THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Systems Modeling

ISE 2010

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture
Lab

Course Description:
Mathematical modeling of mechanical, social, and biological systems, with applications; use of modeling software.

Prerequisites and Co-requisites:
Prereq: CSE 1222 and Differential Equations. Concur: Linear Algebra, and Soph standing in Engineering or NMS.

Course Goals / Objectives:
- Recognize that dynamic systems occur in a variety of applications, and will be able to apply common mathematical methods to their solutions
- Distinguish alternative systems archetypes, (discrete time, continuous time, discrete event, and hybrid systems)
- Gain an understanding of basic numerical methods for simulating deterministic dynamic systems in a variety of contexts
- Be proficient in the use of Systems Dynamics software, such as iThink, to model dynamics of modern business applications
- Be proficient in using Matlab and Simulink to model dynamic engineering and biological systems

Course Topics:

- Review of differential and difference equations
- Principles of systems
- Numerical integration
- Closed loop feedback systems: first order systems
- First order systems: mechanical and electrical analogs
- First order systems: examples from biology and economics.
- Closed loop feedback systems: second order systems
- Second order systems: mechanical and electrical systems
- System dynamics: stocks and flows
- Discrete event systems
- Examples in logistics
- Examples in biological systems
- Complex adaptive systems

Designation:
Elective
Required