ME363: System Dynamics - Spring 2008
Dept. of Mechanical, Aerospace & Biomedical Engineering
University of Tennessee - Knoxville
MWF 10:10am-11:00am @ Perkins 324 (Section 001)

Instructor: Dr. Dongjun Lee, 502 Dougherty Hall, djlee@utk.edu, 974-5309
Office hour: MWF 11:00am-12:00pm or by appointment

Teaching Assistant: TBA


Prerequisites: ME231 (Dynamics) and Math231 (Differential Equations I)

Course Introduction: Dynamic systems (with input and output) are ubiquitous in our everyday life, not confined only in the engineering domain: automobile with gas-pedal input and car-speed output, robot arm with joint-motor-torque input and arm-position output, and even pathological system with medicine-dose input and bacteria-number output, and stock-market with FBI-interests input and stock-price output, to name just a few. These seemingly-daunting systems are often captured well-enough by simple mathematical models, so called, linear time-invariant systems (i.e. system property does not change as time goes by with twice-larger input generating twice-large output). This course is one of the very first courses for the study in this direction, with main emphasis on mechanical systems (yet, ideas/concepts will be applicable to systems in other domains as well).

Course Objectives: Students will be able to 1) develop (simplified/linearized) mathematical models of dynamic systems in various application domains; 2) analyze and predict the systems’ behaviour in the time-domain, Laplace-domain and frequency-domain; and 3) design and analyze simple feedback controls for them.

Grading: Homework (total 6) 30%, Mid-Term Exam (2/20/08) 30%, Final Exam (4/30/08) 40%. Grading based on relative-scale (A 15%, B,B+ 50%, C,C+ 25%, D,F 10%) with possible fine-tune (up to 2-3% for each segment) to the instructor’s discretion.

Course Plan (tentative, R: readings)
1. Introduction and some functions (R: 1.1-1.3)
2. Mass-spring-damper system (R: Ch. 4)
3. Resistance-inductance-capacitance electrical system (R: 6.1, 6.2)
4. Hydraulic system (R: 7.1-7.4)
5. Technique for solving equation of motion (R: 3.1, 3.2)
6. Laplace-domain analysis and transfer function (R: Ch.3, 6.3)
7. Time-domain response of first and second-order systems (Ch. 8)
8. Frequency response and mechanical vibration analysis (Ch.9, 12.1-12.3)
9. Feedback control design in Laplace-domain (Ch.10)
Late Submission Policy: Homework is due before or at the beginning of the class on the same date. If you submit your assignment after the due time but still on the same date will have 50% deduction of the full score. If you submit your assignment on the next day of the due date or later, you will get zero point, so don’t do that.

For Students taking this ME363 instead of BME320: These BME students will take this course ME363 and receive 2 credits rather than 3 credits. To accommodate this credit-difference, works for these BME students will be reduced as follows: 1) from the above Course Plan, items 3, 4, and 9 will not be graded; 2) according to 1), number of homework and exam problems for these BME students will be reduced approximately to 2/3 of that of other students; and 3) these BME students will be graded only among themselves (still the relative grading scaled mentioned above in Grading will be used among themselves). Even so, these BME students will take the same exams (with less number of problems) and do the same homework (also, with less number of problems) along the same time schedule just like as the other students of the class. Due to this reason, attendance of ME363 throughout the semester, which is equivalent to the BME320 class attendance, is strongly recommended.

Student Conduct Standards: Students are expected to perform this course with a high academic standard, honesty, and integrity. More precisely, you are expected and required to follow the University’s Honor Statement, which can be found in the Hiltopics, the student handbook: “An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity”. Any academic dishonesty found in this course will lead to “F”-grade of the course as well as his/her case will be reported to an Academic Review Board by notifying the administrative head, the department head, and the Office of the Dean of Students. This is also very important and imperative for your success in your professional career. So, please don’t do any academically inappropriate conduct which you think (or are not sure) may lead into this unfortunate circumstance. For other student conduct policy, again, refer to the Hiltopics.

Students with Disabilities: The Office of Disability Services (ODS) assists students with disabilities in eliminating barriers so that they may have access to all the academic, social, cultural, and recreational opportunities of the University. To have this service, you need to contact the ODS: 2227 Dunford Hall, 915 Volunteer Blvd, 964-6087 (v/tty) or ods@utk.edu. For more details, refer to the Hiltopics or contact the ODS.