MATH 252 - Section B6 - Summer 2018

Contact Information

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Office Hours

Mondays, 3:30 - 5:00 PM
Tuesdays, 5:00 - 7:00 PM
or by appointment.

Class Meetings

MWF 6:00-8:45 PM, SEC 220

Exam Schedule

- Midterm 1: Friday, June 1 - First half of class
- Midterm 2: Wednesday, June 13 - First half of class
- Final Exam: Friday, July 6 - 6:00 - 9:00 PM

Textbook

This course will use *Differential Equations*, **4th edition**, by Paul Blanchard, Robert Devaney, and Glen Hall. ISBN-13: 978-1-133-10903-7.

Course Information

The information for this course can be found on Sakai. All announcements and assignments will be posted to this site. If you have any issues accessing the Sakai site, let me know as soon as possible. My personal website will also likely have some of these materials posted to it, but the most up-to-date resource will be Sakai.

Learning Goals

During this course, students will

1. Gain a familiarity with differential equations, which will show up in a variety of places after this class.
2. Understand how qualitative, quantitative, and numerical techniques can be applied to a problem, and when each one should be used.
3. Improve skills and confidence in talking about and presenting mathematics to their peers.
4. Become exposed to some of the ideas from higher-level mathematics, which will be expanded upon in future classes.

Class Overview

MATH 252 is an introduction to differential equations, generally directed at math majors. The course takes a three-pronged approach to studying differential equations: Qualitative methods (general behavior of solutions), Quantitative methods (analytical solutions), and Numerical methods (approximating solutions on a computer). We will take a look at all three of these over the course of the summer. The topics this course will cover are:

- First Order Differential Equations
- Systems of Differential Equations
- Linear Systems and Higher-order Linear Differential Equations
- Numerical Methods for ODEs
- Non-linear Systems of ODEs

NOTE: Linear Algebra (Math 250) is a prerequisite for this class. You will be expected to know the basics of linear algebra and matrix manipulation for this class. See the Midterm 1 topic outline for more information.

Grade Breakdown

Final grades for the class will be decided according to the following breakdown:

In-Class Assignments	10%
Quizzes	10%
MATLAB	10%
Midterm Exams	10% + 25%
Final Exam	35%

Class Structure

This class will be run in a mix between lecture and workshop formats. A lot of research has been done fairly recently on the implementation of Active Learning practices in math classrooms, and an article to this end has been posted to Sakai. I personally feel like these types of activities are very helpful in learning math, as you learn math best by doing problems, not by sitting around listening to lectures. Therefore, my plan is to implement several different activities in the classroom to move it more towards Active Learning. These may be things that you haven't seen in a math class before, but both I and the current research in the field believe that they are helpful in developing a better understanding of the course material. It only really works if you buy into it though, so I'm hoping you can give it a shot with me. If you have any questions, let me know and I'd be happy to talk about it.

The general plan for the class is as follows. Monday and Friday classes will generally start with a mini quiz and a Readiness Assessment, the first of which will test your knowledge of the homework problems assigned in the previous class, and the second will cover the readings assigned for the

current class. You will be expected to have read the appropriate sections of the book before coming to class, and the Readiness Assessment will test your basic knowledge of these sections. These will be done individually, but there may be a group component to them afterwards. The rest of the class will consist of a mixture of workshop time, various activities, and lecture on the topics of the day. Over the course of each day, there will be two Practice Problems which will be completed, allowing you to practice the topics we are going over in class and show me that you know what is going on in class. Wednesday classes will be slightly different in that they will start with a quiz, testing material from the previous week of class. The rest of class will more or less be the same, consisting of lectures, activities, and workshops to help deepen or expand your knowledge of the material being covered.

Academic Integrity Policy

All students in this course are expected to be familiar with and abide by the academic integrity policy (`http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers`). Violations of this policy are taken very seriously. In short, dont cheat, and dont plagiarize. In terms of exams, its fairly easy to understand what cheating/plagiarism is. For homework, you are definitely allowed to work with other students, but everything you turn in should be your own work. In particular, this means that you should NOT just write down and turn in a solution that you got from a friend, classmate, or the Internet. You should also be able to explain every step of what you turn in to me if asked. I would much prefer that you turn in a half-finished assignment than one that you looked up online or took from a classmate. In the first case at least both you and I know what you need to improve on and can work towards it. If you have any questions about this policy, please let me know. I am more than happy to talk about it.

Attendance Policy

Attendance is mandatory at every class. Each day in the classroom during the summer corresponds to an entire week of class during the semester. Therefore, missing a single class can be very detrimental to your learning and development in this course. Attendance will be taken in the form of practice problems and Readiness Assessments given out every day in class. If you need to miss a class, come talk to me about it as soon as possible.

Homework Assignments

There will be no traditional homework assignments for this course. There will be homework assigned each night, but the assignments will not be collected or graded. It is up to you to determine how many of the problems you want to do and how completely you want to work them out. You will get credit for this homework in terms of the quizzes and Readiness Assessments that will take place at the start of each class. These will be taken from problems very similar to those on the homework, so doing these problems will directly help you to do well on the mini-quizzes, as well as on the exams. I am also planning to post answers (not solutions) to the homework if the answer is not already in the book, so that you can check your work after doing the problems.

You will also be expected to read sections of the textbook and/or watch videos online before class. These will be announced at the end of the preceding class, and your knowledge of these sections will be tested with the Readiness Assessments at the start of each class. These assessments will cover basic knowledge of these sections. With the active learning component of the class, there will be less time for lecturing, so you all having a base level understanding of the material before you show up to class will help things to run smoothly. I also taught MATH 244 as a flipped classroom last summer, which means I made video lectures for the entire course. I may, at points throughout the summer, send you links to the videos for the appropriate sections for you to watch before class.

Projects / MATLAB Assignments

There will be 5 MATLAB assignments over the course of the summer. Each of these will involve taking pre-written code and modifying it to run some experiments that will illustrate concepts from class. These are assignments that have been given for the last several years, and I think they are well-made assignments. The assignments and sample code will be posted to Sakai, and you can download MATLAB by following the link here: `https://software.rutgers.edu/product/3437`.

In-Class Assignments

In-class assignments will take 3 forms. Monday and Friday classes will start with a mini-quiz about the homework from the previous class. This will be very similar to the homework problems assigned from that class. These mini-quizzes will be followed by a Readiness Assessment, covering basic knowledge on the reading assignments for the current class. Finally, there will be Practice Problems assigned each day in class, giving samples of the types of problems that could be seen on quizzes or tests related to the material being discussed in class.

Quizzes

On each Wednesday class that does not have a midterm, the class will start with a quiz. This quiz will cover the material that has been discussed over the last week. The quiz will last approximately 40 minutes and will be of similar difficulty to problems from the homework. These will be done individually and will be closed-book, closed-note.

Exams

This course will consist of two midterm exams and a final exam. The first midterm will happen this Friday, June 1. This exam is a prerequisite exam, covering material that you should know coming into this class, and is worth 10% of the final grade. There is an file on Sakai that contains an outline of what will be covered on this exam. This exam will take an hour. The second midterm will happen near the middle of the course and the tentative date is listed at the top of the syllabus. This exam will last 80 minutes. Due to the length of each class period, this will only take up half of the class, and we will continue with lecture/activities after the exam. These will be closed-book, closed-note exams, which will be taken individually. Calculators and electronic devices will not be permitted on exams.

Exam Rewrites

For each of the midterm exams, you will be allowed to rewrite the problems that you do not get full points on. You will receive exams with scores on the problems, but no marks on the pages, and can rewrite problems to get back half of the points that you missed. However, in order to get any points back for the rewrite, the rewritten version of the problem needs to be completely correct. More details about this process will be provided when the first midterm is returned.

Final Exam

The final exam will take place on Friday, July 6, from 6:00 - 9:00 pm in the normal classroom, and will be cumulative. Calculators and electronic devices will not be permitted on the final exam.

Make-Up Policies

There will be no make-ups for quizzes, practices problems, or exams. There is a decent chance that I will drop some number of practices problems or Readiness Assessments at the end of the course, but that will depend on how things go throughout the summer. If you have a legitimate reason for missing a midterm exam or quiz, then we can discuss potential options for your grade at that point, but try not to miss them. If you will not be in class on a day when an assignment is due, you need to send me a scanned version of the document before the end of class on that day. Pictures of the assignment will not be accepted, and anything received after the end of class will not be graded.

Disability Accommodations

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: `https://ods.rutgers.edu/students/documentation-guidelines`. If the documentation supports your request for reasonable accommodations, your campuss disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: `https://ods.rutgers.edu/students/registration-form`.

Adjustments

All information in this syllabus is subject to change at any time. Any changes will be announced on Sakai, changed on this document, and announced in class.

Tentative Course Schedule

Date	Section(s)	Topics	Due Dates
W 5/30	1.1, 1.2, Notes	Introduction, Solutions, Modeling	
F 6/1	1.2, 1.5	MIDTERM 1, Separation of Variables	
M 6/4	1.3, 1.4, 1.6	Geometric and Numerical Methods	
W 6/6	1.7	Bifurcations	MATLAB 1 Due, Quiz 1
F 6/8	1.8, 1.9	Theoretic and Analytic Methods	
M 6/11	2.1, 2.2, 2.5	Introduction to Systems	
W 6/13	2.7	MIDTERM 2, SIR Model	MATLAB 2 Due
F 6/15	3.1, 3.2, Notes	Linear Systems	
M 6/18	3.3, 3.4, 3.5	Phase Plane Analysis	
W 6/20	3.7	Trace-Determinant Plane	MATLAB 3 Due, Quiz 2
F 6/22	1.8, 2.3, Notes	Analytic Solution Methods	
M 6/25	3.6, 4.1, 4.2	Second Order Equations	
W 6/27	4.3, 4.4	Resonance, Steady State	MATLAB 4 Due, Quiz 3
F 6/29	5.1, 5.2	Non-Linear Systems	
M 7/2	5.3, 3.8, 2.8	Other Topics, Review	MATLAB 5 Due
F 7/6		FINAL EXAM	