CONTROL SYSTEMS II

Course Description
The objective of this course is to provide students with the necessary knowledge to design, implement, and document a control engineering project. The course has three components: lectures, prepared laboratories (in the form of a project that is the same for all students), and a design project (specific to each group of students). The lectures and laboratories cover a range of special topics related to the practical implementation of control systems that are not covered in introductory control courses but that are likely to arise in the professional career of controls engineers.

Learning Objectives
At successful completion of this course, the student will be able to:

- Understand the concepts of Model Identification and Parameter Estimation (least-square identification of a auto-regressive model; nonparametric identification in the time domain; and nonparametric identification in the frequency domain)
- Understand Robust Control techniques (Nyquist-plots, small-gain, and passivity)
- Understand Optimal control techniques (LQR/LQG for state-space systems and time-optimal controller for the positioning of a mass using force actuation)
- Understand Nonlinear control techniques (Lyapunov's stability method; feedback linearization controller for a fully actuated 2nd order mechanical system; backstepping for triangular nonlinear systems; actuator limitations)

The course is heavily project-oriented and the students will be required to design, implement, document, and present a significant control systems project, which requires them to address the issues covered in the lectures.

Major Course Requirements

Homework (25%): 5 to 6 Homework assignments (individual work).
Laboratory (35%): Laboratory reports for hands-on lab during the semester (group report).
Final Project (40%): Final Project, (group end-of-term report, and group presentation).

Total (100%)

Required or Recommended Readings

State Adopted Proficiencies/TExES competencies (COE)

Course Policies

Attendance
I will not take attendance after the beginning of the semester. I expect all students to attend all classes and arrive on time. Late homework will only be accepted for cause: death in family, car accident, hospitalized, doctor appointments, etc.

Late work and Make-up Exams
Late work is not going to be accepted. Make-up Exams are only arranged with 1 week prior notice. No make-up exam will be arranged after each exam.

Student collaboration
I strongly encourage collaboration on homework. It will help many of you to understand the ideas better if you explain them to each other. Collaboration to understand problems and concepts is how best to succeed in the “working world”.

Homework and Exam should be submitted in an organized and neatly presented form. Circle or box the answers to each problem. Appropriate units must be included on all answers. All calculations need to be on an engineers pad. At the top of each page of homework write your name, the course number, the assignment number, and date. Pages are to be numbered and stapled.

Extra Credit:
Extra Credit questions/problems will be in some of the tests and homework.

Cell phone/Electronic Device Usage:
Neither cell phone nor electronic devices are allowed in the class as well as in the laboratory. Students are required to turn off cell phone and Electronic Devices before the class starts.

Academic Integrity/Plagiarism.
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in class failure.

Dropping a Class
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping
the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. November 7, 2014 is the last day to drop a class with an automatic grade of “W” this term.

Preferred methods of scholarly citations

Classroom/professional behavior

Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

Statement of Civility (can be in place of classroom/professional behavior)
Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of gender, ethnic/racial origin, religious background, age, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.
http://falcon.tamucc.edu/~students/JAffairs/ja_hndbk_academic_info.htm

Grade Appeals

A student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details on the process, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult Texas A&M University-Corpus Christi University Procedure 13.02.99.C2.01 Student Grade Appeal Procedures (http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage (http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school or the College of Science and Engineering Dean’s Office.
**Disabilities Accommodations**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

**Statement of Academic Continuity**

In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.
Syllabus

Tentative Weekly Schedule

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<td>August 27</td>
<td>I.- Course Overview</td>
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<td>September 3</td>
<td>II.- Computer-controlled systems</td>
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<td>3</td>
<td>September 8</td>
<td>II.- Nonparametric identification</td>
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<td>IV.- Parametric identification using least-squares</td>
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<td>VI.- Practical consideration in parametric identification</td>
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<td>VII.- Robust stability</td>
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<td>VIII.- Control design by loop-shaping</td>
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<td>IX.- Review of state-space models</td>
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<td>X.- Linear Quadratic Regulation (LQR)</td>
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