MATH 140: Modeling with Calculus, Fall 2015

**Professor Erin McNicholas**  
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Section 1  
Office Hours  
MWF 10:20-11:20 am  
MWF 9-10 am (Ford 211)  
Ford 204  
Tue 9:30-10:30 am (Bistro)

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Section 2  
Office Hours  
MWF 12:40-1:40 pm  
MWF 10:20-11:20 am  
Ford 201  
TTh 9:30-10:30 am

**Preceptor Help Sessions:** Sunday-Thursday, times and location TBA

**Class Website:** The daily schedule, reading assignments, and resources will be posted on WISE. There will be a reading assignment for every day of class. If you miss class, go to the this website to see what you’ve missed.

“Logic moves in one direction, the direction of clarity, coherence and structure. Ambiguity moves in the other direction, that of fluidity, openness, and release. Mathematics moves back and forth between these two poles. It is the interaction between these different aspects that gives mathematics its power.” - William Byers

**Required Course Materials**

  *Start R in Calculus*, by Daniel Kaplan  
  *Linear Algebra Reader*, by Beveridge, Flath, Halversen, Kaplan, and Saxe

- **Software:**
  We will be using R Studio, which is installed in all the Ford computer labs (as well as several other labs across campus). R Studio is available free on the internet, and you may choose to download and install it on your personal computer; instructions are available below. If you have trouble installing, you can ask WITS for help (with installation only), and in the meantime, use the computer labs.

  R studio download help page:  

  Mosaic package download:  

**Class Objectives and Structure**

Mathematics is both a process of creation and discovery. It requires critical thinking, imagination, logic, and persistence - skills which will help you in whatever field you chose to pursue.

The concepts and techniques explored in this course demonstrate the elegance, power, and sublime utility of applied mathematics. Their discovery and implementation changed our
understanding of the universe and have shaped our modern technological existence. Through this course you will learn the fundamentals of modeling using calculus, differential equations, and linear algebra; apply your knowledge to model complex systems and draw informed conclusions; strengthen your ability to interpret and present information in graphical, numerical, verbal, and symbolic formats; and practice effective communication and collaboration with your peers.

To maximize your learning, you should attend class every day and participate fully in the in-class activities, many of which you will be asked to turn in. You must arrive in class having some understanding (though not perfect understanding) of the material. This understanding is achieved by completing the daily reading assignment, watching the assigned videos, and taking notes summarizing the main concepts presented. The reading assignment for each day is listed on the Daily Schedule and Assignments webpage on WISE. We use class time to address confusion, refine our understanding, practice skills, and work through activities.

Your grade will be based on your level of achievement in each of the following student learning outcomes:

- **Content knowledge**
  As demonstrated on exams, projects, and homework

- **Problem solving and critical thinking, including the ability to make judgments and draw appropriate conclusions based on quantitative information**
  As demonstrated on exams, projects, and homework

- **Technical writing and speaking**
  As demonstrated on project reports and group exams

- **Appropriate use of technology**
  As demonstrated on projects and R Studio assignments

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**Course Components**

- **Group Exams**
  Group Exams are completed in groups of three, with each group member having a unique set of problems to work on. Group members proofread each other’s work and offer suggestions. Seventy-five percent of your group exam score is based on your individual problem solutions, 25% is based on your work proofreading your team members’ exams. Each team member is allowed one page, one-sided, of notes. For more information see the handout “Group Exams”, available from the class WISE site.

- **Group Projects**
  In groups of two or three, you will collaborate on two extensive modeling projects. The goals of the projects are to model a real-world event that is not a routine homework exercise, to gain experience with open-ended problems, to practice communicating and explaining mathematical results about rates of change and integration clearly and professionally, and to gain further experience working in a team on a mathematical problem. These projects will culminate in formal written reports. Project descriptions with full details will appear on the course WISE site.

  Your group turns in one report and everyone in the group earns the same grade. To provide some accountability, however, every group member is required to submit an informal group evaluation via email. The evaluation should include a few sentences about how well the group members worked together. The evaluation must include your estimate of the percentage of the project work that you feel each group member did (e.g. 33%/33%/34% or 50%/25%/25%, etc.). These evaluations will be held in confidence, and used at the end of the semester, if necessary, to adjust final grades. Please include *Math 140 Group Evaluation* in the subject line of your email.
• **WebWork/Homework**

Problem sets for each covered section of the text will be assigned using WebWork, an online homework distribution and grading system. The goal of these assignments is to give you practice applying class concepts, and a means of checking your understanding. The best feature of WebWorK is that when you enter an answer to a homework problem, the system immediately tells you whether the answer is correct. You can try a problem as many times as you like. Once you get the answer right, that fact is immediately recorded (provided it is before the due date), and any wrong answers are not counted in your grade. Here are some tips on using WebWork:

- **Get started on WebWorK early!** Enter some answers at least a couple of days before the due date. That way you will have time to seek help on the harder problems (and the ones that looked easy at first but turned out to be tricky) before the set is due. Avoid the last-minute rush. The system often becomes overloaded and slow in the last couple hours before a set is due.

- **WebWorK usually requires very precise answers.** For example, if the correct answer is 1.60045 and you enter 1.6, the system will say that’s incorrect. If you are entering a decimal answer, give at least five digits of accuracy. On most problems, you can enter answers like \( \cos(9.81\sqrt{340}) \) instead of a messy decimal, and WebWorK will do the calculation for you.

- **Some WebWorK problems require formulaic answers,** like \( x^{2/3} \), which means \( x \) raised to the power \( 2/3 \) (two-thirds). However, if you enter \( x^{2/3} \), the system will say that’s wrong, since WebWorK interprets that as one third of \( x^2 \). So be careful and check your syntax.

- **WebWorK has a previewing feature which allows you to see how a complicated formula that you just entered is actually interpreted by WebWorK.** The previewer will help you track down syntax errors and ensure that your answer is being interpreted the way you want without having to add three hundred parentheses.

- **Last, and MOST IMPORTANT, do not spend large amounts of time guessing random answers and entering them into WebWork.** This is a waste of your time! If you don’t know how to do a problem, consult the WISE chatroom to get help from your peers or come to my office hours. If you think you are doing everything correctly and WebWork doesn’t accept your answer, please come to my office hours or email me with an explanation of what you have done, so I can help. Banging your head against the computer, yelling at it, or throwing it out the window has no effect on whether WebWork accepts your solution or not.

• **Quizzes and In-class Activities**

In this course, it is essential that you start exploring ideas before class and use class time to strengthen and clarify your understanding. To guide you, reading assignments, reading questions, and practice problems will be posted on the Homework website. Reading quizzes will test your comprehension of the main ideas in the assigned reading and practice problems. They are given in the first few minutes of class, and without advance notice. You will be allowed to use your hand-written notes, not not your text during the quiz.

Worksheets and activities will be assigned regularly and either be collected at the end of class, or in some cases, at the beginning of the next class period.

• **Exams**

There will be two midterm exams and one final exam.
Section 01 final exam is on Saturday, December 12, 2015 from 8-11 am,
Section 02 final exam is on Thursday, December 10, 2014 from 2-5 pm.
Grades

Weighting of course components in the calculation of your cumulative grade:
Midterm Exams (total for two): 25%
Final Exam: 20%
Group Exams (total for three): 15%
Group Projects (total for two): 20%
WebWork: 15%
In-class participation, worksheets, and reading quizzes: 5%

Your grade will be based on the percentage of points you earn out of the total possible. 90% and above guarantees you an A-, 80% and above guarantees you a B-, 70% and above guarantees you a C-, and 60% and above guarantees you a D.

Student Responsibility

Most of you already know this, but previous experience has shown that a friendly reminder is sometimes helpful. You are all adults and responsible for your own education. I will do everything in my power to help you learn. You should always feel free to stop by my office. In addition to the posted office hours, I am available by appointment. You should feel free to ask me questions in class. Stop me if you are confused and ask me to explain things again. I welcome student questions! Although I will do everything in my power to help you learn the concepts covered in this class, you are ultimately responsible for your grade. The following is a list of things I expect from you.

- **READ THE TEXTBOOK.** This class is formatted under the assumption that you have completed the assigned reading and practice problems before class. Class time will consist of discussions highlighting the main points of the section, in-class examples, and explorations. It will be difficult to engage in the material during class if you have not looked over the content ahead of time.

- **DO THE ASSIGNMENTS.** Mathematics is not a spectator sport. You will only learn mathematics by practicing, that is what homework is for. I encourage you to work with your fellow students on homework assignments. Make it a social activity and you will not only learn a great deal, you will have fun doing it.

- **THINK CRITICALLY.** Your goal in this class should be to understand the concepts and strengthen your mathematical reasoning skills. Mimicking problem solving strategies, or working through processes you don’t understand is a waste of your time. Throughout the course you should be asking yourself “Why are we doing this? Why does this method work? How is this related to other topics I’ve learned?”

- **ASK QUESTIONS & SEEK HELP!** Ask questions in class, after class, during office hours, whenever! If you are confused or having problems with a certain section of the material see me AS SOON AS POSSIBLE. I am happy to help you but it is impossible to go over several weeks worth of material right before an exam.

- **STUDY & SHARE YOUR INTEREST.** Willamette’s Credit Hour Policy states that you should spend **2-3 hours outside of class on course work for each hour spent in class**. To master the content of this course and to earn a good grade you will need to invest time and effort. Set aside time for both homework and studying. We will be discussing a trove of interesting and complex ideas. It would be wonderful if you discussed these concepts with your fellow classmates, your friends, and your family!
Late Assignments and Missed Classes

I expect everyone to attend all classes and turn in all assignments. If for some reason you are unable to attend class or turn in an assignment, please let me know as soon as possible, preferably before the missed class or assignment.

Cell Phone/Screen Policy

Unless specifically stated for class use, no laptops, iPads, or other devices which take your eyes off your fellow classmates and the class discussion are allowed. Electronic devices such as cell phones, pagers, iPods, etc. must be turned off during class meetings. *If your cell phone goes off, or it is clear that you are using one of these devices during class, you will be responsible for bringing treats for the entire class at the next class meeting.* Papers should not be read during class, though I applaud your efforts to stay abreast of current events.

Academic Integrity

As is stated in the Willamette University CLA catalog

“Plagiarism and cheating are offenses against the integrity of the courses in which they occur and against the college community as a whole. Plagiarism and cheating involve intellectual dishonesty, deception and fraud, which inhibit the honest exchange of ideas. In accordance with Willamette University Standards of Conduct and the Willamette Ethic, students are entitled to notice of what constitutes plagiarism and cheating, and the right to appeal penalties. Plagiarism and cheating may be grounds for dismissal from the college.”

Additional information can be found on the Plagiarism and Cheating Policy website http://www.willamette.edu/cla/catalog/resources/policies/

All midterm and final exams are to be taken individually without use of books or notes (except as noted on the exam description). The use of laptop computers, cell phones, and any equipment that communicates wirelessly are not allowed on quizzes and exams. You are responsible for keeping your eyes on your own work and for keeping your work away from the eyes of others during the exam.

On group projects, you may discuss the problem and methods of approach verbally with other students. You should, however, not make any of your written work or calculations available to other students (except for your group members). Copying, paraphrasing, or otherwise drawing on language from the work of students in another group (past or present students) is considered plagiarism. All students involved with plagiarized projects will receive failing project grades. I will spend no time attempting to figure out who copied from whom.

Special Note

If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me within the first two weeks of the semester. Please request that a Disability Services staff person send me the appropriate forms verifying your disability and specifying the accommodation you will need. If your disability allows for extra time on an exam you must remind me of your needs at least one week before each exam and send me an email reminder at least three days before the exam to ensure appropriate accommodations are made.
Advice From Previous Students To Future Students

Class in General

“I really liked how applicable the subjects were to real-life situations, and how there were multiple ways of learning the material.”

“The vast differences in the material that was covered was challenging. In all of my previous math classes there have been clear reasons for transitions. This class felt slightly jumbled.”

In-Class Activities and Lectures

“Ask questions, don’t be afraid to pause the lecture.”

“Pay attention and don’t skip lectures. They are invaluable for understanding the material.”

“Actively listen and ask questions since a lot of material is covered.”

“Read textbook before lecture day so you aren’t lost.”

“Pay attention and do the worksheets. They help a lot for the midterms.”

“Don’t come to class tired, or if you do bring snacks and coffee. Don’t try to do the WeBWorK in class, pay full attention to the now.”

WebWorK & RStudio

“DON’T LISTEN TO ANYONE WHO HATES WEBWORK. Seriously, I love WebWorK (despite its horrible capitalization). There is nothing better than knowing you got a 100% on your homework assignment. I can’t tell you how many times I’ve longed for a WebWorK-style system in other classes. WebWorK ensures high homework grades and high material understanding. I would not have done nearly as well in the class without WebWorK, I guarantee you. WebWorK catches your misconceptions so they do not perpetuate. And unlike getting written homework corrections, there’s a tangible benefit to retrying a problem until you get it right (namely a higher homework grade).”

“Every time I have a math class that has non-webwork homework, I can’t help but feel annoyed. I know webwork is a hassle when things don’t work correctly, but being able to get that immediate feedback on whether we’re doing things right or not is SO helpful for me. Also helping other students/getting help with webwork online in the chatroom was very helpful and enjoyable. I would tell students to USE THE CHAT ROOM to help each other!”

“Keeping up with the WeBWorK and WeBWorK being so semantical could be annoying, but actually the practice and instant feed-back was really useful. Same for RStudio.”

“Utilize the preceptors as much as possible and always complete the assignment. It’s points that shouldn’t be wasted.”

“At the beginning of the semester I was afraid of RStudio and now I love it!”

“Do the WeBWorK in tutoring. Some of the questions are really hard without help. Also it is a good study space.”
Group Exams

“Liked the ability to work with classmates to improve our understanding.”

“I like being able to work with others and get input on what I did before I turn it in.”

“Don’t blow them off! They may seem like they’ll be easier because you have people to help you, but they are harder questions than would be on the midterms.”

“Despite the fact that you work with others, you still are graded mostly on your own work. Don’t rely on your group to do it for you.”

“Prepare for a group exam just as you would for any other exam. The problems aren’t necessarily easier, but you have longer to do them; collaboration however can be difficult.”

“Be assertive - finish your problem before helping others. Don’t be scared to ask for extra quiet time.”

“Always prepare but don’t feel nervous. Group exams are a good way to learn.”

“Ask the professor and your group members for help if needed. It’s not a solo exam.”

“Make your note sheet quality. Take advantage of having people who can look at the problem and solution differently.”

Projects

“Don’t wait to start until the last minute and meet with the professor. She’s extremely helpful.”

“Start planning early and leave yourself enough time to perfect your report.”

“Find time to meet with your partners early. Don’t wait until the last minute! Also, don’t be afraid to ask your professor for help.”

“Find a schedule that works for everyone and actually get stuff done! Professor was great with answering all sorts of questions.”

“Allow large blocks of time to work on the project together. This works better than several small meetings.”

“Get to know your classmates early on and chose group partners that are responsible and hard working.”