

# CMSC/MATH 325: Mathematical Modeling and Simulation (3 credits) Spring 2014

<http://marmorstein.org/~robert/Spring2014/cs325.html>

**Instructor:** Robert Marmorstein (marmorsteinrm@longwood.edu) 434-395-2185

**Lecture:** 11:00am-12:15pm (TR) Ruffner G56

**Office Hours:** 1:00-2:00pm MTWRF or by appointment (Ruffner 329)

*My schedule is posted near my office door. To make an appointment, please check the schedule to see which times I am free, then contact me by e-mail and list some possible times we could meet.*

## Course Description:

An introduction to mathematical modeling and computer simulation that includes linear programming, discrete and stochastic mathematical models, curve fitting, and discrete event simulation including basic queuing theory. Other topics may include continuous models, random number generation, and statistical analysis of models. Various simulation software packages will be discussed and used.

## Prerequisites:

MATH 261, MATH 171 or 270, and CMSC 160.

## Course Objectives:

The student will:

- Apply programming skills to real-world problems
- Learn to create mathematical and computational models of complex systems
- Construct simulations of systems in C or C++ and evaluate them using statistical techniques
- Use linear programming to solve simple optimization problems

## Textbook and Other Resources:

The textbook for this class is "Discrete Event Simulation: A First Course" by Lawrence M. Leemis and Stephen K. Park (1<sup>st</sup> edition, 2006). ISBN: 0-13-142917-5

## Course Requirements:

Your grade will depend on successful completion of programming projects(40%), homework assignments and quizzes(40%), presentations (10%), and a final exam (10%). There will be no midterm exam for this course.

## Grading Policy:

Late work will not be accepted unless you have a serious medical or family emergency which prevents you from completing the assignment on time. In such cases, you do not need a doctor's note, but you must send me e-mail within twelve hours of the assignment due date to explain your circumstances and to make arrangements for the work to be completed.

## Grading Scale:

	100-91:	A	90:	A-	
89:	B+	88-81:	B	80:	B-
79:	C+	78-71:	C	70:	C-
69:	D+	68-64:	D		
63 or lower:	F	(There is no grade of D- in this course)			

### **Slip Days:**

You will be allocated a fixed number of slip days at the start of the semester. You may use your slip days to extend the due date of one or more *programming projects*. You can use all of your slip days on one assignment or you may use them over multiple assignments.

Slip days are calculated from the minute the assignment is due until you turn it in and are rounded *up* to the nearest integer value. That means that if you turn an assignment in 24 hours and 1 minute late, you will use up *two* slip days. The slip day clock runs over weekends and holidays. If a lab is due on Friday and you turn it in on Monday, you will have used three slip days, not one. Slip days cannot be shared, traded, bought, or sold, but can occasionally be earned by participation in relevant campus activities I select.

### **Attendance:**

I expect you to attend class unless you are sick or engaged in a school-sponsored sport or extracurricular activity. Please do NOT come to class if you are sick. Instead, contact me within 12 hours of the absence to check whether you've missed any work and then make arrangements to get notes from another student in the class. You should also check the course web site for announcements, new assignments, and other important updates.

I will rely primarily on your honor for enforcement of the attendance policy. However, I will keep a record of your attendance as required by Longwood policy. In accordance with campus policy, missing more than 10% of scheduled class time (5 class sessions) to unexcused absences may, at my discretion, result in loss of one letter grade and missing 25% of class or more (14 sessions), whether excused or not may result in an automatic failing grade.

### **Collaboration:**

Exams and quizzes are to be completed entirely on your own. You may discuss the homework and projects with other students subject to these restrictions:

#### **1. You should turn in only work which YOU have typed or hand-written.**

*The work you submit should, in general, be either your own original work or material which I have provided and you have modified without help from others. You MAY assist other students or get assistance with simple problems like syntax errors, but you may NOT copy large blocks of code from each other. A good guideline of what "large" means is that changes that involve one or two lines of code are usually okay, but copying more than three complete statements is usually too much.*

*If you are working in an assigned group, you may turn in one copy of the assignment for all the members of your group as long as you are careful to make sure that the name of each group member appears in a comment at the top of the files to which they contributed.*

#### **2. You may NOT copy code from other students or the Internet by electronic means.**

*This doesn't mean you can't look online for help with a project. It just means that you shouldn't copy/paste or download code and turn it in as your own. You must re-type any code you find (again subject to the three line limit).*

You may not share code with other students using flash drives, cell phones, e-mail, web sites, floppy disks, CDs, or **any other** electronic storage or communication device unless you are both assigned to the same group for a project. You may not print out copies of your code to share with other students (personal copies or copies for other students in your group are fine).

### **3. You must give proper attribution.**

Whenever you receive help or use an online resource, you should comment your code to give proper credit. A simple comment like “/\* based on <http://codewarrior.com> \*/” is fine. This comment should go directly above or directly after the place that you used the resource or received help to make it clear which parts of your program are not entirely original.

### **4. You are responsible for securing your code.**

Helping other students to cheat is also cheating. Furthermore, it is your responsibility to make sure that other students do not use your work to cheat. Be careful with who you allow to access your computer or account. Report any missing files, flash drives, or other devices that contain your work to me promptly.

Infractions of these policies will be dealt with harshly under the Longwood Honor Code. Any student convicted of an honor offense involving this class will automatically receive a final course grade of **F** in addition to any penalties imposed by the Honor Board. You should consider all work in this class to be pledged work, whether or not the pledge appears on the assignment.

### **Food and Drink:**

You may bring non-alcoholic beverages, including soft drinks, to class. However, please do not eat in class (it distracts me and the other students). Violations of this policy will be considered an unexcused absence. I occasionally grant exceptions to this rule for students who must otherwise forgo lunch or have medical needs that require them to eat in class. If you feel that you need such an exception, you must make arrangements with me in advance (that is, before bringing food to class).

### **Cell Phones and Laptops:**

Cell phones, music players, and laptops are to be turned off and put away during class, except for use in the lab sessions. Violations of this policy will be considered an unexcused absence.

### **Tentative Course Schedule:**

*Please check the course web site regularly for updated versions.*

Weeks 1-2 (Jan. 14-16, 21-23)	Introduction, Review of C Programming and Probability Numerical Problems and Rounding <b>Last Day to Drop (by 5pm)</b>
<b>Jan. 21</b>	
Week 3 (Jan. 28-30)	Discrete Models and Difference Equations ( <i>Read Chapter 1</i> )
Week 4 (Feb. 4-6)	Random Number Generation and Monte Carlo Simulation ( <i>Read Chapter 2</i> )
Week 5 (Feb. 11-13)	Discrete Event Simulation, Statistics ( <i>Chapters 3 and 4</i> )
Week 6 (Feb. 18-20)	Next-Event Simulation ( <i>Chapter 5</i> )

Week 7 (Feb. 25-27) <b>Mar. 3-7</b>	Discrete and Continuous Random Variables ( <i>Chapters 6 and 7</i> ) <b>Fall Break: NO CLASS</b>
Week 8 (Mar. 11-13) <b>Mar. 10</b>	Catchup and Review <b>Deadline to Withdraw without an F</b>
Weeks 9-10 (Mar. 18-20, 25-27)	Output Analysis and Input Modeling ( <i>Chapters 8 and 9</i> )
Week 11 (Apr. 1-3)	Stochastic Modeling and Markov Chains
Week 12 (Apr. 8-10)	Curve Fitting, Interpolation, and Splines
Week 13 (Apr. 15-17)	Linear Programming
Week 14 (Apr. 22-24) <b>Apr. 28</b>	Catchup and Review <b>Final Exam (Monday, 3:00pm-5:30pm)</b>