Math 250B – Fall 2020

Course Information

Instructor: Dr. Scott Annin
Sections: 05 (1:00—2:50 PM) and 09 (5:30—7:20 PM)
Class Numbers: 31076 (1:00—2:50 PM) and 33133 (5:30—7:20 PM)
Zoom Class Room: Meeting ID 914—0686—9020
Zoom Office Hours: Meeting ID 512—459—2043

Office Hours

Mondays: 12:00—12:45 PM and 7:30—9:00 PM
Wednesdays: 12:00—12:45 PM and 7:30—9:00 PM
Fridays: 6:00 – 10:00 PM
Sundays (USUALLY): 8:00 PM — 12:00 midnight

Note: If these times are not convenient for you, you are always welcome to set up another appointment with me outside of my regular office hours.

E-Mail: sannin@fullerton.edu (I will respond to queries sent to this address within 48 business hours.)

Text: *Differential Equations and Linear Algebra (4th edition)*, by S. Annin and S. Goode

Course Description: Introduction to the solutions of ordinary differential equations and their relationship to linear algebra. Topics include matrix algebra, determinants, systems of linear equations, vector spaces, linear independence, bases, linear transformations, eigenvalues, and systems of differential equations

Grading: Homework and Quizzes (10 %), Three Midterms (19 % each), Final Exam (33 %). Whichever of the five components of your grade (homework/quiz, midterm 1, midterm 2, midterm 3, or final) is highest will receive an extra 5% weight in your course grade computation, and whichever is lowest will have 5% reduced weight. **Also, I reserve the right to raise or lower your class percentage by 2-3% on the basis of a qualitative measure that I call "qualitative performance" (see below).**

Grading Scale: I will use the following grading scale for this course:

A+ 97.5 – 100 %
A 90 – 97.5 %
A- 87.5 – 90 %

B+	85 – 87.5 %
B	77.5 – 85 %
B-	75 – 77.5 %
C+	72.5 – 75 %
C	65 – 72.5 %
C-	62.5 – 65 %
D+	60 – 62.5 %
D	52.5 – 60 %
D-	50 – 52.5 %
F	0 – 50 %

Exams: The dates of the tests are:

Test Dates

First Midterm	**Wednesday, September 23**
Second Midterm	**Wednesday, October 21**
Third Midterm	**Monday, December 7**
Final Exam	**1:00 PM class: Monday, December 14 from 1:00—3:00 PM** **5:30 PM class: Monday, December 14 from 5:00—7:00 PM**

Note: In-class exams are closed book, closed notes, closed calculators. **No make-up exams are allowed**, so check your schedule now to ensure that you have no time conflicts with the above exam schedule.

Examination Protocols: You must be prepared to show me a picture identification at all examinations, and you will be expected to turn on your device camera during all examinations. All examinations will occur synchronously during our regular class hours. You must be logged in to the Zoom Class Room (Meeting ID 914—0686—9020) with your voice muted and your camera activated and focused on yourself and your exam paper for the duration of the exam. You should print out the exam and write your answers on the printed paper in the space provided. Following the exam, you will submit your exam via Canvas.

Attendance Policy: I will only take attendance during the first two weeks of the semester. You are responsible for material covered in class lectures, whether delivered synchronously or via separate YouTube videos that can be watched at any time. It is never a good idea to miss any of the live lectures for this class, because you will miss not only the cornerstone mathematical material presented, but also any announcements or other pertinent information for the course. It is always the student's responsibility to be aware of all information that has been disseminated during class meetings.

Class Lecture Recordings: All class lectures will be recorded via Zoom and made available on the Internet for students in the class to watch at any later time in the semester. If you prefer not to have your voice or your face recorded, please let me know so that I can plan other ways

for you to interact during the class lecture. However, during examinations, you must have a working camera available to record your likeness and your work. Videos of examinations will not ever be posted to the Internet.

Important Dates pertaining to Withdrawal:

- **Tuesday, September 8**: Last day to drop without grade of "W". Students drop by using Titan Online.
- **Monday, September 21:** Last day the Math Department will be flexible on the approval of non-medical withdrawal requests. Beginning Tuesday, September 22, students must have a serious and compelling reason for non-medical withdrawal requests and must provide supporting written documentation for their reason (poor academic performance does not constitute such a reason).
- **Friday, November 13:** Last day to withdraw with a truly serious and compelling reason that is clearly beyond the student's control. Students must document their reason.

Holidays: No classes on Monday, September 7 (Labor Day), Wednesday, November 11 (Veteran's Day), and during the week of November 23—27 (Thanksgiving Break).

Homework and Quizzes: Homework assignments will be due at 10 PM on the due date. You will submit each homework assignment electronically to Canvas as a SINGLE file in PDF, DOC, or DOCX format. Again, I repeat, you must submit **ONE SINGLE file** – do not submit multiple individual pages or files. If you have multiple pages to submit, use a PDF Scanner or Cam Scanner to first compile your pages (in the correct order) into a SINGLE file.

- *Please print your name, my name, and your class time at the top right corner on the first page.*
- *Please write ON EACH PAGE of your e-mailed submission: Page 1 of #, Page 2 of #, Page 3 of #, etc., where # is the total number of pages on your assignment.*
- *To reiterate, the whole assignment must be submitted to Canvas as* **ONE SINGLE file of format PDF, DOC, or DOCX**. *Do not attach multiple files, do not refer me to an on-line website, and do not send me your homework via an e-mail.*

At least one assignment will be due per week, but two assignments in a given week is also possible. No late papers can be accepted. For each assignment, some problems will be graded in detail for mathematical correctness, and some credit will also be given for the overall completeness and quality of the work, regardless of the correctness. **Points in this category may be deducted for sloppy work, illegible writing, or poorly organized and difficult-to-follow steps.** Some problems may require you to provide a written explanation, and this should be done carefully, using complete sentences. The homework is very important, and you should work hard at it and allow sufficient time to do a thorough job. You may work together with friends and get any help from me you need, provided your final solution write-up is done in your own words and is not merely copied. I will supply formal solutions to some of the problems on the webpage. Quizzes may be scheduled with as little as one class period advance notice.

Qualitative Performance: I may use the following qualitative factors to raise or lower your class percentage by 2-3 % (basically, to deal with borderline grade cases): attendance, participation in class discussions, hard work, improvement, office hours, etc....

Academic Integrity: Students who violate university standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the university. Since dishonesty in any form harms the individual, other students, and the university, policies on academic integrity are strictly enforced. This includes receiving a disciplinary F in the course and having your name and the incident reported to the appropriate academic deans. I expect that you will familiarize yourself with the academic integrity guidelines found in the current student handbook. Examples of academic dishonesty include, but are not limited to: (1) copying from another student's homework, quiz, or exam, (2) using any unauthorized electronic device during examinations or quizzes whatsoever (calculator, phone, laptop, iPad, smart-watch, etc.), (3) allowing another student to copy your written work, (4) copying solutions from a text solutions manual or from any on-line resource such as Chegg, and (5) seeking answers to graded course work (e.g., homework) from unauthorized "experts" from outside this class, such as an outside mathematician or a different professor (unless you have asked me for permission first). Please note that in any case where I suspect any type of academic dishonesty, I reserve the right to require an oral examination from a student within 48 hours of notification in order to ensure that the student understands in full the work they have submitted (this applies to homework and examination solutions). The student must demonstrate that they have a mastery of the work they submitted for grading.

More Information: For more information on Students with Special Needs, Academic Dishonesty, and Emergency Preparedness, please visit the link:
http://fdc.fullerton.edu/teaching/syllabus.php

Final Thoughts: I'm looking forward to working with you all this semester! I *want* to help you learn the material and do well in the class. If you are having any problems or concerns with the class, I hope you will be comfortable talking to me about it. I'll do my best to give advice to keep you on track. To help me learn your names and get to know each of you, I require that each of you to drop by my Zoom office sometime during the first three weeks for 5 minutes to introduce yourself. I'll drop your lowest homework and quiz score if you do this by Friday, September 11. This will help me get to know you and vice versa, and it won't take long. Have a great semester, and good luck.

Scott Annin
August 2020

Math 250B Learning Goals

Upon completing of this course, students should:

- Know real-world examples of differential equations
- Appreciate first-order differential equations qualitatively, geometrically, numerically, and analytically
- Be able to analytically solve first-order differential equations that are separable, linear, or can be solved via using a change-of-variables technique
- Be able to do basic matrix operations, such as addition, subtraction, multiplication, scalar multiplication, transpose, derivatives, and integrals
- Understand how to use matrices to represent linear systems of equations
- Master the technique of Gaussian elimination, including bringing a matrix into row-echelon form, to solve linear systems of equations
- Be able to determine the inverse of a square matrix, if it exists, using the Gauss-Jordan technique
- Understand the equivalence of statements in the Invertible Matrix Theorem
- Be able to compute the determinant of a matrix and understand its interpretation
- Know the basic properties of determinants, including how they behave under transpose, inverse, multiplication, elementary row operations, and so on
- Know the definition and basic examples of vector spaces
- Be able to check whether a subset S of a vector space V forms a subspace
- Be able to determine, given a subset S of a vector space V, whether S spans V, is linearly independent, both (i.e. S is a basis), or neither
- Be able to compute a basis and the dimension for a given vector space V
- Determine bases and dimensions for nullspace(A), rowspace(A), and colspace(A), for any m x n matrix A
- Know and understand the value and uses of the Rank-Nullity Theorem for a matrix A
- Know the definition and basic examples of inner product spaces
- Be able to determine whether a set of vectors in an inner product space is orthogonal or orthonormal
- Be able to apply the Gram-Schmidt process to a set of vectors
- Know the definition and examples of linear transformations
- Be able to compute bases and dimension for the kernel and range of a linear transformation
- Know the relationships between the dimensions of the kernel and range of a linear transformation via the general Rank-Nullity Theorem
- Be able to determine whether a given linear transformation is one-to-one, onto, both (i.e., an isomorphism), or neither
- Understand the basic concepts of eigenvalues and eigenvectors, as well as their use in the diagonalization process
- Be able to determine whether a given square matrix is diagonalizable or not
- Know the requirements of a basis of solutions to an nth order linear homogeneous differential equation

- Be able to determine the general solution to an nth order constant-coefficient linear homogeneous differential equation
- Be able to use the annihilator and variation-of-parameters techniques to determine a particular solution to an nth order linear non-homogeneous differential equation, and therefore, determine the general solution of such differential equations
- Be able to use matrices to represent a first-order linear system of differential equations
- Be able to draw a phase portrait to represent the solutions to a first-order linear system of differential equations
- Be able to determine the general solution to a first-order homogeneous linear system of differential equations that is represented by a diagonalizable coefficient matrix
- Be able to determine the general solution to a first-order homogeneous linear system of differential equations that is represented by a non-diagonalizable coefficient matrix (in the case of 2x2 and 3x3 matrix only)
- Be able to use the variation-of-parameters technique to determine a particular solution to a first-order non-homogeneous linear system of differential equations (in the case of 2x2 coefficient matrix only)
