MATH 281-2 ACCELERATED MATHEMATICS FOR ISP: FIRST YEAR WINTER 2017

Course: MATH 281-2

Instructor: Jason Siefken
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Class: MTWF 11:00–11:50 in ISP 203

Discussion Section: Th 11:00–11:50 in ISP 203

Webpge: http://www.math.northwestern.edu/
~siefkenj/math281-2

Office: Lunt 213

Office Hours: T 1:00–2:30, W 3:30–5:00, or by appointment

Textbook: *A Modern Introduction to Differential Equations*, by Henry Ricardo

Math 281-2 continues our accelerated dive into mathematics by exploring the most fruitful modeling concept to come from calculus: the differential equation.

Imagine a system that varies over time—maybe your satisfaction while eating a meal, $s(t)$. If your satisfaction varies, then $s'(t) \neq 0$. You might wonder what would cause your satisfaction to increase and what would cause it to decrease. An incredibly simple model might suppose you take one bite of food every 20 seconds until the food is gone, and as per a law of diminishing returns, your increase in satisfaction is inversely related to your satisfaction. This model is represented by the equation $s'(t) = \frac{k}{s(t)}$, and it's just one instance of a *differential equation*—an equation that relates the derivatives of a function to the function itself.

This course will focus on *ordinary differential equations*, that is, differential equations that don't have partial derivatives. We will survey some techniques for solving differential equations and get our hands dirty with modeling scenerios with differential equations.

LEARNING OUTCOMES

After taking this course, you will be able to:

- Identify and solve several types of ordinary differential equations, combine solutions of a differential equation to get new solutions, analyze the behavior of differential equations (without solving them).
- Produce defensible models of of worldly phenomena using differential equations, and simplify those models until they are suitable for analysis.
- Work independently to understand concepts and procedures that have not been previously explained to you, and communicate those concepts to others.

PREREQUISITES

To be prepared for this course, you should have a solid understanding of multi-variable calculus, especially vector fields.

TO SUCCEED

Learning is hard! It is exercise for the mind, and like exercise, when you're doing it, it feels pretty uncomfortable (and if it doesn't, you're probably doing it wrong). Here are some tips to help you succeed academically (getting the grade you want) and intellectually (learning the most you can).

- Form a regularly-meeting study group of 3–4 people. Having others studying around you will help you study, and having someone to talk about confusing problems with will help you both productively struggle (struggling with others is how real-world problems are solved).
- Read the textbook *before* class. In class we will be working on problems that we haven't gone over before. If you expose yourself to the concepts prior to class, you'll get a lot more

out of it.

- Visit the tutors, paid for by the university, at the **Calculus**, **Chemistry and Physics Resource Room** at Tech HG04 and Allison 1021 (http://www.math.northwestern.edu/undergraduate/tutoring-advising/tutoring/). Also, take advantage of the ISP upperclassmen. They've been through this struggle before!

ASSESSMENT

Midterm 1
15%

In-class midterm on Thursday, January 26.

Midterm 2
15%

In-class midterm on Thursday, February 23.

Homework and Quizzes
30%

Homework: Homework will be assigned throughout the term and typically due at the beginning of class on Thursdays. You are encouraged to work together to solve homework problems, but *you* must write up your solutions to be turned in.

Some homework will focus on explaining problems rather than just "solving" them. If you'd like your write-ups to look like a pro's, I suggest you use the LaTeX typesetting software. LaTeX is the industry-standard for scientific write-ups in math, physics, chemistry, computer science, and engineering. It has a learning curve but is well worth the effort. See the course webpage for details.

Quizzes: Quizzes will take place at the beginning of discussion section on Thursdays (though not necessarily every Thursday). They may be announced or unannounced.

Final
40%

A comprehensive 2 hour final will be held on Thursday, March 16 at 9:00–11:00 AM in ISP 203.

POLICIES

I have carefully planned the midterm dates, so please ensure you are available for each midterm. If you miss a midterm for a justified reason (illness, family affliction, or other reason recognized by Northwestern's policies), I can excuse it for you by weighting other tests more heavily. However, *there will be no makeup exams.*

If you have a disability/health consideration that may require accommodations, please contact the Office of Services for Students with Disabilities and register for AccessibleNU as soon as possible. All information will remain confidential. http://www.northwestern.edu/accessiblenu

For the rest of Northwestern's polices, please see http://policies.northwestern.edu