COURSE SYLLABUS Fall 2016

Department	EECS	Course Number	CSCI 410
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 Course Title:
 Modeling and Simulation
 Total Credits: 3

1. General Course Information

1.1 Course Description

This course gives a comprehensive treatment of the important aspects of a simulation study, including modeling, simulation software, model verification and validation, input modeling, random number generators, generating random variates and processes, statistical design and analysis of simulation experiments.

1.2 Prerequisites by Topic

C Programming, Probability and Statistics

1.3 Course Staff

Instructor: Jiang Li, Ph.D. Office: 2038B Downing Hall Phone: x64861 Email: <u>lij@scs.howard.edu</u> Office Hours: Tuesday/Thursday 12-2PM, or by appointments

2. Learning Resources

2.1 Required Text

• Simulation Modeling and Analysis, 5th Edition Authors: Averill Law Publisher: McGraw-Hill ISBN-13: 978-0073401324 ISBN-10: 0073401323

2.2 Department Resources

Laboratories: 2113 Downing Hall (Obtain account logins from System Administrator, Mr. Guy Lingani – <u>glingani@scs.howard.edu</u>)

3. Aims, Objectives, Program Outcomes

3.1 Course Aims

To provide students with an understanding of simulation techniques, use in modeling and analyzing systems, and practical application in problem solving associated with system development. To provide

students with the skills necessary to develop simulation applications of real-world phenomena and systems using a special purpose simulation package such as ARENA

3.2 Course Outcomes

By the end of this course, you should be able to perform the following tasks:

- 1. Understanding basic simulation methodology
 - a. Identify all variables and events needed to implement a simulation
 - b. Hand-simulate a system.
- 2. Understand the difference between random numbers and pseudo-random numbers.
 - a. Identify if a generated number qualifies as a pseudo-random number
 - b. Identify various generators for pseudo-random numbers
- 3. Understand stochastic variants
 - a. Generate random numbers according to specific distributions.
- 4. Apply simulation techniques to implement various systems
- 5. Apply techniques for analyzing data.
 - a. Understand transient vs. steady-state simulations and applicable estimation methods.
- 6. Validate simulation models.
- 7. Apply variance reduction methods to simulation models.
- 8. Identify simulation applications that have a particular socially conscious relevance (address socially relevant computing).
- 9. Work in a group to address a particular problem by designing, developing and exercising simulation model alternatives.

3.3 CS Program Outcomes

- a) An ability to apply knowledge of computing and mathematics appropriate to the discipline. Ability to design, develop, and analyze significant software systems.
- b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. Ability to apply computer science principle and practices to a variety of problems.
- c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- d) An ability to function effectively on teams to accomplish a common goal.
- e) An understanding of professional, ethical, legal, security and social issues and responsibilities.
- j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- k) An ability to apply design and development principles in the construction of software systems of varying complexity.

3.4 Relationship between Course Outcomes and Program Outcomes

Successfully completing this course will contribute to the recognition of your attainment of the following program outcomes:

Program Outcomes	COURSE
A. An ability to apply knowledge of computing and mathematics appropriate to the discipline.	1a, 1b, 2a, 2b, 3a, 4, 5a, 6, 7

B. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.	1a, 1b, 2a, 4, 5a, 6, 7
C. An ability to design, implement, and evaluate a computer-based system, process, component, or program to	1a, 2a, 2b, 4, 5a, 6, 7
D. An ability to function effectively on teams to accomplish a common goal.	9
E. An understanding of professional, ethical, legal, security and social issues and responsibilities.	8
F. An ability to communicate effectively with a range of audiences.	
G. An ability to analyze the local and global impact of computing on individuals, organizations, and society.	
H. Recognition of the need for and an ability to engage in continuing professional development.	
I. An ability to use current techniques, skills, and tools necessary for computing practice.	
J. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.	1b, 2a, 2b, 3a, 4, 5a, 6, 7
K. An ability to apply design and development principles in the construction of software systems of	1a, 1b, 2b, 4, 5a, 6, 7

3.5 Relationship between Course Outcomes and Program Objectives

Successfully completing this course will contribute to the recognition of your attainment of the following program objectives:

Program Objectives	COURSE
1. conceptualize, analyze, design, implement, and evaluate a computerized solution to a real life problem using appropriate	1a, 1b, 2a, 2b, 3a, 4, 5a, 6, 7
2. work effectively as a team member;	
3. enter a professional computer science position or enter an appropriate graduate program;	1a, 2a, 2b, 3a, 4, 5a, 6, 7
4. communicate effectively through speaking, writing, and the use of presentation tools;	
5. adapt to technological changes and innovations in the	1a, 4, 5a, 6, 7
6. be aware of ethical and societal concerns relating to computers in society and to be able to apply this knowledge in the conduct of their careers.	

4. Teaching and Learning Activities

4.1 Learning Activities

Date	Activity	Course Outcomes
August to December 2016	Tuesday and Thursday Lectures (Lecture Series): A detailed teaching plan can be found in section 4.2	1, 2, 3, 4, 5, 6, 7
September to December 2016 Assignments and Projects: Homework will defined material to work through. The proj given after the midterm exam. Office hours seeking help from the instructor on the assign Homework assignments require students to incrementally develop simple to complex sim		1, 2, 3, 4, 5, 6, 7, 8, 9

4.2 Major Topics Covered in the Course

- 1. Computer simulation concepts: different types of models, & simulations.
- 2. Modeling theory overview, with focus on discrete event simulation.
- 3. Discrete modeling and simulation concepts: constructing simulation data, events, calendar and simulation clock.
- 4. Modeling complex systems.
- 5. Statistical analysis and model comparison.
- 6. Model Validation and Verification.
- 7. Random Number generation and Random-Variant generation
- 8. Experiment design and optimization.
- 9. Simulation software.

5. Assessment

5.1 Assessment Summary

Homework: 30% Project: 20% Midterm: 20% Final: 30%

5.2 Course Grading

Grading process: 90-100 =A, 80-89=B, 70-79=C, 60-69=D, < 60=F

5.3 Incomplete Grades and Withdrawals

A grade of *Incomplete* (I) is given only if you have fulfilled most of the course requirements prior to the Registrar's withdrawal deadline, Nov 4th 2016, and an emergency prevents you from completing the course. Such an emergency must be documented by your dean or advisor. However, if you have not completed

most of the coursework, make sure you withdraw before the deadline; otherwise, I will have to enter the grade you have earned thus far. Please note that if you receive an *Incomplete*, you can complete only the coursework you missed and you must complete that work by the end of the following semester, in accordance with University policy.

5.4 Policy on projects, assignments, and make-up exams

- All assignments must be entered in computer and submitted online at the course web site. Handwritten submissions scanned into computer are not accepted. Detailed justification must accompany the answers for written assignments.
- Regarding late submissions:
 - ✓ Late submissions are allowed. However, each hour of being late will incur 1% penalty (Any partial hour will be counted as a whole hour). Therefore, submissions after 100 hours of deadline will receive no grade.
 - \checkmark No late submissions are accepted for the last written assignment before exams.
- No make-up exams will be given unless there is a bona fide written doctor's excuse approved by Special Student Services. In the event that such an excuse is accepted, the deadline will be extended the number of days specified in the excuse.
- Re-grading request must be sent **within a week** of the date the graded material was returned to the class. Requests for re-grading or any questions regarding graded material will not be accepted after that time. Any graded material that is not picked up within two weeks after distribution will be discarded.

5.5 Plagiarism Policy

Suspected plagiarism will incur interviews. All verified instances of plagiarism will be resolved by an office of the administration, which will conduct the appropriate hearings. See the section entitled "ACADEMIC CODE OF STUDENT CONDUCT" on pages 26-27 of the "Student Reference Manual and Directory of Classes."

6. Notices

6.1 Electronic Devices

You are expected to conduct yourself during class time in a professional and respectful manner. Therefore, unless I instruct otherwise, please turn your cellphone off or put it on "vibrate" during class. Also, please refrain from surfing the Web, emailing, texting, tweeting, and engaging in other distracting activities during class time. If you engage in such activities, you will be required to turn off the device or leave the classroom.

No electronic devices, except the simplest calculators (capable of only +, -, \times , \div) can be used in exams.

6.2 ADA Compliance

Howard University is committed to providing an educational environment that is accessible to all students. In accordance with this policy, students in need of accommodations due to a disability should contact the Dean of Student Services for verification and determination of reasonable accommodations as soon as possible. Note: Accommodations are not retroactive. The Office of Student Services is located in Suite 725 of the Howard Center and may be reached at (202) 238-2420.

6.3 Writing Across the Curriculum (WAC)

Writing is an essential tool for thinking and communication in virtually every profession. Therefore,

in this course you are expected to produce writing that is not only thoughtful and accurate, but also organized, clear, and consistent with the rules of Standard English. If your writing does not meet these standards points may be deduced from the assignment or you may be required to revise the assignment and resubmit it. For assistance with our writing, go to the student section of the Writing across the Curriculum (WAC) website – <u>http://www.cetla.howard.edu/wac/students.aspx</u>

6.4 Statement on Interpersonal Violence

Howard University takes sexual assault, dating violence, domestic violence, stalking and sexual harassment seriously. If a student reveals that he or she needs assistance with any of these issues, all Responsible Employees, which includes faculty, are required to share this information with the University Title IX Office (806-2550) or a student can be referred for confidential services to the Interpersonal Violence Prevention Program (IVPP) (238-2382) or University Counseling Services (806-6870). For more information about these services, please go to https://www2.howard.edu/title-ix.

<u>7.</u> Addendum

7.1 Students expect that their professors will:

- 1. Care about the success of each student, and promote mutual respect.
- 2. Come to every class, and on time.
- 3. Keep abreast of the technical field she/he is teaching.
- 4. Explain how the subject being taught is broadly connected to the field and possibly to other courses.
- 5. Keep abreast of, and adapt to, evolving teaching approaches.
- 6. Have office hours for each class, and be present at these times.
- 7. Coordinate any travel with his/her Department Chairs.

Students who feel that a professor fails in the above expectations may confidentially express his concerns in the Comments box in the Office of Student Services in the L. K. Downing Building, Room 1114, or email Dr. Rhoulac Smith, Director of Student Services, at <u>trhoulac@howard.edu</u>. Your communication must be respectful, professional, and truthful.

7.2 Professors expect that their Students will:

(Failing to comply will result in appropriate penalties. In certain cases these penalties are expressly defined below.)

- 1. Take a professional approach to all class activities and interactions. Show that your take the class seriously and come to class prepared.
- 2. Absenteeism: Come to every class.
 - 2% penalty from total class grade for every unexcused absence
- 3. Lateness: Not come to class after it begins.
- 1% penalty from total class grade for every instance of infraction
- 4. Leaving Early: Not leave class before it ends.
 - 1% penalty from total class grade for every instance of infraction
- 5. **Disruption**: Avoid entering and leaving the classroom during instruction.
- 6. Eating: No eating in class.
 - 1% penalty from total class grade for every instance of infraction.
- 7. **Electronics**: No use of laptop, cell phone, iPad, headphones or other electronic equipment that are not explicitly requested to be used by the Professor.
 - 1% penalty from total class grade for every unexcused absence
- 8. **Cheating**: Any form of cheating, including plagiarism, in an exam or assignment shall automatically result in a zero-grade for all involved, for that exam or assignment.

9. **Communication**: Communication, oral or written, with the Professor, including email, in all matters concerning the course, shall be done professionally; that is, as it would be done with a potential employer. (e.g., respectful, include your full name, clearly articulate the objective of the communication concisely)