

## CS690 - Systems Simulation and Modeling

Fall 2004: September 7 – December 21, 2004

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**Texts:**

- Kelton, W. D., Sadowski, R. P., and Sturrock, D. T. (2004), *Simulation with ARENA*, 3<sup>rd</sup> edition, McGraw-Hill Publishing Co., New York, NY (with CD), ISBN: 0-07-285694-7.
- Supplementary Material and Handouts.

Course Web site: [http://www.rivier.edu/faculty/vriabov/cs690a\\_home.htm](http://www.rivier.edu/faculty/vriabov/cs690a_home.htm)

**Description:**

This course examines a variety of computer simulation and modeling techniques utilized in industrial and business environments, including: Discrete system simulation, Probability and Modeling concepts, Queuing theory and Manufacturing applications. Simulation applications in a number of areas are studied, such as: Computer and Network modeling, Industrial simulation, Facilities planning, and Queuing systems. Students gain hands-on experience in formulating, programming, and running computer simulations utilizing *ARENA* software. A number of case studies are examined. Students learn to utilize resources on the World Wide Web. An individual *Research Project* is a major part of the course.

**Prerequisites:** by permission

<b><u>Evaluation:</u></b>	<b>Mid-Term Exam</b>	<b>25%</b>
	<b>Final Exam</b>	<b>30%</b>
	<b>Project</b>	<b>35%</b>
	<b>Homework</b>	<b><u>10%</u></b>
		<b>100%</b>

**Note:**

Students should expect to spend approximately 6 hours per week outside of class on: readings, homework and computer work. Be sure to *budget your time* accordingly. Absent students are responsible for obtaining the assignment. More than *two unexcused absences* are cause for *automatic withdrawal* from the class.

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**TOPIC OUTLINE**

<u>SESSION</u>	<u>TOPIC</u>	<u>READINGS</u>	<u>HOMEWORK</u>
<b>1</b> <b>(09/14)</b>	Introduction to Simulation, Terminology & Definitions	[K] Preface [K] Appendix C: Probability & Statistics	
<b>2</b> <b>(09/21)</b>	Computer Simulation Concepts; Monte Carlo Simulation	[K] Chaps. 1 & 2	[K] Ex. 2.1-2.5
<b>3</b> <b>(09/28)</b>	Building Simulations in ARENA	[K] Chaps. 3 & 4	[K] Ex. 3.1-3.5
<b>4</b> <b>(10/05)</b>	Modeling Basic Operations & Inputs	[K] Chapter 5	[K] Ex. 5.1-5.13
<b>5</b> <b>(10/12)</b>	Intermediate Modeling & Terminating Statistical Analysis	[K] Chapter 6	[K] Ex. 6.1-6.5
<b>6</b> <b>(10/19)</b>	<b>MID-TERM EXAM</b>	<b>[MID-TERM EXAM]</b>	<b>[PROPOSAL DUE]</b>
<b>7</b> <b>(10/26)</b>	I/O Analysis & Animation	[K] Chaps. 5-7	[K] Assigned Exercises
<b>8</b> <b>(11/02)</b>	Entity Transfer & Steady-State Statistical Analysis; Conducting Simulation Studies	[K] Chapter 7 [K] Chapter 12 <i>Project: Problem Formulation &amp; Solution Methodology</i>	[K] Ex. 7.1-7.4
<b>9</b> <b>(11/09)</b>	Detailed Modeling with ARENA	[K] Chapter 8 [K] Chapter 12 <i>Project: System &amp; Simulation Specification</i>	[K] Ex. 8.1-8.3
<b>10</b> <b>(11/16)</b>	Modeling Issues & Techniques	[K] Chapter 9	[K] Ex. 9.1-9.2
<b>11</b> <b>(11/23)</b>	Integration and Customization	[K] Chapter 10	[K] Assigned Exercises
<b>12</b> <b>(11/30)</b>	Discrete/Continuous Models	[K] Chapter 11	
<b>13</b> <b>(12/07)</b>	<b>[PROJECT PRESENTATION]</b>	<b>[PROJECT DUE]</b>	<b>Demonstration</b>
<b>14</b> <b>(12/14)</b>	<b>FINAL EXAM</b>	<b>[FINAL EXAM]</b>	

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**An individual TERM PROJECT is required**

**TERM PPROJECT**

Choose a problem, develop a simulation model, construct and run an *ARENA* model to simulate it. Research and report on it in depth. Your write-up should be no more than 5 double-spaced pages in length typewritten in MS/Word (hard copy and on a diskette). It should contain an *Abstract*, an *Executive Summary*, a *Bibliography*, and be in standard university term paper format. Your write-up should explain the problem, your solution (model) to it, and should describe and analyze the results of your simulation runs. **Clearly describe your “what-if” questions and how you answered them.**

**TERM-PROJECT PROPOSAL Approval**

Your topic ***must be approved*** by the professor before you begin work. Your proposal should be two (2) double-spaced, typewritten pages and must reflect preliminary research and serious thought about your topic. The Proposal is due in class by **CLASS #6 (October 19, 2004)**.

**Important NOTES:**

- Groups of no more than two (2) students are allowed. Equal effort and collaboration is required.
- The short presentation (10 minutes) should be made in **CLASS #13 (December 7, 2004)**. The executive summary is expected to be delivered to the class members.
- The written Paper and a Program on a diskette are due in **CLASS #13 (December 7, 2004)**. Be sure to submit 1 extra copy (3-hole punched) along with the original. A self-addressed, stamped envelope will ensure that your graded Paper is returned to you.

**HOMEWORK ASSIGNMENTS**

Homework is an important component of the learning experience in this course.

**ALL** homework assigned in this course is due in class in a format that is clear, concise and professionally done. You can think of each question or problem as an assignment from your supervisor at work, which requires some research and a well-written document.

You should present (where appropriate) your computer model, your results, and your analysis of these results. Be sure that all of your write-ups are checked for grammar and typographical errors.

*Homework will be collected at the discretion of the instructor.*