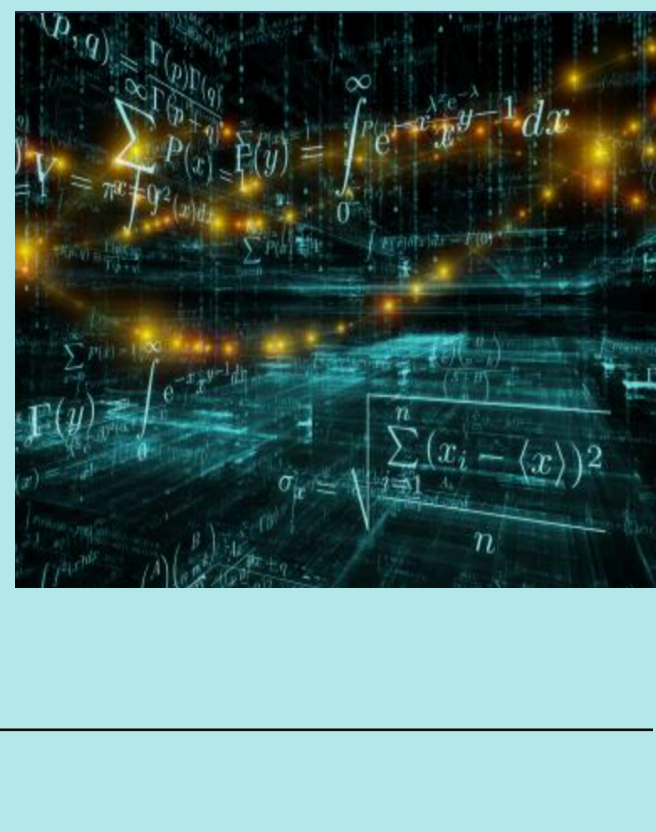


Linear Algebra and Differential Equations



MST 205/605

Dr. John Gemmer: gemmerj@wfu.edu

Office: Manchester 388

Course Website: <http://users.wfu.edu/gemmerj/math205-605S22.html>

Canvas: The course syllabus and grades will be posted on Canvas

Office Hours: T 2:00-3:00, W 2:00-4:00, Th 3:00-5:00

Class Meeting Times: MWF 12:30-1:45

Class Location: Carswell 101

Teaching Assistant: Grace Hofmann (hofmgel17@wfu.edu)

Study Sessions: Thursdays 7-9, Kirby 103

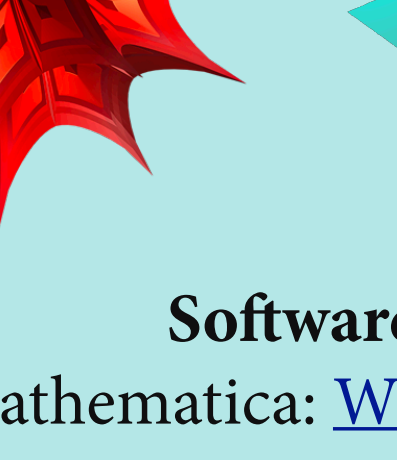
COURSE DESCRIPTION

This course serves as an introduction to both linear algebra and differential equations. Both of these topics are crucial mathematical tools for engineers, physicists, and mathematicians. Differential equations are often used to model the dynamic change of many physical systems but can be notoriously difficult to solve explicitly. However, linear algebra provides a methodology for solving systems of linear differential equations that commonly arise in applications. To grow the students mathematical toolbox, this course will cover topics in matrices, determinants, vector spaces, first order differential equations, linear differential equations, linear transformations, eigenvalues, eigenvectors, systems of differential equations, and power series solutions. While this course is primarily about building up the students mathematical training, along the way, time permitting, we will discuss numerical solutions and applications of differential equations.

REQUIREMENTS



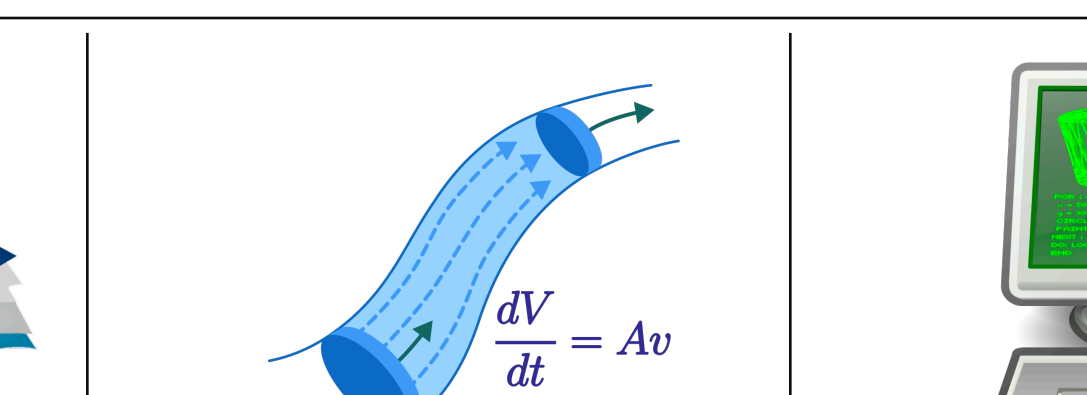
Prerequisites:
Calculus II



Textbook
Peterson, Sochacki



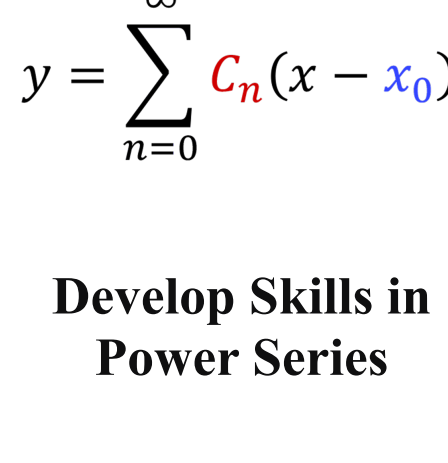
Computer Access:
Laptop/Desktop



Software:

Matlab, Mathematica: [WFU Software Link](#)

OBJECTIVES



Master Elementary Linear Algebra



Master Elementary Differential Equations



Develop Mathematical Computational Skills

$$y = \sum_{n=0}^{\infty} C_n(x - x_0)^n$$

Develop Skills in Power Series

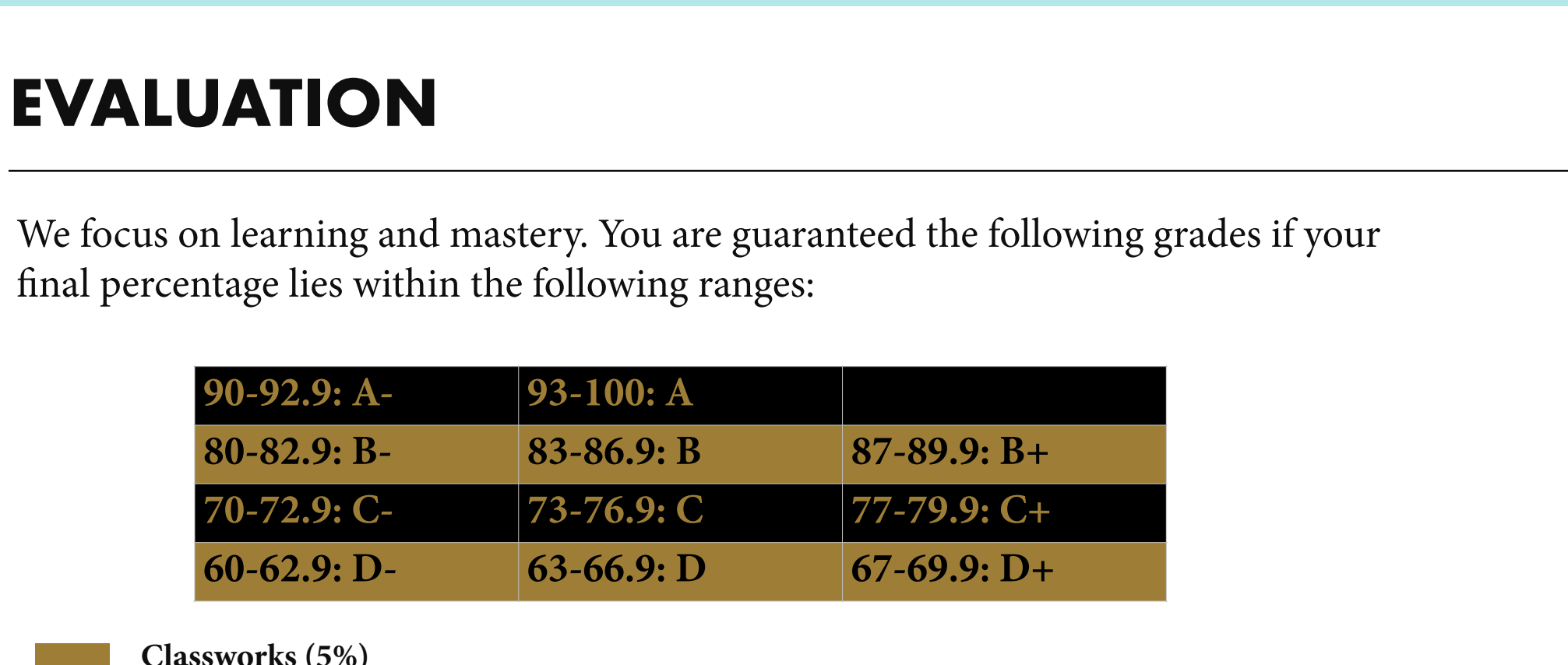


Learning to collaborate



Write Effectively

CLASS STRUCTURE



EVALUATION

We focus on learning and mastery. You are guaranteed the following grades if your final percentage lies within the following ranges:

90-92.9: A-	93-100: A	
80-82.9: B-	83-86.9: B	87-89.9: B+
70-72.9: C-	73-76.9: C	77-79.9: C+
60-62.9: D-	63-66.9: D	67-69.9: D+

Classworks (5%) Structured in class group assignments Grades based on attendance	Quizzes (10%), at least 1 dropped 5-10 minutes In class on Thursdays	Weekly Homework (20%), at least 1 dropped Open book, collaboration allowed with citation Homework is due on Thursday in class	Three summative assessments (30%) In class, closed notes	Final Exam (35%) Comprehensive In class, closed notes
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Classworks: Throughout the course there will be several class works. These consist of structured group assignments that will be completed during class time. These assignments will generally be exploratory allowing students to synthesize concepts through a "hands on" approach. Classworks will be graded based on attendance.

Quizzes: On most Fridays there will be a short 5-10 minute in-class quizzes. These quizzes will consist of a very short problem that will test your knowledge of the prior lectures and homework. These quizzes are to help both the students and the instructor understand concepts that students may be struggling with. All quizzes will be announced in class. There will be no "pop" quizzes. There are no retakes for missed quizzes, however I will drop the lowest quiz score from your final grade.

Weekly Homework: Homework will be assigned most weeks on Thursday and will be due Friday in class the following week. Late homework will not be accepted under any circumstances. However, I will drop at least one homework assignment from your grade. While you are allowed to collaborate with your colleagues, homework must consist of solutions that show all steps, be your own work and be written clearly using complete sentences as appropriate (see homework policy). All homework will be submitted in class on paper. I will not accept digital versions of your homework.

Summative Assessments: There will be three in class summative assessments in the course and a cumulative final exam.

Late Work Policy: Except in very extreme circumstances, I do not accept late assignments or reschedule exams. If you have a situation in which you cannot make an exam for personal reasons, you must arrange accommodations with the instructor to schedule the exam **before the scheduled exam date**. If you have a legitimate emergency situation, I will make sure that all students in the course will have access to the same exception to this policy.

If you need to miss class due to a university sponsored activity, such as athletics. Please contact the faculty member as soon as possible to reschedule due dates.

COURSE ENVIRONMENT

Names/Pronouns
You **deserve** to be addressed in the manner you prefer. To guarantee that I address you properly, you are welcome to tell me your pronoun(s) and/or preferred name at any time, either in person or via email.

Diversity
We embrace diversity of age, background, beliefs, ethnicity, gender, gender identity, gender expression, national origin, religious affiliation, sexual orientation, and other visible and non-visible categories. **I do not tolerate discrimination.**

Accessibility
I want you to succeed in this course. Wake Forest University provides reasonable accommodations to students with disabilities. If you are in need of an accommodation, then please contact me privately as early in the term as possible. Retroactive accommodations may not be provided. Students requiring accommodations must also consult the Center for Learning, Access, and Student Success(118 Reynolda Hall, 336-758-5929, <http://class.wfu.edu>). For personal issues, stress, health problems or life circumstances see shs.wfu.edu/. Contact me if you have other special circumstances. **I will find resources for you.**

Title IX
You **deserve** a community free from discrimination, sexual harassment, a hostile environment, sexual assault, domestic violence, dating violence, and stalking. If you experience or know of a Title IX violation, you have many options for support and/or reporting; see titleix.wfu.edu/.

Emergency Fund
You **deserve** a learning environment in which all of your physiological and safety needs are met. If you are experiencing situations in which these needs are not met, e.g. you do not have adequate housing or sufficient food security, the Chaplain's Office has an emergency fund which can provide support: <https://chaplain.wfu.edu/care-support/chaplains-emergency-fund/>. In situations in which you need immediate assistance there is emergency funding available through the Department of Mathematics and Statistics. If you are in need of emergency help you are encouraged to reach out to a faculty member in the Department of Mathematics and Statistics who will work with the chair of the department to address your needs.

Course Resources
The department has a limited amount of funding for class materials. If you cannot afford class materials, you are encouraged to contact the chair of the department privately as early in the term as possible. Due to the limited amount of funds, students must exhaust all other sources of funding before applying to the department for assistance.

The Honor Code
At Wake Forest, we expect you to behave as honorable citizens of the class, the university, and the world as a whole. When you complete an assignment with your name on it, you are representing that everything you are turning in is your own work. That means that you do not copy from other students, textbooks, or websites. If at any time I become aware of cheating or plagiarism in this course, I will submit the information to the honor council.

TENTATIVE COURSE CALENDAR

Matrix Algebra and Introduction to Vector Spaces

Week 1:

- 1/10: Systems of linear equations I, **Sections 1.1**
2. 1/12: Systems of linear equations II, **Section 1.1**
3. 1/14: Matrices and matrix operations I, **Section 1.2, Homework #1 Due.**

Week 2:

1. 1/17: **MLK Day**
2. 1/19: **Snow Day (Nothing Useful Happened)**
3. 1/21: Inverses of matrices I, **Section 1.3, Homework #2 Due.**

Week 3:

1. 1/24: Inverses of matrices II, **Section 1.3**
2. 1/26: Determinants I, **Section 1.5-1.6**
3. 1/28: Determinants II, **Section 1.5-1.6, Quiz #1, Homework #3 Due.**

Week 4:

1. 1/31: Vector Spaces I, **Section 2.1**
2. 2/02: **Fertilizer Bomb**
3. 2/04: **Fertilizer Bomb**

Week 5:

1. 2/07: Vector Spaces II, **Section 2.1**
2. 2/09: **Summative Assessment #1**
3. 2/09: Subspaces and spanning sets I, **Sections 2.2**

Vector Spaces and First Order Differential Equations

Week 6:

1. 2/14: Subspaces and spanning sets I, **Sections 2.2**
2. 2/16: Linear Independence and bases I, **Section 2.3**
3. 2/18: Linear Independence and bases II, **Section 2.3, Homework #4 Due.**

Week 7:

1. 2/21: Dimensions, null, row and column space I, **Section 2.4**
2. 2/23: Dimensions, null, row and column space II, **Section 2.4,**
3. 2/25: Wronskians **Section 2.5, Quiz #2, Homework #5 Due.**

Week 8:

1. 2/28: Introduction to ODEs, **Section 3.1**
2. 3/01: Separable differential equations, **Section 3.2**
3. 3/03: Linear differential equations, **Section 3.3, Quiz #3, Homework #6 Due.**

Spring Break: 3/5-3/13

Week 9:

1. 3/14: Theory of Linear ODEs I, **Section 4.1**
2. 3/16: **Summative Assessment #2**
3. 3/18: Theory of Linear ODEs II, **Section 4.1**

Linear Differential Equations and Linear Transformations

Week 10:

1. 3/21: Homogenous linear differential equations I, **Section 4.2**
2. 3/23: Homogenous linear differential equations II, **Section 4.2**
3. 3/23: Method of undetermined coefficients I, **Section 4.3, Quiz #4, Homework #7 Due.**

Week 11:

1. 3/28: Method of undetermined coefficients II, **Section 4.3**
2. 3/30: Linear transformations, **Section 5.1**
3. 4/01: Algebra of linear transformations **Section 5.2, Quiz #5, Homework #8 Due.**

Week 12:

1. 4/04: Matrices for linear transformations I, **Section 5.3**
2. 4/06: Matrices for linear transformations II, **Section 5.3**
3. 4/08: Eigenvalues and eigenvectors of matrices I, **Section 5.4, Quiz #6, Homework #9 Due.**

Week 13:

1. 4/11: Eigenvalues and eigenvectors of matrices II, **Section 5.4**
2. 4/13: **Summative Assessment #3**
3. 4/15: **Good Friday**

Eigenvalues, Eigenvectors, Systems of ODEs, and Power Series

Week 14:

1. 4/18: Similar matrices, diagonalization, Jordan canonical form, **Section 5.5**
2. 4/20: Theory of systems of differential equations, **Section 6.1**
3. 4/22: Homogenous systems I, **Section 6.2, Quiz #7, Homework #10 Due.**

Week 15:

1. 4/25: Homogenous systems II, **Section 6.2**
2. 4/27: Power series solutions I, **Section 8.1**
3. 4/29: Power series solutions II, **Section 8.1, Quiz #8, Homework #11 Due.**

Final Exam: Who knows

SUCCESS

Attend class

Participate constantly

Invest time

Concentrate on concepts in addition to calculations

Seek help when needed

Eliminate Virtual Distractions