# Course Syllabus for CECS 552: Modeling and Simulation, Fall 2017

## Department of Computer Engineering and Computer Science, California State University, Long Beach

* Prerequisites: Graduate standing or consent of instructor.
* Instructor: Dr. Todd Ebert
* Contact: 562.985.1169, Todd.Ebert (at csulb dot edu)
* Office hours: TuTh: 10:30AM-11:30AM, F: 8:00AM-9:00AM
* Course Call Numbers. Lecture: 8787, Section 1, Lab: 10492, Section 2
* Lecture Meeting: TTH 6:30-7:20PM, VEC 402
* Lab Meeting: TTH 7:30-8:45PM, VEC 402
* Required Text: S. Ross,  [Simulation](https://www.amazon.com/Simulation-Fifth-Sheldon-M-Ross/dp/0124158250/ref=sr_1_2?ie=UTF8&qid=1471898444&sr=8-2&keywords=simulation), Academic Press 2012, 5th edition, 0124158250
* Course website: <http://www.csulb.edu/~tebert/teaching/fall17/552/intro.html>

## Course Description

This course provides an introduction to the process of designing models of existing or proposed real-world systems, and how to use the models to perform simulations that allow for predictions about the future behavior of the system. The system could be something as mundane as a cricket match, to something more complex, such as a communication network, or transportation system. Most systems of interest will require the development of one or more statistical models. Thus, modeling and simulation has a significant overlap with probability and statistics. The course topics will include a review of concepts from probability and statistics that are relevant to modeling and simulation, algorithms for random-variable sampling, modeling and analysis of basic queueing systems, variance-reduction techniques, statistical-validation techniques, Independent Monte Carlo (IMC) and Markov-Chain Monte Carlo (MCMC) simulations, and discrete-event modeling and simulation. Programming assignments will be provided throughout the semester. In addition, each student will complete an end-of-term project that centers on the modeling and simulation of a system of interest.

## Course Topics

* Review of probability
* Independent Monte Carlo method
* Sampling discrete and continuous random variables
* Queueing theory
* Discrete-event simulation
* Variance reduction techniques
* Markov-Chain Monte Carlo methods
* Simulated annealing
* Statistical analysis of simulated data
* Statistical validation techniques

## Course Lectures

Most lectures are supplemented with lecture notes in pdf format. They can be found at<http://www.csulb.edu/~tebert/teaching/fall17/552/lectures.html>Some examples in the notes are to be completed by students during lecture.

## Course Lab

The course lab hour will primarily be used for completing and demonstraing programming assignments. Programming assignments will be reviewed on a FIFO basis.

## Course Assessment and Grades

* **Homework Quizzes: 20%.**Homework is assigned each week and there will be 6 quizzes throughout the semester (see quiz dates below) that are based on the homework. Each quiz will have three problems C, B, and A. The C problem is worth 10 points, the B problem 15 points, while the A problem is worth 20 points. Each problem is based on one of the HW problems, but possibly shortened so that the quiz can be completed in 20 minutes. There are NO MAKE UP QUIZZES. Instead, I will drop your lowest quiz score and replaced it with the average of what you scored on the remaining quizzes. The grade points earned for a quiz can be calculated by dividing the total points by 10. For example, a quiz score of 3.6 points earns 3.6 grade points, which is approximately equivalent to the grade of A-.
* **Exams: 40%.**There will be three exams, including the final, each worth 20%. During exams, PREPARED NOTES, COPYING ANSWERS, CALCULATORS, and other ELECTRONIC DEVICES are NOT permitted. Any use of the above is considered CHEATING and results in an automatic course grade of F. MAKE-UP EXAMS ARE ONLY PROVIDED WHEN THERE IS DOCUMENTED EVIDENCE OF ACCIDENT OR SEVERE ILLNESS.
* **Programming Assignments 20%.**Programming assignments will be assigned throughout the semester. The objective of these assignments is to reinforce the concepts taught in lecture, and to give students hands-on experience with using them. Each assignment comes with a suggested due date. Although the date is "soft", students are expected to complete the assignments at a consistent rate, meaning that it is not acceptable to go long periods without completing assignments, followed by short periods (usually towards the end of the semester) of having lots of programs reviewed. Also, PLAGIARISM WILL NOT BE TOLERATED. Plagiarism in this context means that one or more lines of your code was originally obtained from another entity (human, machine, or some combination thereof) STRONG EVIDENCE OF PLAGIARISM will result in a course grade of F. Thus, it is important that each student keeps his or her code private. Evidence of code sharing will result in automatic course grades of F for ALL involved parties. Collegial discussion of all programming assignments (along with comparing output results) is encouraged, but not the sharing of code.
* **Final Project 20%.**After the 2nd midterm, each student will focus on the completion of a project that involves modeling and simulating a system of interest. Each student will submit a report and give a 10 minute presentation on December 15th, from 7:15PM-9:15PM.

Some assessments may come with signed grades. The grade points are as follows: A+(4.3),A(4.0), A-(3.7),B+(3.3), B(3.0), B-(2.7),C+(2.3),C(2.0), C-(1.7),D(1.0),D-(.3),F(0.0). The sum of the grade points will be weighted according to the percentage for which each of the letter grade counts towards the overall grade. All final grades will be rounded (either up or down) to the nearest unsigned letter grade.

**Quiz Dates:** September 7th, September 14th, September 21st, October 12th, October 26th, November 9th

## Exam Schedule

* Midterm Exam 1: Thursday, September 28th
* Midterm Exam 2: Thursday, November 16th