COURSE INFORMATION

Course Meeting Times: MW 3:00-3:50PM, MW 4:00-4:50PM
Classroom: 119 Materials Science and Engineering Building
Credit Hours: 3 hours (4 hours for graduate students)
Course Website: Located at https://compass2g.illinois.edu/ (access restricted to enrolled students)

Instructor: Douglas M. King (dmking@illinois.edu)
Office Location: 3 Transportation Building
Office Hours*: Monday, after class until 5:30PM; Tuesday, 2:00-2:50PM

Teaching Assistant: Muhammed Sutcu (sutcu1@illinois.edu)
Office Hour*: Thursday, 5-6PM in room 205 Transportation Building
* - Office hours are also available by appointment (please arrange by email, providing at least 24-hours of advance notice)

Textbook: "Discrete Event System Simulation" (5th Edition) by J. Banks, J. S. Carson, B. L. Nelson, D. M. Nicol (Prentice Hall). [This is recommended textbook, and is not required]
Software: The educational version of the SIGMA software package will be used for all course examples, and (when needed) should be used to complete all assignments and projects. The educational version of SIGMA can be downloaded without charge from sigmawiki.com. Please download and install the software as soon as possible, and let the TA know if you encounter any difficulties.

Course Description: This course is intended to be an introduction to the development and use of discrete event simulation models.

Learning Outcomes: Following the completion of this course, students should be able to…
…identify the key components of a simulation model
…understand the role of simulation in engineering practice
…formulate and run discrete event simulation models for a variety of real-world systems
…generate input data for discrete event simulation models by applying techniques that produce pseudorandom variables according to common probability distributions
…analyze simulated outputs using statistical methods

Prerequisites: Credit in IE310 and CS101 (familiarity with probability and statistics will also be very helpful)

Students with Disabilities: All reasonable accommodations required for students with disabilities will be provided, as ensured by Article 1, Part 1 of the Student Code.

GRADING AND POLICIES

Grades will be based on the following: Midterm exams (2) 60% (30% each)
Homework assignments 20%
Project 20%

Assignment Policies:
- Assignment Schedule and Submission: Roughly five assignments will be collected during the semester. Instructions for how to submit homework assignments will be provided. Please follow these instructions carefully! Late submissions will not be accepted.
- Assignment Groups: You may submit assignments in groups of up to three students, with the following restrictions:
  1.) Groups must submit a group agreement form before the due date. Details will be available on Compass.
  2.) Once a group has been formed, no new members can join that group.
  3.) Each group must turn in one assignment; all group members will receive the same grade for each assignment.
  4.) If you are a member of a group, you may decide to leave that group, but you cannot join another group (i.e., you must complete all future assignments on your own).
Project Policies: A semester project will be assigned, in which you will create, execute, and analyze the output of a simulation model. Completing this project will require a written report summarizing your findings. Full details will be provided when the project is assigned.

Exam Policies:
- **Schedule:** Exam dates will be announced in class.
- **Absences:** To ensure that student performance is assessed uniformly, make-up exams will only be allowed under extraordinary and unavoidable circumstances. Appropriate documentation verifying the absence may be required; in cases of illness you may be asked to have documentation from a physician reviewed and verified by the Dean of Students. Please notify the instructor as early as possible if you believe you will need to take a make-up exam. Make-up exam arrangements will be made on a case-by-case basis.
- **Allowed materials:** Exams are closed books and closed notes, though you are permitted to bring one 8.5” × 11” sheet of notes, double sided, so formulas and expressions need not be memorized. Calculators are allowed as long as they do not have communication abilities, and may be inspected at any time. Calculators should only be used for numerical computation purposes; all work must be shown. **Cell phones should not be brought to exams!**
- **Regrades:** To request that your exam be regraded, you must return your exam to the instructor within one week of when the exam was originally returned in class. **Do not write on your exam!** On a separate sheet of paper, provide a written explanation of where you believe you deserve additional credit (and how many points), based on your work as it was completed when you originally took the exam. If you request a regrade, your entire exam will be reviewed and regraded.

Attendance: You are expected to attend all course meetings and participate in class discussions. Important course announcements will be made during class; you are responsible for being aware of these announcements.

Academic Integrity: It is expected that your exams will contain only your own work, and that your assignments and project will contain only the work of your group. Any student who misrepresents their work in an exam, or group who misrepresents their work on an assignment or project, will receive a grade of zero on that exam, assignment, or project; other penalties may also be pursued, as allowed by University policy.

Cell Phones and Other Devices: Please turn off all cell phones before class. Use of other electronic devices (tablets, laptops, etc.) is allowed for course-related purposes only. Do not bring any electronic devices (other than a calculator) to exams.

NOTE: The policies contained in this syllabus are subject to change. You will be notified in the event of any changes.

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**TENTATIVE LIST OF TOPICS**

Discrete Event Simulation Models
- Introduction and definitions (system, entities, attributes, laws, policies, etc.)
- Events and states
- Structure of simulation programs, linked lists, event list management
- Model validation and verification
- Simultaneous events and event priorities
- Event graphs

Pseudo Random Number Generators (PRNG)
- Uniform distributions
- Linear congruential generators (LCG)
- Testing a PRNG for uniformity and independence
- Non-uniform random number distributions (inversion, acceptance/rejection, etc.)
- Discrete (Alias tables)
- Generating normal random variables

Simulation Output Analysis
- Classical statistics
- Terminating versus steady state simulations
- Initial transient problem (initialization bias, Welch's method)
- Confidence interval and variance estimation (replication, batched means, regeneration, etc.)
- Variance reduction techniques (common random number, antithetic random number, control variates)