Applied Mathematics & Statistics 553.797
Introduction to Control Theory and Optimal Control
Spring, 2018 (4 credits)

Instructor
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Teaching Assistant
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Office hours: Tuesdays 3:00-5:00 pm

Meetings
Monday, Wednesday, 3:00–4:15 pm, Whitehead 304

Textbook
No textbook required for the class, course notes will be made available throughout the semester. Some suggestions of additional references:

Online Resources
Please log in to Blackboard for all materials related to this course.

Course Information

• This course will introduce the mathematical foundations of control theory and optimal control for systems governed by ordinary differential equations. The main focus is on the mathematical aspects and results of this important field which shall be illustrated, however, by the study of several examples of systems from e.g mechanics, engineering or population dynamics.
The course will also include a numerical component with the implementation/simulation of some of such control systems using scientific computing languages like MATLAB.

• Prerequisites
Calculus 3 (AS.110.202 or equivalent)
Linear Algebra (AS.110.201 or equivalent)
Differential equations (AS.110.302 or equivalent)

Course Topics

- Reminders on analysis and differential equations: Cauchy-Lipshitz theorem, existence in local time, global solutions, Gronwall's lemma...
- Controllability of linear systems: resolvant, Kalman condition, Brunovski's form...
- Linear time-optimal control.
- Linear-quadratic theory.
- Nonlinear optimal control: calculus of variations, existence of solutions, Pontryagin's maximum principle...
- Numerical methods for optimal control.
- If time permits: stabilization of systems, control of PDEs.

Course Expectations & Grading
Final grade will be obtained from the average of assignments' grade (total of around six Assignments).

Assignments & Readings
One assignment approximately every two weeks, available on Blackboard. Homeworks may include mathematical derivations/proofs as well as simulations in MATLAB or equivalent language.

Ethics
The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor.

You can find more information about university misconduct policies on the web at these sites:

- For undergraduates: http://e-catalog.jhu.edu/undergrad-students/student-life-policies/
- For graduate students: http://e-catalog.jhu.edu/grad-students/graduate-specific-policies/

Students with Disabilities
Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516-4720, studentdisabilityservices@jhu.edu.