

Object-Oriented Simulation/Discrete Event Models

ECE-575, Fall 2006

Class Homepage: <http://www.acims.arizona.edu/EDUCATION/ECE575Fall06/ECE575Fall06.html>

Lecture Hours: 04:00PM-05:15PM Mon./Wed.
Building/Classroom: HARV 415

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Course Objectives: To present concepts of computer-based *modeling* and *simulation* (M&S) applicable to a wide variety of technological systems. To provide hands-on experience with M&S, and specifically object-oriented M&S of *discrete event models*. Related with M&S, heterogeneous simulator interoperation, simulation model verification and real-time execution of simulation model are also covered. Students are expected to come away with a sound foundation and associated computer-based tool set for constructing, simulating and verifying the behavior of models of complex systems that cannot be understood in other terms.

Topics Covered:

- (1) Introduction to Systems Modeling Concepts
- (2) Review of Object-Oriented Programming Language
- (3) Basic Discrete Event System Modeling and Simulation Concepts
- (4) Creating Modular Discrete Event Models
- (5) Simulating Discrete Event Models
- (6) Constructing Complex Models from Modular Components
- (7) Fundamentals of Discrete Event Simulation Protocols
- (8) Incorporating Randomness into Simulation Models
- (9) Interoperation of Heterogeneous Simulators
- (10) Simulation-Model Conversion to Real-time Software
- (11) Checking Dead-lock of Simulation Model
- (12) Checking Live-lock of Simulation Model

Course Requirements:

Homework (25% of grade)

Term Project (25%): Course requires completion of a term project. Early in the term, students will consult with the instructor to determine a project topic that benefits their overall academic objectives or current professional activities. Projects can focus on theoretical aspects with little or no programming or applications using DEVJava, ODEVs, ADEVs. Possible application domains are numerous, including communication, manufacturing, defense, and business to name a few (see www.acims.arizona.edu for examples of previous projects). Projects can be carried out either individually or as a team. Projects requiring the participation of individuals with different skill sets and disciplinary backgrounds will be encouraged, but not required.

Examinations (50%): Mid-term exam (25%), Final-term exam (25%)

Text/Software Materials:

Modeling & Simulation Texts:

- **Recommended:** Theory of Modeling & Simulation, 2nd edition, by Bernard P. Zeigler, et. al., 2000
- Multifaceted Modelling and Discrete Event Simulation, Academic Press, London; Orlando, 1984.
- Theory of Modelling and Simulation, John-Wiley, New York, 1976.

Software

- ODEVS: Open C++ Source of DEVS formalism
- VeriRTS: Real-time System Verification Tool based-on DEVS and Timed Automata
- DEVSJava 3.0: Java Implementation of Parallel DEVS formalism
- ADEVS: Open C++ Source of Parallel DEVS formalism

Prerequisites: None (Programming maturity is assumed. Some prior simulation experience is helpful although not assumed.)

Important Dates: For information on course withdrawal, refer to the calendar of important dates and deadlines. Term project is due on or before December 16th by 5:00 p.m.