

CS-558 COMPUTER SIMULATION

Course Overview and Introduction

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January 24, 2019

Outline

Introductions

Syllabus

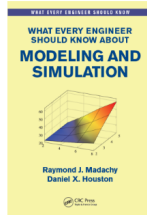
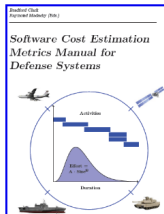
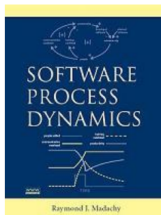
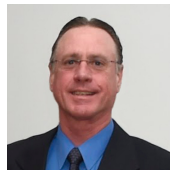
Important Definitions and Terms

Simulation Examples

Student Roll Call

Instructor Biography

- Professor, Department of Systems Engineering at Naval Postgraduate School
- Research interests include modeling and simulation of systems and software engineering processes, system cost modeling for total ownership cost, affordability and tradespace analysis, and integrating systems engineering and software engineering disciplines.



Education

University of Southern California

Ph.D. Industrial and Systems Engineering, 1994

Areas: systems engineering, systems architecting, computer science

Dissertation: "A Software Project Dynamics Model for Process Cost, Schedule and Risk Assessment"

University of California, San Diego

M. S. System Science, 1983

Comprehensive exam covered digital signal processing and system dynamics

University of Dayton

B.S. Mechanical Engineering, 1981

Minor: Aerospace Engineering

Professional History

2008-present	Naval Postgraduate School Full Professor, Department of Systems Engineering, 2018-present Associate Professor, Department of Systems Engineering, 2008-2018
2005-2008	University of Southern California Research Assistant Professor and Interim Director of Systems Architecting and Engineering Program, Department of Industrial and Systems Engineering, 2007-2008 Research Scientist, Departments of Industrial and Systems Engineering and Computer Science, 2005-2007
2001-2005	Chief Science Officer, Cost Xpert Group Inc.
2001-2005 (part-time)	Research Associate, University of Southern California, Department of Computer Science
2000-2001	Chief Scientist, C-bridge Internet Solutions, C-bridge Institute
1992-2000	Litton Systems Manager, Software Engineering Process Group, Litton Guidance & Control Systems, 1997-2000 Senior Engineering Specialist, Litton Data Systems, 1992-1997
1988-1992	Librascope Corporation Staff Engineer, 1991-1992 Lead Software Engineer, 1989-1991 Programming Research Specialist, 1988-1989
1987-1988	Laboratory Manager, University of California, Los Angeles
1985-1986	Independent Contractor, TRW Electronics and Defense, Advanced Programs Division
1982-1985	Member of Technical Staff, Hughes Aircraft Co., Radar Systems
1981-1982	Aerospace Engineer, General Dynamics, Convair

Syllabus

See separate syllabus.

Important Definitions and Terms

- System - A set of interacting parts that form a connected whole accomplishing a specific function or set of functions.
- Model - A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process.
- Simulation - A method for executing a model over time.
- Continuous Model - A mathematical model whose output variables change in a continuous manner with respect to time. Contrast with: Discrete Event Model.
- Continuous System - A system for which the state variables change continuously with respect to time.
- Deterministic Model - A model in which the results are determined through known relationships among the states and events and in which a given input will always produce the same output. Contrast with: Stochastic Model.
- Discrete Event Model - A mathematical model whose output variables change from one value to another at discrete event times. Contrast with: Continuous Model.
- Discrete System - A system for which the state variables change instantaneously at separate points in time.
- Entity -An object in a system that has attributes whose motion may result in an event.
- Event - An occurrence causing changes in the state of a discrete system.
- Monte Carlo - A simulation in which random statistical sampling techniques are employed.
- Random - Pertaining to a process or variable whose outcome or value depends on chance.
- State - A static view of a system described by the values of its variables.
- Stochastic Model - A model in which the results are determined by using one or more random variables to represent uncertainty. Contrast with: Deterministic Model.

Representative Engineering Applications

Biomedical	Biomechanics Biomedicine Medical devices Bioinformatics Biomaterials
Chemical	Biochemical Corrosion Genetics Pharmaceuticals Transport phenomena Waste management Plant design Process design Chemical synthesis
Civil	Structural design Building materials Hydraulics Transportation systems Environmental Municipal infrastructure Construction management
Electrical and Electronic	Circuit analysis and design Power systems and grids Signal processing and communications Networks Computer engineering

Representative Engineering Applications (Cont.)

Mechanical	Materials Thermodynamics Fluid dynamics Vehicle dynamics Kinematics Nanotechnology Control system design
Software	Software development processes Software evolution and maintenance Defect modeling Business value
Industrial and Systems	Systems of Systems Sustainment System Architecture Manufacturing Operations research Economic and financial analysis

Introductory Simulation Example

See *Electric Car Charging Queue-Server System* Simulation from Chapter 1.