Fall 2015

Updated August 2015

AERO 540 (ME 540) [??]

AERO 548 (Astrodynamics) [Kolmanovsky]

AE566 (Data Analysis and System Identification) [Bernstein]

AE740 [Special Topics in NL Control](Girard and Kolmanvosky)

EECS 418 (Power Electronics)[Hofmann]

EECS 460 [Meerkov]

EECS 461 [Freudenberg]

EECS 463 [Mathieu]

EECS 498 [Meerkov] (Control of Manufacturing Systems; Flyer attached)

EECS 558 [Teneketzis]

EECS 560 (AERO 550) (ME 564) [Gillespie]

EECS 598-002 [Ozay] Hybrid Systems: Specification, Verification and Control

ME 461 [Vasudevan] Automatic Control

ME 560 [Stein]

ME 564 (AERO 550)(EECS 560) [Gillespie]

ME 569 [Stefanopoulou] Powertrain Control

NA 483 [Sun] Marine Control Systems (Tu-Th 4:30 to 6:00 PM)

ROB 501 [Grizzle] Mathematics for Robotics

ROB 550 [Atkins and Revzen] Robotics Systems Laboratory

PhD-level optimization courses

IOE 610 - M/W 9:00-10:30am - 1680 IOE (Linear Programming; Nagarajan)

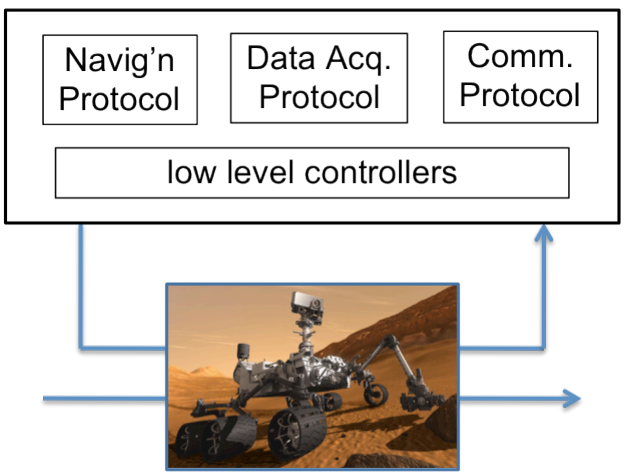
IOE 611 - T/TH 12:00-1:30pm - 1690 Beyster (Convex Optimization (unofficial title), Epelman)

EECS 598-002 Special Topics, Fall 2015

Hybrid Systems: Specification, Verification and Control

MW 3:30-5:00 pm, 1940 COOL

$$\varphi_{\mathbf{env}} \rightarrow (\varphi_{\mathbf{nav}} \wedge \varphi_{\mathbf{dac}} \wedge \varphi_{\mathbf{com}})$$



$$\dot{x} = f(x, u)$$

Hybrid systems, dynamical systems where continuous dynamics and discrete events interact, are ubiquitous and can be found in many different contexts. Examples are as diverse as manufacturing processes, biological systems, energy systems, medical devices, robotics systems, automobiles and aircrafts. Advances in computing and communication technologies have enabled engineering such systems with a high degree of complexity. Most of these systems are safety-critical, hence their correctness must be verified before they can be deployed.

This course will provide a working knowledge of several analysis and design techniques to guarantee safety, reliability and performance of such systems.

Topics include

- specifications: Automata theory, discrete transition systems, temporal logics
- modeling: Hybrid automata, switched systems, piecewise affine systems
- verification of hybrid systems: stability, model checking, direct methods (barrier certificates), abstraction-based methods
- correct-by-construction controller synthesis: reactive control synthesis, switching protocols, model-predictive control

and more…

Grading will be based on a few homework assignments, critiquing research papers and in-class discussions, and a (team) term project.

Instructor: Necmiye Ozay, EECS
For additional information contact necmiye@umich.edu
web.eecs.umich.edu/~necmiye/courses/hybridsystems.html

University of Michigan
College of Engineering
Fall 2015

EECS 498-001

Control of Manufacturing Systems

Mon and Wed, 6:00pm – 7:30pm
Room: 3427 EECS bldg.

Instructor: Semyon M. Meerkov
(734-763-6349, 4230C EECS Bldg, smm@umich.edu)
Office Hours: Mon and Wed, 5:00pm – 6:00pm or by appointment
Room 4230C, EECS bldg.

Course description: Manufacturing is a major source of national wealth. Losing manufacturing, a country is losing its wealth. Until recently, methods of design and control of manufacturing systems has been based on "weak" engineering – experience, common sense, and, in some cases, simulations. Efficient manufacturing requires more: rigorous analytical methods. Such methods have emerged during the last 25 years. The results obtained, with emphasis on control and management, will be discussed in this course.

The course is directed towards undergraduate students from all CoE departments interested in careers involving design/manufacturing of products, e.g. automobiles, aircraft, semiconductors, computer/communication devices, etc. The skills acquired should make the students knowledgeable in various facets of manufacturing and marketable as engineering managers of manufacturing operations.

Position in the program: This course may be counted as Upper Level EE Elective

Topics included:

- Mathematical modeling of manufacturing systems
- Performance analysis of manufacturing systems
- Design manufacturing systems for optimal and robust performance
- Off-line control of manufacturing systems
- On-line (closed loop) control of manufacturing systems
- Applications on the factory floor.

Prerequisites: The only prerequisite is a course on elementary probability theory. Familiarity with control is a plus, but not a requirement.

Textbooks: J.Li and S.M. Meerkov, *Production Systems Engineering*, Springer, 2009
S.B. Gershwin, *Manufacturing Systems Engineering*, Prentice Hall 1994

Software: PSE Toolbox (see www.productionsystemsengineering.com)

Class rules: No late arrivals or early departures (unless with prior arrangements with the instructor). No food or drink during the class. The Honor Code is strictly observed.

Homework: Homework sets will be assigned every Wed. and due the following Web (to be uploaded on CTools by 6:00 pm. No late homework will be accepted, except in cases of documented emergency. Homework should be performed individually, however constructive discussions about the homework problems are allowed. PSE Toolbox will be required for most of the assignments. All assignments will be graded out of 100 points.

Exams: The course will have a midterm and a final. Each exam will be graded out of 100 points. The are scheduled for

Midterm: Thursday, October TBA, Room TBA

Final: December TBA, Room TBA

Exam rules: Closed books and notes; two 3-by-5 "cheat" cards are allowed. The exam will be graded out of 100 points.

Course Grading:

Homework	25%
Midterm	25%
Final	50%
Total:	100%