Mechanical Engineering Dept. Department

Syllabus
ME 436: Fluid Power Systems (3-0-3)

Course Catalog Description:

Study of fluid power systems as used in industrial applications to transmit power by the flow of hydraulic fluids. Fluid power circuit diagrams including components, such as, valves, pumps, actuators, filters, intensifiers, reservoirs and accumulators. Design of positive displacement pumps. Analysis of fluid leakage, hydrostatic transmissions, hydraulic stiffness, and performance of positive displacement pumps and actuators.

Course Pre-requisites:

- ME 311: Fluid Mechanics

Course Objectives:

1. Introduce students to basic fundamentals required to understand, analyze and design the main components commonly used in fluid power systems.
2. Make students familiar with graphical symbols conforming to international standards for various fluid power components.
3. Provide students with a working knowledge of components forming hydraulic circuits. 4. Introduce students to some safety considerations in hydraulic systems.
4. Introduce students to modeling of leakage problem in fluid-power components and computer-aided calculations of leakage in pumps and motors.

Course Learning Outcomes:

CLO1. Demonstrate an understanding of various components of fluid power systems and how they work together in a typical fluid-power system

CLO2. Read hydraulic diagrams in accordance with ISO or ANSI standards.

CLO3. Recognize different types of pumps and actuators, their use in real life, their theoretical performance and their actual performance.

CLO4. Design positive-displacement pumps for given discharge and pressure rise.

CLO5. Recognize different types of valves and their use in fluid power systems to control direction of flow, fluid pressure (system load) and flow rate (operation speed).

CLO6. Compute the leakage from cylinders, motors and pumps

CLO7. Demonstrate an understanding of analysis and design of hydraulic circuits and some safety precautions in such circuits.

Learning Resources:

- Anthony Esposito, FLUID POWER WITH APPLICATIONS, 7th edition, Prentice Hall Inc., 2009.
- Michael J. Pinches and John G. Ashby, Power Hydraulics Prentice Hall Inc., 1988

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
second major exam	12	20.0%
project	14	10.0%
Final exam	15	30.0%
HWs	2	10.0%
Quizzes	3	10.0%
First Major Exam	6	20.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introduction, applications of fluid power, standard symbols and some basic circuits, directional, pressure and flow control valves.
2	Introduction, applications of fluid power, standard symbols and some basic circuits, directional, pressure and flow control valves. (Continue)
3	Introduction, applications of fluid power, standard symbols and some basic circuits, directional, pressure and flow control valves. (Continue)
	compressibility, hydraulic stiffness, natural frequency of fluid- power systems, and other important definitions.
4	compressibility, hydraulic stiffness, natural frequency of fluid- power systems, and other important definitions. (Continue)
5	Analysis of positive displacement pumps and their ideal and actual performance.
6	Analysis of positive displacement pumps and their ideal and actual performance. (Continue)
7	Design procedure for positive displacement pumps.
8	Design procedure for positive displacement pumps. (Continue)
9	Efficiencies of pumps and motors and Hydrostatic transmissions analysis and design
10	Efficiencies of pumps and motors and Hydrostatic transmissions analysis and design (Continue)
	Cylinders: types, cushioning, usage and control, design and related applied circuits.
11	Cylinders: types, cushioning, usage and control, design and related applied circuits. (Continue)
12	Cylinders: types, cushioning, usage and control, design and related applied circuits. (Continue)
	Leakage analysis and modeling.

Week#	Topics
13	Leakage analysis and modeling. (Continue)
14	Accumulators and intensifiers analysis and design and some related circuits.
	Some applied circuits.
15	Some applied circuits. (Continue)
	tests