Mechanical Engineering Dept. Department

Syllabus
ME 417: Mechanics of Machines (3-0-3)

Course Catalog Description:

Synthesis and graphical method of analysis of plane mechanisms: kinematics and kinetics of 2D mechanisms. Design of cam-follower mechanism. Static and dynamic balancing. Introduction to kinematics of basic industrial robots.

Course Pre-requisites:

- ME 201: Dynamics

Course Objectives:

1. Introduce students to mechanisms and their application in machines
2. Introduce students to tools to analyze kinematics and kinetics of machinery
3. Introduce students to problems in machinery such as balancing and vibration

Course Learning Outcomes:

CLO1. gain clear knowledge about some of the basic mechanisms, such as four-bar and slider crank linkages; demonstrate a clear understanding of the physical meaning of degree of freedom; gain the ability to identify mechanical joints of mechanisms; and to visualize their mobility

CLO2. demonstrate the ability to draw the kinematic diagrams of actual mechanisms and determine their mobility, and perform kinematic design of Grashof's four-bar linkages.

CLO3. demonstrate the ability to determine the position parameters, velocities, and accelerations (linear and angular) of various planar mechanisms using both analytical complex number methods and graphical methods, and kinematics of basic industrial robots..

CLO4. perform static and dynamic force analyses, and solve for the forces and moments acting on the mechanism; including joint reaction forces, by applying Newton’s laws of motion and D’Alembert's principle; both analytically and graphically.

CLO5. demonstrate ability to construct various follower motion diagrams and understand the advantages and disadvantages of each type of motion; and to be able to design cam profiles for any given follower displacement using graphical methods.

CLO6. demonstrate a basic understanding of the balancing of rotating machinery

Learning Resources:

- Theory of Mechanisms and Machines, by: J. Uicker, G. Pennock, J. Shigly, Oxford University Press, International 5th Edition, 2018

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Homework	None	8.0%
Quizzes	None	10.0%
Project	None	7.0%
Major Exam 1	None	25.0%
Major Exam 2	None	25.0%
Final Exam	None	25.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introduction to mechanisms
2	Introduction to mechanisms (Continue)
3	Introduction to mechanisms (Continue)
	Analytical kinematic analysis of mechanisms
4	Analytical kinematic analysis of mechanisms (Continue)
5	Analytical kinematic analysis of mechanisms (Continue)
6	Graphical kinematic analysis of mechanisms
7	Graphical kinematic analysis of mechanisms (Continue)
8	Graphical kinematic analysis of mechanisms (Continue)
9	Graphical kinematic analysis of mechanisms (Continue)
	Static and dynamic force analyses of mechanisms using analytical and graphical methods
10	Static and dynamic force analyses of mechanisms using analytical and graphical methods (Continue)
11	Static and dynamic force analyses of mechanisms using analytical and graphical methods (Continue)
12	Static and dynamic force analyses of mechanisms using analytical and graphical methods (Continue)
	Cam motions and Dynamics
13	Cam motions and Dynamics (Continue)
14	Cam motions and Dynamics (Continue)
	Balancing of rotating machines

Week#	Topics
15	Balancing of rotating machines (Continue)