DESIGN OF FLUID POWER SYSTEMS

Subject Code: 13ME2115

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Pre requisites: Fluid mechanics, Hydraulic machinery

Course Educational Objectives:

To make the student understand

1. different components of hydraulic and pneumatic power systems such as pumps, motors, direction control valves
2. design of hydraulic and pneumatic circuits for selected industrial applications
3. electrical controls in fluid power systems

Course Outcomes:

The student will be able to

1. select suitable pump, motor and other components for a specified application
2. design the circuit for a given application and execute the same in industry
3. attend to maintenance and trouble shooting of fluid power systems in industry

UNIT-I

Introduction to hydraulic systems and ancillary hydraulic systems: Introduction to hydraulic systems, design and construction of hydraulic reservoir and sizing, gravity type, spring-loaded and gas loaded type accumulators

Hydraulic pumps: Gear pumps, vane pumps and piston pumps, sizing of hydraulic pumps, selection of hydraulic pumps

UNIT-II

Hydraulic control valves: direction control valves, pressure control valves, flow control valves, servo valves

Hydraulic cylinders and motors: hydraulic cylinder operation and cylinder mountings - hydraulic cylinder design and cushions, hydraulic motors - gear, vane and piston motors – hydraulic motor theoretical torque, power and flow rate - hydraulic motor performance - hydrostatic transmissions

UNIT-III

Hydraulic circuit design and analysis: Control of single and double acting cylinders, regenerative and pump unloading circuit, hydraulic cylinder sequence and synchronizing circuits, speed control of hydraulic cylinder and motor, hydraulic motor breaking system

UNIT-IV

Pneumatics: Basic requirements for pneumatic system – air compressor – pneumatic cylinders and air motors – pneumatic valves - basic pneumatic circuits

Maintenance and trouble shooting of hydraulic and pneumatic systems: oxidation and corrosion of hydraulic fluids - maintaining and disposing of fluids - wear of moving parts due to solid particle contamination of the fluid - problems caused by gases in hydraulic fluids - troubleshooting of hydraulic system - maintenance and troubleshooting of pneumatic systems

UNIT – V

Electrical controls in fluid power systems: Basic electrical devices – electrical components, electrical controls in pneumatic systems, examples of simple electro-pneumatic circuits with solenoid operated direction control valve for the control of single and double-acting cylinders

TEXT BOOKS:

1. Anthony Esposito, "*Fluid Power with Applications*" Sixth Edition, Pearson Education, Inc.New Delhi, 2003.
2. S.R.Majumdar, "*Pneumatic Systems – Principles and Maintenance*", Tata McGraw Hill Publishing Company Limited, New Delhi, 1995

REFERENCES:

1. S.R.Majumdar, " *Oil Hydraulic Systems – Principles and Maintenance*", Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
2. Andrew Parr, "*Hydraulics and Pneumatics – A Technician's and Engineer's Guide*", NinethJaico Impression, Jaico Publishing House, Mumbai, 2005
3. www.pneumatics.com
4. www.fluidpower.com.tw