ME656: Oil Hydraulics and Pneumatics

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Course Content:

1. **Introduction to Power Transmission Systems:**
   Functional requirements of a power transmission, how these requirements can be fulfilled by various power transmission systems like mechanical, oil hydraulic, pneumatic, electrical or their combinations; Fundamentals of oil hydraulics and pneumatics, Control functions of oil hydraulic systems; Comparison between various power transmission systems, Applications of oil hydraulic and pneumatic power transmissions.

2. **Hydraulic & Pneumatic Symbols as per ISO/ANSI, Properties and selection of hydraulic fluids, Filtration, Hydraulic reservoirs and accumulators, Seals and packing’s.**

3. **Oil Hydraulic Pumps and Actuators:**
   Construction, working principle and operation of rotary & reciprocating pumps like gear, vane, generated-rotor, screw, axial piston, radial piston
   Pump characteristics, Specifications, sizing and selection of pumps
   Linear actuators like ram type, telescopic and single acting/double acting, types of their constructions, types of mountings, cylinder materials, cushioning of hydraulic cylinders, Rotary actuators, Specifications, sizing and selection of actuators.

4. **Control Valves:**
   Construction, working principle and operation of direction control valves, flow control valves and pressure control valves including non-return, pressure relief, compound pilot operated pressure relief, safety, sequence, pressure reducing, unloading, counterbalance valves. Different types of center positions of DCVs, Methods of actuation of DCVs.
5 **Hydraulic and Pneumatic Controllers used in Feedback Control systems:**

Construction, working principle and operation of proportional and servo control valves including servo-type DCV like nozzle valve, flapper type valve, mechanical servo valve, single and double stage servo valves; Applications of servomotor systems in feedback control systems.

6 **Hydraulic Circuits:**

Reciprocation, quick return, sequencing, flow control circuits, synchronizing circuits, accumulator circuits, industrial circuits like press circuits, machine tool circuits, forklift, earth mover circuits - design and selection of components.

7 **Pneumatic Systems and Circuits:**

Pneumatic fundamentals, Construction, working principle and operation of pneumatic power transmission system components like Power source, FRL unit, Actuators and control valves like DCV, FCV, PCV, time delay, quick exhaust, twin pressure, shuttle; Pneumatic circuits like reciprocating circuits, switching circuits, sequential circuits, hydro pneumatic circuits, solenoid operated circuits, simple logic circuits, Programmable logic circuits using PLC/Microcontroller and their applications, Selection, sizing and specifications of pneumatic components.

**Total Hrs.** 42

**Reference Books:**

1. John Pippenger, “*Industrial Hydraulics*”, Tyler Hicks, McGraw Hill.