

ME 317: Kinematics of Machines
Fall Semester Only

Type (check one): Required: Elective:

2005-2006 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: R.L. Norton, *Design of Machinery - An Introduction to the Synthesis and Analysis of Mechanisms and Machines*, Third Edition, McGraw-Hill, 2004.

Other Required Materials: None

Other References: None

Instructor: Dr. Yeu-Sheng Paul Shiue, Professor of Mechanical Engineering

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. Yeu-Sheng Paul Shiue **Date:** 22-Aug-05

**Professional Component:
ME 317 – Kinematics of Machines**

Category (check one)	<input type="checkbox"/> Math/Basic Science <input checked="" type="checkbox"/> Engineering <input type="checkbox"/> General Education <input type="checkbox"/> Other
Design (check one)	<input type="checkbox"/> Significant <input type="checkbox"/> Some <input checked="" type="checkbox"/> None
Realistic Constraints (check all that apply)	<input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input type="checkbox"/> Sustainability <input checked="" type="checkbox"/> Manufacturability <input type="checkbox"/> Ethical <input type="checkbox"/> Health & Safety <input type="checkbox"/> Social <input type="checkbox"/> 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