Fall 2010

Updated 30 March 2010

AERO 548 [Bernstein]

AERO 575 [Kolmanovsky]

AERO 584 [Kabamba]

EECS 460 [Meerkov]

EECS 461 [Freudenberg]

EECS 498 [??]

EECS 501 [??]

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

EECS 598 [Teneketzis] DECENTRALIZED RESOURCE ALLOCATION IN NETWORKED SYSTEMS: A MECHANISM DESIGN APPROACH (see flyer below)

MATH 658 [Bloch] Nonlinear Dynamics and Geometric Mechanics on Manifolds **(see description next page)**

ME 461 [Gordon]

ME 540 [Kuo]

ME 552 [Awtar]

ME 560 [Stein]

ME 568 [Ulsoy]

NA 531 [Sun]

NA 568 / EECS 568 [Eustice] Mobile Robotics: Methods and Algorithms (see flyer)

Mathematics 658

Nonlinear Dynamics and Geometric Mechanics on Manifolds

Instructor: Anthony M. Bloch.

Office: 4842 East Hall. Tel: 647-4980 Email: abloch@umich.edu

Webpage: http://www.math.lsa.umich.edu/˜ abloch

Fall Term, 2010, TTh 10-11.30

This course will discuss geometric aspects of the modern theory of ordinary differential equations and dynamical systems, with applications to various mechanical and physical systems. Topics will include: the qualitative theory of ODE's on manifolds, symplectic and Poisson geometry, nonlinear stability theory, Lagrangian and Hamiltonian mechanics, integrable systems, reduction and symmetries, mechanical systems with constraints including nonholonomically constrained systems, and mechanical systems with forces and controls

Recommended texts: The course will be drawn from several sources. The texts A. Bloch, Nonholonomic Mechanics and Control, Springer Verlag, and J. Marsden and T. Ratiu, Mechanics and Symmetry, Springer Verlag are recommended. Other books will be referenced as well as the primary mathematical literature.

Prerequisite: a course in differential equations.

Grading: The course grade will be based mainly on completion of problem sets and general class participation.

EECS 598

DECENTRALIZED RESOURCE ALLOCATION

IN NETWORKED SYSTEMS: A MECHANISM DESIGN APPROACH

FALL 2010

Instructor: D. Teneketzis, Rm. 4413 EECS Bldg.

Tel. 763-0598; email: teneketzis@eecs.umich.edu

Lectures: Mon, Wed. 10:30 – 12, Rm. 3433 EECS EECS Bldg.

Office hours: Tuesday, 10 – 1p.m.

Prerequisites: Graduate standing

Credit Hours: 3

COURSE DESCRIPTION

The goal of this course is to demonstrate how ideas from mechanism design, a branch of mathematical economics, can be used to optimally solve decentralized resource allocation problems that arise in various technological areas, such as communication networks (wired and wireless), supply chain systems, energy markets, electronic commerce, advertising, etc.

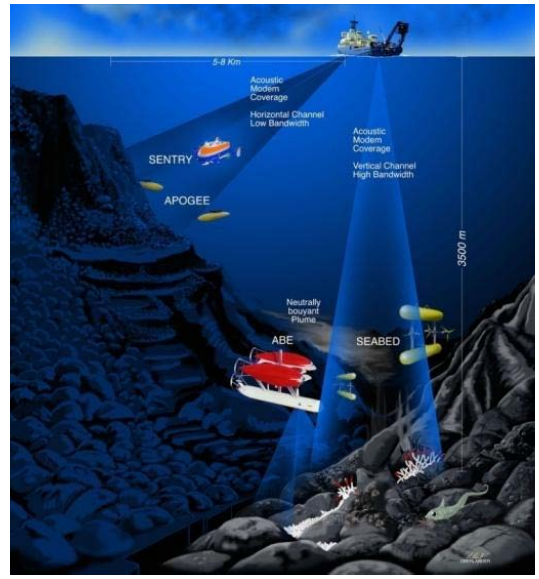
At the beginning of the course I will present the fundamental ideas of realization theory and implementation theory, the two components of mechanism design. Afterwards, I will discuss how these ideas can be used to solve problems in the abovementioned technological areas. Examples of such problems will include: unicast service provisioning in wired networks with cooperative or strategic users; multirate multicast service provisioning in wired networks with cooperative or strategic users; power allocation in wireless networks with cooperative or strategic users; production coordination in supply chain systems with multiple products, many strategic manufacturers and many strategic suppliers; pricing for electric power; coordinated multi-lateral trades for electric power networks; resource allocation in local public good networks with applications to electronic commerce and advertising; learning and strategic pricing; and many others.

The course requirement will be a term project. Students will form teams of two. Each team will select a project topic, will study a set of papers related to the topic, will write a critique of the papers, and will give an oral presentation at the end of the semester.

No textbook is required for this course. Throughout the lectures papers will be distributed to the class, and references to the relevant literature will be given.

For more information about this course please contact the instructor.

Mobile Robotics: Methods and Algorithms
NA 568 / EECS 568



FALL 2010
T, TH 10:30 – 12:30
1371 GG BROWN
North Campus

Professor: Ryan Eustice
eustice@umich.edu
http://robots.engin.umich.edu

PREREQUISITES (advised, not required):
Graduate standing or instructor permission

Course Description:

Theory and application of probabilistic techniques for autonomous mobile robotics. This course will present and critically examine contemporary algorithms for robot perception (using a variety of modalities), state estimation, mapping, and path planning. Topics include Bayesian filtering; stochastic representations of the environment; motion and sensor models for mobile robots; algorithms for mapping, localization, planning and control in the presence of uncertainty; application to autonomous marine, ground, and air vehicles.

Course Topics:

- Probabilistic Models / State Estimation
  - Probability review, Bayes rule, Bayes filters
  - Motion models, Sensor models
  - Kalman filters – KF, EKF, UKF
  - Discrete filters – Particle filters, Rao-Blackwellized PFs
- Mapping / SLAM
  - Map representations – occupancy maps, feature-based maps, pose-graphs
  - EKF SLAM, FastSLAM, Pose-Graph SLAM, Visual-SLAM
- Perception:
  - Computer vision, image processing
  - LIDAR, scan-matching, ICP
  - RANSAC, data association
- Navigation / Localization
  - GPS, IMU, odometry
  - Underwater vehicle navigation
- Planning
  - Markov Decision Processes, Partially Observable Markov Decision Processes
  - Exploration, Active localization