ME 317: Kinematics
Fall Semester Only

Type (check one): Required: √ Elective:

2010-2011 Catalog Data: A study of relative motion and geometry of machine parts and mechanisms without reference to force or mass. Graphical and analytical solutions for the displacement, velocity, and acceleration of planar mechanisms. General case of acceleration including Coriolis component. Computer programming and numerical techniques applied to velocity and acceleration analysis of cycles. *One semester; three credits.*

Prerequisites: ME 121, ME 202

Co-Requisites: None

Textbook: Robert L. Norton, *Design of Machinery - An Introduction to the Synthesis and Analysis of Mechanisms and Machines,* Fourth Edition, McGraw-Hill

Other Required Materials: None

Other References: None

Instructor: Dr. James Aflaki

Course Objectives:

1. Deepen understanding of kinematic analysis as an essential element of the design process
2. Develop mastery of analytical, graphical, and numerical methods for calculating kinematics of machine elements

Prerequisites by Topics:

1. Differential and integral calculus
2. Kinematics of particles and rigid bodies

Topics:

1. Overview: links, joints, degrees of freedom, mechanisms, structures
2. Spatial and planar mechanisms
3. Planar mechanisms: slider-crank, four-bar linkage, quick return, toggle mechanisms, pantographic mechanisms, etc.
4. Computer programming / modeling software
5. Displacement analysis: graphical methods, analytical solutions, numerical methods; complex variable methods; software and programming
6. Velocity analysis: graphical methods, analytical solutions, numerical methods; complex variable methods; software and programming
7. Acceleration analysis: as above, plus: accelerating reference frames, equivalent linkages
8. Introduction to gears and gear trains
9. Introduction to cam design

Class Schedule: Three 50-minute sessions per week

Prepared by: Dr. James Aflaki **Date:** August, 2010

Professional Component:
ME 317 – Kinematics

Category (check one)	_____Math/Basic Science __√__Engineering ____ General Education _____ Other
Design (check one)	____Significant ____Some __√__ None
Realistic Constraints (check all that apply)	____Economic ____Environmental ____Sustainability __√__Manufacturability ____Ethical ____Health & Safety ____Social ____Political

Relationship to Program Outcomes:

Check all that apply:

__√__(a) an ability to apply knowledge of mathematics, science, and engineering
____ (b) an ability to design and conduct experiments, as well as to analyze and interpret data
__√__(c) an ability to design a system, component, or process to meet desired needs
____ (d) an ability to function on multi-disciplinary teams
__√__(e) an ability to identify, formulate, and solve engineering problems
____ (f) an understanding of professional and ethical responsibility
____ (g) an ability to communicate effectively
____ (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
____ (i) a recognition of the need for and an ability to engage in life-long learning
____ (j) a knowledge of contemporary issues
__√__(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice