1/9 2000

WICHITA STATE UNIVERSITY
MECHANICAL ENGINEERING DEPARTMENT

DESIGN OF MACHINERY
ME 339 – SPRING 2000

INSTRUCTOR: Bassam Alshaer
101J - Ext. 6383

CLASS TIME: ~~8:20 - 9:30 a.m.~~, MW, 102 EB   8:15 - 9:25 a.m. MW

OFFICE HOURS: Will be announced!

TEXT: Design of Machinery - An Introduction to the Synthesis and Analysis of Mechanisms and Machines, R. L. Norton, McGraw-Hill.

REFERENCES
1. Mechanism Design: Analysis and Synthesis (Volume 1), A.G. Erdman and G.N. Sandor, Prentice Hall.
2. Theory of Machines and Mechanisms, J.E. Shigley and J.J. Uicker, McGraw-Hill.
3. Kinematics and Dynamics of Machines, G.H. Martin, 2nd Edition, McGraw-Hill.

GOALS
1. Understand the concepts of kinematics and dynamics in design of machinery.
2. Learn the use of computer-aided engineering as an approach in engineering design.
3. Learn the art of design process with real engineering problems in practice.

LECTURE TOPICS[1]
- Introduction
    - Design process
    - Degrees of freedom and mobility, Grubler and Kutzbach's equations
    - Fourbar linkage, Grashof's law
    - Slider-crank mechanism, Watt's and Stephen's sixbar mechanisms
    - Kinematic inversions, isomers, linkage transformations
    - Practical considerations in design

- Position Analysis
    - Vector loop closure
    - Graphical method
    - Analytical methods
    - Algebraic constraint equations
    - Complex number notation
    - Numerical procedures

- Computer Software
    - Programs description, modeling techniques, programs use in design

---

[1] The topics may not be covered in the order they appear. Additional topics may be covered or some deleted as necessary.

- **Mechanisms Design**
  - Linkage design/synthesis
  - Design of ~nction, path, and motion generators
  - Prescribed positions, precision points, and timing
  - Cognates, Cayley and Roberts diagrams
  - Design of dwell mechanisms
  - Analytical methods: Freudenstein's equation, Chebychev spacing

- **Velocity Analysis**
  - Angular velocity, velocity difference and relative velocity
  - Graphical methods: velocity polygons, instantaneous centers
  - Analytical methods: linear algebraic velocity equations, numerical procedures
  - Computer methods
  - Design considerations, small project

- **Acceleration Analysis**
  - normal and tangential accelerations
  - graphical method: acceleration polygons
  - analytical methods: linear algebraic acceleration equations, numerical procedures
  - computer methods
  - design considerations, small project

- **Dynamic Fundamentals**
  - Newton's laws of motion, d'Alembert principle, energy methods
  - Moments of inertia, radius of gyration, radius of percussion

- **Dynamic Force Analysis**
  - Kineto-static analysis
  - Graphical, analytical, and computer methods
  - Balancing

- **Cam Design**
  - S V A J diagrams
  - Harmonic, Cycloidal, Polynomial
  - Practical considerations in design

- **Design Projects**
  - Computer assignments and projects
  - Term design projects

GRADING SCHEME

Midterm Exam	30%
Final Exam	30%
Homework	10%
Computer and Design Projects	30%

NOTES:

For the reported work, use only 8 112 x 11 papers on one side. *No make-up exam will be given, and no late work is accepted.*