ME/AE 5338, MAE 4301 Analytical and Computational Dynamics Spring 2014

- **Instructor**
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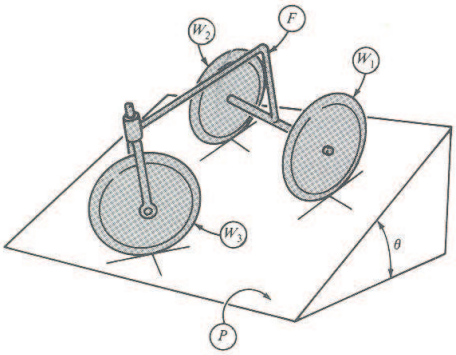
    Office hours: Wed. 10:15am-11:15am and by appointment



- **Course Specifics**
  - ME/AE 5338 Analytical and Computational Dynamics
  - T-TH 3:30-4:50pm
  - Woolf Hall Room 308
  - Web Site: elearn.uta.edu

- **Course Overview**

  The goal of this course is to provide students with the analytical and computational skills required to model and simulate simple and complex dynamic systems consisting of interconnected rigid bodies. The primary goal is to teach students how to model and generate the equations of motion for any system of rigid bodies. The secondary goal is to teach students how to use simulation and animation to check the correctness of the model.

  The approach to dynamics followed in this course is not a rehash or simple extension of what was taught in earlier undergraduate dynamics courses. It is a highly effective approach which makes complex problems, which would be difficult to model using methods commonly taught to undergraduates, quite simple to analyze. The course is based on one of the most powerful methods for modeling dynamic systems currently available. Knowledge of dynamic modeling, especially the approach taught in this course, is a highly valuable skill sought both by industry and academia. Thus the course is suitable for students seeking industry employment or considering graduate school after graduation. The course also makes extensive use of software tools which make it easier and less tedious to model complex systems. This software facilitates the generation of animations that allow the student to visualize the behavior predicted by the model. These animations are always interesting and fun to examine.

- **Student Learning Outcomes**

  By the end of this course students should be able to:

  - develop a dynamic model, the equations of motion, for a system of three-dimensional rigid bodies, which may be connected or not, and may be subject to constraints.
  - develop a numerical simulation of these systems using the appropriate software tools.
  - develop a simple animation of the system being examined.
  - use checking functions to determine the validity of the model they develop.

- **Course Content**

  Three dimensional, rigid, multibody kinematics and dynamics, Newton's second law, Euler's equations, Lagrange's equations, D'Alembert's Principle, Kane's Method, Work-Energy Theorem, Virtual work, Impulse-Momentum theory, Collisions, Discrete event systems, Numerical simulation and visualization, Model validity checking functions.

- **Course Materials**
  - **Textbooks and References**
    - *Optional* "Dynamics: Theory and Applications", Thomas R. Kane and David A. Levinson, McGraw-Hill Book Company, 1985.

    - *Optional* "Dynamics Online: Theory and Implementation with Autolev", Thomas R. Kane and David A. Levinson, 2009. Can be purchased from www.autolev.com.

  - **Software Used**

    - "*Autolev*" by Online Dynamics, for symbolic manipulation. Basically *Mathematica* for dynamics using syntax resembling *Matlab*. Software is available in the computer clusters located in Ransom Hall, Nedderman Hall, and the Engineering Lab Building.
    - "*Matlab*" by Mathworks, for general computation and animation. It is assumed that the student is familiar with this software.

- **Major Assignments and Examinations**

Midterm	April 27	3:30-4:50pm
Final Exam	May 8	2-4:30pm

  The final exam date and time cannot be changed, except in very extreme cases.

- **Grading Policy Options**

  There are two grading options for this course:

  - **Option 1**

    1. Homework (10%)
    2. Project (20%)
    3. Midterm (30%)
    4. Final Exam (40%)

  - **Option 2**

    1. Homework (30%)
    2. Midterm (30%)
    3. Final exam (40%)

- **Homework Policy**

  Collaboration on homework is encouraged. You may consult outside reference materials, other students, the teaching assistants, and/or the instructor. However, all solutions that are handed in should reflect your understanding of the subject matter at the time of writing.

- **Attendance Policy**

  Students are not penalized for not attending the lectures, but it is strongly advised that they do. Material is presented in the lectures which is not available in the textbook.

- **Grade Grievance Policy**

  Objections concerning the grading of homeworks and tests should be raised within one week after they are returned. After one week the grade is permanent.

- **Code of Conduct**

  - No persistent talking during lecture.
  - No newspaper reading during lecture.
  - No laptop computers should be open during lecture unless specifically requested by instructor.

- **Drop Policy**

  Refer to the University's drop policy.

- **Americans with Disabilities Act**

  The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112-The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of The Rehabilitation Act, here is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

  As a faculty member, I am required by law to provide "reasonable accommodation" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.uta.edu/disability. Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

- **Academic Integrity**

  All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

  I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

  I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

  Instructors may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents' Rule 50101, 2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

- **Student Support Services Available**

  The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

- **Electronic Communication Policy**

  UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation.

- **Student Feedback Survey**

  At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate.

- **Final Review Week**

  A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances;

and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.