

3/4 B.Tech. SIXTH SEMESTER

ME6T6A

INDUSTRIAL HYDRAULICS & PNEUMATICS

Credits: 4

Lecture:- 4 periods/week

Internal assessment: 30marks

Practice: --

Semester end examination: 70 marks

Objectives:

1. Define basic concepts of fluid power systems, actuators, hydraulic motors and hydraulic elements
2. Design hydraulic circuits
3. Explain various types of accumulators, intensifiers, pneumatic and electro-pneumatic systems

Learning outcomes:

At the end of course the students will be able to:

1. Explain the fundamentals of fluid power systems, hydraulics systems and its components.
2. Describe various types of fluid power actuators, hydraulic motors and hydraulic elements in the design of circuits.
3. Explain various types of accumulators and intensifiers.
4. Design hydraulic circuits
5. Illustrate the operation of pneumatic and electro-pneumatic systems
6. Discuss the applicability of servo systems and trouble shooting in fluid power systems.

Pre-Requisite

Fluid mechanics and Hydraulic machinery, Basic electronics and Mechanics

UNIT-I

FUNDAMENTALS OF FLUID POWER SYSTEMS:

Introduction- types advantages, disadvantages & applications- fluid characteristics- terminologies used in fluid power- hydraulic symbols- hydraulic systems and components- sources- pumping theory- gear, vane & piston pumps.

UNIT-II

FLUID POWER ACTUATORS:

Introduction- hydraulic actuators- hydraulic cylinders- types, construction, specifications and special types. Hydraulic motors- Working principle- selection criteria for various types- Hydraulic motors in circuits- Formulae- numerical problems.

UNIT-III

HYDRAULIC ELEMENTS IN THE DESIGN OF CIRCUITS-

Introduction- control elements- direction control valve- check valve- Pressure control valves- Relief valve- throttle valve- Temperature & Pressure compensation- locations of flow control valve.

UNIT-IV

ACCUMULATORS & INTENSIFIERS:

Types, size & function of accumulators- application & circuits of accumulators- Intensifiers- circuit & Applications.

UNIT-V

DESIGN & DRAWING OF HYDRAULIC CIRCUITS-

Introduction- case study & specifications- method of drawing a hydraulic circuit- hydraulic cylinder- quick return of a hydraulic cylinder.

UNIT-VI

PNEUMATIC SYSTEMS-

Introduction- symbols used- concepts & components- comparison- types & specifications of compressors- arrangement of a complete pneumatic system- compressed air behavior- understanding pneumatic circuits- direction control valves.

UNIT-VII

ELECTRO PNEUMATICS-

Introduction- Pilot operated solenoid valve- electrical connections to solenoids- electro pneumatic circuit switches- relays- solenoids- P.E. converter- concept of latching

UNIT-VIII

APPLICATIONS-

Servo systems- Introduction- closed loop, hydro-mechanical and electro hydraulic- conventional and proportional valves- characteristics of proportional and servo valves- PLC applications in fluid power- selected pneumatic/electro pneumatic circuit problems- failure and trouble shooting in fluid power systems.

Learning resources

Text books:

1. S.Ilango and .Soundararajan “Introduction to Hydraulics and Pneumatics”, PHI,New Delhi,
2. T.Sunder Selwyn &R.Jayendiran “Applied Hydraulics and pneumatics”, Anuradha publications

Reference books:

1. S.R.Majumdar, “Oil Hydraulic Systems” , McGrawHill companies
2. Majumdar, “Pneumatic Systems: Principle and Maintenance”, McGrawHil.