UNIVERSITY OF CINCINNATI  
Dept. of Aerospace Engineering and Engineering Mechanics  

20-AEEM-313 Modeling and Simulation of Physical Systems  
Autumn, 2002  

Instructor: Prof. B.K. Walker, 745B Rhodes, 6-3552 (voicemail), bruce.walker@uc.edu, www.ase.uc.edu and go to Faculty and my name or www.ase.uc.edu/~bwalker  

Meeting time and place: MWF 9:00-9:50, 643 Baldwin  


Online notes: Go to http://www.ase.uc.edu/class and look for ‘aeem313’ directory. Notes are in .pdf format and are readable with Adobe Acrobat Reader.  

Course goals: Develop methods for deriving mathematical models of physical systems, including mechanical motion, electrical, fluid flow, and thermal systems and mixtures of these, including both linear and nonlinear systems. Model types include differential equations, transfer functions, and state space descriptions. Examine the dynamic responses of such systems to various excitations, including step functions, impulse functions, sinusoidal inputs, and (time permitting) random inputs. Develop methods for digital simulation of dynamic system models, primarily using Matlab and Simulink. Build further on the technical writing and oral presentation skills developed in Integrated Engineering I and II. Prepare for later material in Controls, Flight Mechanics, and other courses involving dynamic systems. 

Prerequisite material: Basic Integrated Engineering, Differential Equations (including Laplace transforms). Probabilistic Engineering preferred as prerequisite, but not required. Matlab experience preferred but not necessary. Numerical Methods preferred as a corequisite but not absolutely necessary.  

Course assignments: Primarily modeling and simulation projects, sometimes done on a group basis, sometimes on an individual basis. Such projects must be summarized in well-written reports, and will sometimes be presented to the class. Project areas in the past have included: automobile suspension systems, damping of a mechanical space payload support system subject to vibrations, manned maneuvering unit dynamics, beam vibrations and damping, orbital motion (nonlinear and linearized models), linear notch filter design, thermal control systems (building a better pizza box).  

Grade determination: Quizzes and exams - 25%, project reports and presentations - 50%, individual homework - 25%.  