



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Introduction to Modeling and Simulation

CSE 2021

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture

Course Description:

Concepts of modeling and simulation; develop MATLAB skills to explore modeling concepts; project: design, implementation, verification/validation of model; oral and written project report.

Prerequisites and Co-requisites:

Prereq: Math 1151 (152) or equivalent, and Physics 1250 (131).

Course Goals / Objectives:

- Be competent with discussing the importance of modeling to science and engineering, the history and need for modeling, the cost effectiveness of modeling, the time-effect of modeling;
 - Be familiar with defining modeling terms, listing questions that would check/validate model results, describing future trends and issues in science and engineering, and identifying specific examples of modeling in science and engineering;
 - Be familiar with utilizing the Modeling Process to identify key parameters of a model, estimating model outcomes, and utilizing MATLAB to implement the mathematical representation of the model;
 - Be familiar with constructing difference-based computer models, conducting and explaining the transformation of continuous functions and dynamics equations into discrete computer representations;
 - Be competent with writing simple MATLAB programs performing numerical calculations as needed for modeling and simulation; be competent with implementing finite difference modeling equations and creating simulations in MATLAB;
 - Be familiar with visualizing empirical data and the fitting function using MATLAB;
 - Be familiar with identifying different types of models and simulations; describing iterative development of a model; explaining use of models & simulations for hypothesis testing;
 - Be familiar with discussing methods for reviewing models, their verification and validation; differences between predictions of model, actual results and relevance of these differences to the problem; suitability/limits of model;
 - Be familiar with documenting the development and implementation of a model and presenting it in oral and written form.
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Course Topics:

- Introduction to modeling; modeling concepts and definitions
 - Introduction to MATLAB, scripts
 - MATLAB arrays, array math
 - MATLAB programming mechanisms (conditionals, loops, etc.)
 - MATLAB i/o
 - Advanced graphing in MATLAB; curve fitting
 - Linear models
 - Nonlinear functions; modeling examples
 - Stochastic models
 - Final project overview and Requirements
 - Accuracy and precision in modeling; verification and validation; project plan
 - Project implementation; Project presentations
 - Review/exams
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Designation:

Elective