Course Announcement: ME 225BB Special Topics in ME, Spring '14

Modeling and Control of Distributed Systems

Modelling, dynamics and control of spatially distributed systems such as those described by partial differential equations and dynamical systems on lattices. The emphasis will be on linear, constructive and algebraic techniques. The material in the course will be strongly motivated by physical examples. Prototype problems from spatially distributed arrays of dynamical systems and hydrodynamic stability will be used to illustrate the theory.

Instructor: **Bassam Bamieh** , 2328 ENG II, x.4490, *bamieh@engineering.ucsb.edu*
Office Hours: TBA

Coordinates: Tu, Thu, 11:00-12:15, 2243 ENG II *(Enr. code: 50757)*

Required Text: Instructor's notes will be provided

Supplementary Texts

- *An Introduction to Infinite-Dimensional Linear Systems Theory* by R. F. Curtain and H.J. Zwart, Springer-Verlag, 1995
- *State-Space and frequency-domain methods in the control of distributed parameter systems* by S. P. Banks, Peter Peregrinus Ltd., 1983
- *Stability and Stabilization of Infinite Dimensional Systems with Applications* by Z.H. Luo, B.Z.Guo and O. Morgul, Springer-Verlag, 1999

Web Page: GauchoSpace

Prerequisites: ME243A/B (ECE230A/B) and a solid background in advanced linear algebra. Familiarity with functional analysis and a certain amount of ``mathematical maturity'' is helpful. Students will be expected to make up any missing mathematical background using provided references.

TOPICS:

- Examples and motivation, connections and equivalences between finite and infinite dimensional systems, Carleman and Lie-Koopman linearizations
- Abstract evolution equations, regularity, well posedness and semi-groups
- Stability and spectral conditions
- Controllability/Observability, optimal control, norms, and sensitivities of infinite dimensional systems
- Approximation and numerical methods
- Symmetries, arrays and spatial invariance, transform methods
- Swarming, Flocking and large Multi-vehicle systems
- Hydrodynamic stability and transition to turbulence