

ISyE 4045 ADVANCED SIMULATION

Selective Elective for Operations Research and Analytics and Data Science Concentration

Credit: 3-0-3

Coordinator: Professor Christos Alexopoulos, Fall 2024.

Prerequisites: ISyE 3044 Simulation Analysis and Design

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.

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.

Course Description

Please add

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.

The topical outline is shown in the table below. The table has 2 columns. The first column lists the topics to be covered. The second column lists the number of weeks these topics will 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

Chapters	Description	Weeks
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.

Course Learning 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.

The Mapping from the Course Outcomes to ABET Student Learning Outcomes

The table below shows the relationship between course outcomes and ABET student learning outcomes. The table has 8 columns. The first column lists the course learning outcomes listed above. The next 7 columns list the abbreviated ABET Student Learning Outcomes. The entry of H in a row with specific course learning outcome and column with specific ABET Student Learning Outcomes indicate the importance of attain this outcome is high and will be assessed.

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ &	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and	5. effective on a team provide leadership, collaborative and inclusive environ, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions	7. acquire and apply new knowledge using appropriate learning strategies
1. Modeling with Simio, a state-of-the art simulation package.				H			

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