INME 4005 Mechanism Design Dr. Bob
Capstone Term Project Fall 2014

Due Tuesday, 11/25/14, in class **NO LATE ASSIGNMENTS WILL BE ACCEPTED!**

The goal of the project is to perform complete kinematics and dynamics analysis of a practical mechanism for one motion cycle. Each team or individual must choose a real-world mechanism for analysis in this project. Each team will choose a unique project. Guidelines: the mechanism must come from the real world; planar, 1-dof; not too simple or too complex; no gears or cams.

Specific steps to complete:

1. Find a real-world mechanism and approve it with Dr. Bob (first-come, first-approved, starting immediately, but the signup deadline is Tuesday 9/2/14).
2. Kinematic model of your mechanism: draw the kinematic diagram including the joint arrangements and measure or estimate the link lengths. Calculate the number of degrees-of-freedom. You must also specify the complete input motion (position, velocity, and acceleration of the input variable).
3. Perform complete position, velocity, and acceleration kinematics analysis for the entire range of motion given your kinematic model and input motion assumptions from above. Plot all results vs. the independent variable (joint angle for constant velocity input, otherwise use time). Include a point of interest for translational values (the most important point in the operation of your mechanism). Calculate the motion limits for your mechanism and check vs. your plots. You must use MATLAB to animate your mechanism to the screen for the full range of motion.
4. Completely state the inverse dynamics problem to solve.

Turn in an interim report on Tuesday 10/21/14, covering steps 1-4.

5. Estimate link masses, CGs, and mass moments of inertia. Perform complete inverse dynamics analysis (calculate driving input force/torque requirement given desired motion). Plot all results vs. the input value (or vs. time). Include shaking force and moment.
6. Choose a or b: a. Build a working hardware model of your mechanism or b. make a CAD animation of your mechanism.

Each team will present their results orally to the class on Tuesday 11/25/14 (assuming no hurricane delays) and the final report is due in class on the same day. We will treat these in-class presentations as a learning experience. Presentations are important and will form a part of your project grade. Plan ahead; use a professional PowerPoint presentation with plenty of graphical results.

Final Written Report Format (Include lots of images, photos, graphs, etc.)

Memo (serves as your abstract)
1. Introduction
2. Mechanism Description and Modeling
3. Analysis (derivations, etc.)
   - Kinematics
   - Dynamics
4. Results (MATLAB plots, etc.)
   - Kinematics
   - Dynamics
5. Discussion
6. Conclusions

Appendices (MATLAB code, hand calculations to check results, etc.)