



Department of Civil Engineering Project Management Specialization

ENCI 619.61: Computer Simulation Modeling and Analytical Tools for Project Management Course Outline

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Texts, References, and Class notes

There is no textbook required for the course. The instructor will provide the journal and conference papers and handouts required for the class. The following additional books are recommended for reading purposes.

1. Pritsker, A.A., O'Reilly, J.J. and La Val, D.K. (1997). Simulation with Visual SLAM and Awesim.
2. Halpin, D. W. and Riggs, L.S. (1992). Planning and Analysis of Construction Operations, John Wiley & sons, NY.
3. Banks J. and J.S. Carson II. (1984). Discrete-Event System Simulation, Prentice-Hall, Inc. New Jersey.
4. Law, A. and Kelton, W.D. (1982). Simulation Modeling and Analysis, McGraw-Hill, New York.
5. Hiller, S., and Lieberman, G.J. (2001). *Introduction to Operations Research*, McGraw Hill.
6. Taha, Hamdy A. (1997). *Operations Research: an introduction, 6th ed.*, Prentice Hall.
7. Stark, R.M., and Mayer, R.H. (1983). Quantitative Construction Management, John Wiley & Sons.
8. Adrian, J.J. (), Quantitative Methods in Construction Management, Elsevier publishing.
9. BAdiru, A.B. and Pulat, P.S. (1995). Comprehensive Project Management, Prentice-Hall.

Class notes prepared using MS office applications could be downloaded from the web page. See the instruction sheet handed to you in the first class for details.

Recommended Journal and Conference Proceedings

1. Journal of Construction Engineering and Management (<http://www.asce.org>)
2. Canadian Journal of Civil Engineering
3. Journal of Construction Management and Economics, UK
4. Winter Simulation Conference Proceedings (<http://www.wintersim.org>)

Course Introduction

Project Management (PM) tools can be classified into major headings of Qualitative (managerial tools that aid in the interpersonal and organizational processes), Quantitative (analytical techniques that aid in the computational aspects), and Computer Tools (software and hardware that simplify the process of planning, organizing, scheduling, estimating, and controlling a project). These tools can assist in both quantitative and qualitative analyses needed for Project Management.

Course Description

Computer modeling and simulation is a powerful tool in replicating real life systems. It is also a great tool for decision-making, which provides an appealing approach for analyzing and improving real life operations and processes. The major portion of the course will include design and development of computer simulation models for hypothetical applications in project management for both pre-implementation (pre-construction) and implementation (construction) phases. The rest of the content will include the similar developments and applications using traditional and modern analytical tools such as neural networks, fuzzy set theory, linear programming, dynamic programming, Markov theory, etc. The students will benefit by developing these tools for real life projects and scenarios that are familiar to them.

Course Requirements

- Six assignments
- Final Exam*
- Term Project: Special Purpose Simulation (SPS) Template for a Real System and a maximum of 15 minute presentation
- A paper¹ (maximum 10000 words – include 250 words for a table or a graph, 12 font Times New Roman, double spaced) suitable to publish in a referred journal based on your SPS development and a concise user manual for the template

All homework assignments and final exam* are individual basis. The SPS template and the paper is a pair effort. The term project shall involve a modeling of a complex real system using Symphony Simulation Engine in the students' field of interest. Guidance will be given throughout the semester on the selection of an appropriate project. The term project may include the incorporation of other operations tools for either input modeling or output analysis for your SPS template.

¹ *Specifications of a sample paper will be given in due course.*

Mark Distribution	Homework Assignments	40%
	Term Project	25%
	Presentation: Term Project	10%
	Paper: Term Project	15%
	Final Exam*	10%

	Total	100%
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Class Schedule

#	Topic	Duration
1	Introduction/ Simulation Concepts a) Course Introduction b) Introduction to Simulation c) Applications of Tools d) Introduction to Simphony	1 Week
2	Monte Carlo Simulation a) Review of Concepts b) Simphony Range Estimating and PERT Templates	1 Week
3	Modeling Concepts (using Simphony Templates) a) Range Estimating b) PERT c) Common Template d) Special Purpose Simulation (SPS) Tools e) Special Purpose Simulation Applications	2 Weeks
4	Simulation Experimentation a) Hand Simulation b) Discrete Event Simulation Algorithm c) General Purpose Simulation using Simphony d) Special Purpose Simulation using Simphony	3 Weeks

<p>5 Project: Developing Special Purpose Template using Symphony (workshop)</p> <ul style="list-style-type: none"> a) Project Brief and Conceptual Design b) Creating Template and its elements b) Creating Parameters, outputs, statistics and Cost outputs c) Validation and Verification of the Template 	<p>1 Week</p>
<p>6 Other Analytical and Operations Research Tools</p> <ul style="list-style-type: none"> a) Neural Networks b) Fuzzy Set Theory c) Linear Programming d) Dynamic Programming e) Queuing Theory and Markov Chains (if time permits) 	<p>4 Weeks</p>
<p>7 Final Exam and Project Presentations</p>	<p>2 Weeks</p>