Course Number and Name	IE 448 Simulation
Course Description	This course presents an introduction to discrete event simulation systems. Emphasis of the course will be on modeling and the use of simulation languages/software to solve real world problems in the manufacturing as well as services sectors. The course discusses the modeling techniques of entities, queues, resources and entity transfers in discrete event environment. Particularly, the course will teach the students the necessary skills to formulate and build valid models, implement the model in a software platform, perform simulation analysis of the system, analyze results properly, and avoid costly solutions and errors. The "theory" of simulation involves probability and statistics, thus a good background in probability and statistics is a required prerequisite.
Credits and contact hours	3 Credit hours; 3 hours of lectures
Pre- or Co-requisites	IE 457 Operations research II
Required/ Elective	Required

Text Book(s)	Discrete Event System Simulation; Third Edition, Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, Prentice-Hall
Software tools	Software tools: Rockwell Arena software, release 13, student edition.
References	Simulation with Arena, W. David Kelton, Mc GrawHill - 5/e

Course Objectives	• Recognize the power and limitations of discrete event simulation. • Realize how to formulate an appropriate and correct discrete event model of a system at an appropriate level of detail. • Acquaint analytical and practical understanding of probabilistic events, independence, and inter-arrival time concepts in simulation of processes. • Sustain and enhance a basic perceptive of probability and statistical models used in simulation, as well as random variates and random number generation. • Compare, verify and validate single and alternative systems of real and simulated world. • Practice examples of real-world problems in which simulation techniques can be significantly helpful.
Measured Outcomes	3e, 3i and 3k

Topics covered		
Weeks	Topics	Chapters
1 - 2	Introduction to Simulation and General Principles	Chapters 1 and 2
3-4	Behind the Scenes: How Simulation Languages Work:	Chapter 3.
4	Statistical Models (review):	Chapter 5.
5-6	Arena Concepts	
6-7	Random Number Generation:	Chapter 7.
7	Random Variate Generation:	Chapter 8.
8-9	Queuing Theory In Simulation	Chapter 6.
10	Verification and Validation of Simulation Models	Chapter 10.
11	Output Analysis for a Single System:	Chapter 11.
12	Analysis for Comparing Alternative Systems:	Chapter 12.
13	Input Analysis:	Chapter 9.
14	Metamodeling and Optimization	Chapter 12.

Evaluation		
Assessment Tool	Expected Due Date	Weight
Homework+Participation	One week after homework problems are assigned	6%
First Exam	According to the department schedule.	20 %
Second Exam	According to the department schedule.	20 %
Third Exam (Arena)	According to the teach schedule.	14%
Final Exam	According to the University final examination schedule.	40 %