

Syllabus

ECE/ME 952: Advanced Control Systems II

Department of Electrical and Computer Engineering
College of Engineering and Physical Sciences
Spring 2016

Meeting Times and Location:

Lectures: M W 4:40 – 6:00pm in Kingsbury N204

Instructor: Prof. Se Young (Pablo) Yoon, Kingsbury W217, SeYoung.Yoon@unh.edu, 862-5364. The preferred mean of contact outside office hours is by email.

Office Hours: T R 1 – 2:30pm. Students may stop in when the office door is open.

Credits: 3 credits

Course Purpose: This course introduces concepts in optimal and robust control theory

Course Objectives: By the end of the course, you should be able to do the following:

- Formulate an optimal control problem and define performance measures (Ch. 1, 2)
- Understand the Principle of Optimality and its role to the solution of an optimal control problem (Ch. 3)
- Derive the solution to an optimal routing problem using dynamic programming (Ch. 3)
- Derive the Hamilton-Jacobi-Bellman equation
- Derive the solution to an optimal regulator problem using dynamic programming (Ch. 3)
- Derive the necessary and sufficient condition for a solution to an optimal control problem using the fundamental theorem of calculus of variations (Ch. 4)
- Use calculus of variation to find the solution to the optimal regulator problem (Ch. 5)
- Apply the Pontryagin's Minimum Principle to derive the solution to an optimal control problem with state and input constraints (Ch. 5)
- Apply the Small Gain Theorem to design robust controller for systems with additive uncertainty

Text: (Required) *Optimal Control Theory, An Introduction*, by D.E. Kirk, Dover Publishing, 2004, ISBN 978-0-486-43484-1

References: (Not required)

Robust and Optimal Control, K. Zhou, J. Doyle, and K. Glover, Prentice Hall, 1st edition, 1995, ISBN-13: 978-0134565675 .

Optimal Control, F. L. Lewis, D. Vrabie, V. L. Syrmos , Wiley, 3rd edition, 2012, ISBN-10: 0136024580.

Optimal Control Theory for Applications, D. G. Hull, Springer, 2010, ISBN-13: 9781441922991.

Software: Occasional demonstrations and exercises in MATLAB and Simulink may be assigned, as time permits. This software is available in the ECE cluster for student use.

Homework: Homework will be assigned weekly. Solutions for homework will be posted one week after it is assigned.

Exam: Two midterm exams will be given throughout the semester during class time. In addition, a final exam will be scheduled in the time slot assigned by the university. All in-class exams will be closed book and closed notes. Only electronic devices explicitly approved by the instructor will be allowed within the student’s hearing, sight or reach (see “Use of Electronic Devices” section).

Grade Weighting:	Homework	25%
	Midterm Exam I	25%
	Midterm Exam II	25%
	Final Exam	25%
	Total	100%

Course grades will be determined as follows

Score	≥ 97	92 – 96.9	89 – 91.9	82 – 88.9	77 – 81.9	72 – 76.9	67 – 71.9	62 – 66.9	60 – 61.9	< 60
Grade	A+	A	A- / B+	B	B- / C+	C	C- / D+	D	D-	F

Academic Honesty: Students are required to know and abide to the Academic Honesty statement included in the UNH Student Handbook (<http://www.unh.edu/vpsas/handbook/academic-honesty>). Any assignment or exam that do not abide the above academic honesty statement will receive a failing grade.

Use of Electronic Devices: Students may not use cell phones, PDAs, pager, digital music players, laptops and other electronic devices during class unless designated by the course instructor. If use of any of these items is permitted by the course instructor, these items are not allowed to be used for non-class activities. If you need to leave a cell phone on for an emergency situation, you should inform the course instructor at the beginning of the class session as well as keep the phone in a silent mode (<http://www.unh.edu/vpsas/handbook/welcome-university-new-hampshire>).

Students with Disabilities: The University is committed to providing students with documented disabilities equal access to all university programs and facilities. If you think you have a disability requiring accommodations, you must register with Disability Services for Students (DSS). Contact DSS at (603) 862-2607 or disability.office@unh.edu. If you have received Accommodation Letters for this course from DSS, please provide me with that information privately in my office so that we can review those accommodations.