

Prerequisite: NA

Rationale: This course aims to present the oil hydraulic and pneumatic systems to advances the students. This course will offer the real time automation through Mechatronics engineer.

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)		
						ESE	OEP	PA	RP	
3	0	2#	4	70	30	20	10	10	10	150

Content:

Sr. No	Contents	Teaching Hrs	Weightage (%)
1	**Introduction:** Basics of Hydraulics, Major advantages and disadvantages, Comparison between mechanical, electrical, hydraulic andpneumatic power transmission.	3	6
2	**Hydraulic Oils, Fluid Properties and Filter:**Types, Properties, functions of hydraulic Oils, ISOViscosity grades, Classification-Mineral based, Fire resistant& BiodegradableOils, Filters, Contaminations, Filter rating, location of filter.	5	12
3	**Hydraulic Pumps, Valves and Actuators:**Classification of hydraulic pumps, Gear Pumps, Vane Pumps, Radial pistonPumps, Axial piston Pumps, Selection of Hydraulic Pumps, Direction control valves, Pressure control valves, Flow control valves, Non-returnvalves, Electro-Hydraulic Servo valves, Linear and Rotary Actuators, Hydrostatic Transmission Systems.	13	29
4	**Hydraulic system Accessories and Design of hydraulic circuits:**Reservoirs, Accumulators, Heating & cooling devices, Basic hydraulic circuits, Industrial hydraulic circuits, Power losses in flow control circuits.	7	15
5	**Introduction to Pneumatic systems, Air Compressor, Service Unit, pneumatic actuators and Pneumatic valves:**Basic Requirements for Pneumatic System, Applications, Types & Selection criteria for Air Compressors, Air receiver, FRL unit, Air filter, Pressure regulator and Lubricator, Types of Pneumatic Cylinders & Air motors, Cushion assembly, Pneumatic Direction control valves, Quick exhaust, Time delay, Shuttle and Twin pressure valves.	11	24
6	**Pneumatic circuits:**Basic pneumatic circuits, Conventional method, Cascademethod.	2	5
7	**Electro-Pneumatics and Electro Hydraulics:**Overview and applications, System components, Development of single andmultiple Actuator Circuits.	4	9

Reference Books:

1. S R Majumdar, Oil Hydraulic Systems Tata McGraw-Hill
2. S R Majumdar Pneumatic Systems Tata McGraw-Hill
3. John Pippenger & Taylor Hicks Industrial Hydraulics McGraw-Hill
4. Anthony Esposito, Fluid Power,Prentice Hall
5. Andrew Parr, Hydraulics & Pneumatics , Jaico Publications

Course Outcomes:

After learning the course the students should be able to

1. Understand the knowledge about hydraulic and pneumatic systems.
2. Understand about behavior of working media in hydraulic and pneumatic systems.
3. Control of motions through hydraulic and pneumatic systems.
4. Automation by integration of electrical and mechanical components in hydraulic and pneumatic systems.

List of Experiments:

1. Introduction to graphical symbols as per DIN-ISO: 1219.
2. To understand working and construction of hydraulic components and basic circuits with using of Basic Hydraulic software by Bosch Web Trainer.
3. To understand working and construction of Pneumatic components and basic circuits with using of Basic Pneumatic software by Bosch Web Trainer.
4. Construction of Basic hydraulic circuit.
5. Speed control circuits (Meter-In, Meter-Out and Bypass circuits).
6. Electro hydraulic circuit-Speed control of double acting hydraulic cylinder.
7. Electro Hydraulic circuit-Sequential operation through Limit Switches.
8. To understand use of Logic Elements.
9. To understand use of Quick exhaust, Flow control and Time Delay valve.
10. Control of Double acting pneumatic cylinder.
11. To illustrate pneumatic circuit involving two cylinders.
12. To control double acting pneumatic cylinder through 5/2 solenoid operated DCV and B&R controller**.**

Major Equipments:

1. Hydraulic trainer
2. Pneumatic trainer
3. PLC
4. Web trainer for Basic hydraulics
5. Web Trainer for Basic Pneumatics
6. Automation Studio

Open ended problem

Student may be given a task to exhibit the knowledge of the course studied during the academic year.

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.