

Syllabus: ISyE 4045 Advanced Simulation

4803 A, Format, 3 – 0 – 3

Proposed: Professor Christos Alexopoulos

Prerequisites: ISyE 3044 Simulation Analysis and Design

Catalog Description

Advanced modeling and statistical concepts in discrete-event simulations; Monte Carlo simulation; estimation of error and risk; advanced input modeling techniques; comparison and optimization of systems.

Texts and other resources

Law, A. M., *Simulation Modeling and Analysis*, 5th edition, McGraw-Hill, 2015.

Kelton, W. D., J. S. Smith, and D. T. Sturrock (KSS), *Simio and Simulation: Modeling, Analysis, Applications*, 5th edition, Simio LLC, 2018.

Grading:

25% Homework / Projects

35% Midterm Exam Tuesday, March 5

40% Final Exam Tuesday, April 30, 3–5 p.m. (notice the shorter time interval)

Grades

A \geq 90, B \geq 80, C \geq 70, D \geq 60.

Course Outline:

The first two-thirds of the term will focus on instruction of Simio and Chapters 1–8 from the text of Law. The last one-third will focus on Chapters 9 and 10 of the text and on the application of the statistical analysis methods within Simio. Below is the list of topics to be covered.

Chapters	Description	Weeks
1	Introduction; estimation of error and risk in simulation experiments	1
2–3	Organization of simulation languages; Simio	1
4	Statistical models in simulation; introduction to stationary processes	2
5	Verification and validation	2
6	Selecting input probability distributions	1
7	Random-number generation	1
8	Random-variate generation	1
9	Output data analysis for a single system	2
10	Comparing alternative system configurations; simulation-based optimization	3
	Total	14

Simio instruction will involve Chapters 1–8 of the KSS text and will be intertwined with the topics in the list above. Since models in the KSS text can be quite complex, we will often build smaller models to illustrate the underlying concepts.

Assessment of Outcomes

At the end of this course, students will be able to:

1. Modeling with Simio, a state-of-the art simulation package.
2. Advanced statistical aspects including input data analysis, generation of realizations from statistical distributions, output data analysis, and simulation-based optimization.

<p style="text-align: center;">Course outcome \ Program Outcomes</p>	<p style="text-align: center;">1. identify, formulate solve engg prob by engg, sci & Math</p>	<p style="text-align: center;">2. produce solutions consider public health, safety, welfare, global, cultural, social, environ &</p>	<p style="text-align: center;">3 communicate with a range of audience</p>	<p style="text-align: center;">4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and</p>	<p style="text-align: center;">5. effective on a team provide leadership, collaborative and inclusive environ, plan tasks &</p>	<p style="text-align: center;">6. develop and conduct experiment, analyze and interpret data & use engineering judgment to draw conclusions</p>	<p style="text-align: center;">7. acquire and apply new knowledge using appropriate learning strategies</p>
<p>1. Modeling with Simio, a state-of-the art simulation package.</p>				H			
<p>2. Advanced statistical aspects including input data analysis, generation of realizations from statistical distributions, output data analysis, and simulation-based optimization.</p>	H	H					