Math 20580

Introduction to linear algebra and differential equations

Fall 2017

Course Webpage: http://www3.nd.edu/∼craicu/20580Fall2017/math20580.html

Class meetings:

Section	Instructor	Meeting Time	Room
20580–01	Gerard Misiolek	MWF 8:20–9:10 a.m.	DeBartolo 126
20580–02	Claudiu Raicu	MWF 9:25–10:15 a.m.	Galvin Life Science Center 283
20580–03	Jay Shah	MWF 12:50–1:40 p.m.	Fitzpatrick Hall of Eng. 356

Tutorial section meetings:

Tutorial Section	TA	Meeting Time	Room
22580–11	Fangchi Yan	R 11:00–11:50 a.m.	Pasquerilla 112
22580–12	Fangchi Yan	R 2:00–2:50 p.m.	Hayes Healy 127
22580–21	Michael Perlman	R 3:30–4:20 p.m.	Hayes Healy 229
22580–22	Michael Perlman	R 12:30–1:20 p.m.	Pasquerilla 112
22580–31	Doan Le	R 9:30-10:20 a.m.	Haggar 117
22580–32	Doan Le	R 2:00–2:50 p.m.	Pasquerilla 109

Instructor and TA contact information:

Instructor or TA	Section	Office	Office Hours	Email
Gerard Misiolek	20580–01	246 Hayes-Healy	MWF 11-12pm	gmisiole@nd.edu
Claudiu Raicu	20580–02	112 Hayes-Healy	Mon 11:30-12:30pm Wed 2-3pm	craicu@nd.edu
Jay Shah	20580–03	106 Hayes-Healy	MW 5-6pm	jshah3@nd.edu
Fangchi Yan	22580–11/12	Hayes-Healy B22	Thu 4-5:30pm	fyan1@nd.edu
Michael Perlman	22580–21/22	Hayes-Healy B20	Thu 4:30-6:30pm	mperlman@nd.edu
Doan Le	22580–31/32	Hurley 289	Tue, Wed 3-4pm	dle2@nd.edu

You may attend any of these office hours, not just your instructor's or TA's.

Textbooks:

- Linear Algebra, and its applications, 5th edition, by David C. Lay, Steven R. Lay and Judi J. McDonald, Addison Wesley, 2015.

- Elementary Differential Equations and Boundary Value Problems, 11th edition, by William E. Boyce and Richard C. DiPrima, Wiley, 2017.

Course description:

What is linear algebra? Functions and equations that arise in the"real world" often involve many tens, hundreds or thousands of variables, and one can only deal with such things by being much more organized than one typically is when treating equations and functions of a single variable. Linear algebra is essentially a "language for accounting" that's been developed just for this purpose. We will learn methods for solving equations and ways of understanding their solutions that are very effective when the equations are what is called (of course) "linear". In a kind of analogical way, we will even learn to "visualize" many-dimensional situations.

What are differential equations? Many functions that come up in applications do so only in an indirect fashion. That is, rather than being told what the formula is for a function, one is given some (differential) equation relating the function to one or more of its derivatives. For instance, a bank does not advertise a formula for the amount of money in a hypothetical account. Instead it advertises an interest rate, which is a way of saying how the amount of money in an account will change with time. The main goal in studying a differential equation is to understand the function it applies to. In simple situations one can use the equation to determine a formula for the function. In more complicated ones, when formulas are impractical or impossible, one can still try to answer specific question, like "what happens to the function when the independent variable becomes large? does the function also become large? small?" etc.

What will we cover? We will spend 2/3 of the semester on linear algebra, covering chapters 1 through 6 in Lay's book. The remaining 1/3 of the semester (and the entirety of Math 30650, should you take it) will be spent on differential equations. In this semester, we'll cover Chapters 1 through 3 of Boyce and DiPrima. Time is short, and we won't have much time to discuss applications of the math we're learning, particularly the linear algebra. So we highly encourage you to look at the chapter introductions and some of the"applications" sections (e.g. 1.6) in Lay's book. One can plausibly argue that linear algebra is the fundamental tool in modern applications of mathematics, used to determine airline schedules, rank webpages in search engines, compress or encrypt electronic data, model the flow of oil underground, and so on and on and on.

Course Schedule: On the course webpage listed above a tentative schedule of the material to be covered in each class is available. You are expected to read the material before the class. We will not necessarily cover all the details of the section. Please come to class with questions about the aspects you did not understand from your reading and for which you still need clarification after or during the in-class lecture.

Homework: On the webpage a list of the homework assignment for the material covered in each section is given, as well as the due dates for this homework. You should attempt the

problems the day that they are assigned, and seek help on those aspects of the material you are not understanding so as not to fall behind. Homework is generally due in your Thursday tutorial, with special arrangements for submission on exam days, or when necessary because of Thanksgiving or the end of classes. Late homework will not be accepted. The homework submitted must be stapled: no loose pages.

Tutorial and Quizzes: There will be a tutorial each Thursday of classes except for Thursday October 26, which is the day of the second mid-semester exam. Tutorials *will* be held the first week of classes and during the weeks of the first and third exams. Most weeks, you will have a short quiz in tutorial to help you stay current with the material, except for the first week and exam weeks. The first week's tutorial will be concerned with practicing row reduction, which is a basic skill required for much of the course.

You are expected to attend every class including your assigned tutorials. Excessive absences may result in lowering your grade and even failing the course. There will be no makeups on quizzes; if you have an *excused* absence for a quiz, that quiz will simply be disregarded in your assessment (0 points awarded from a possible 0 points for that quiz).

Exams: There will be three midterm exams and a final exam. Calculators will not be allowed on exams. Exams may be made up only with an excused absence from the Assistant Vice President for Residence Life. Mid-semester or end of semester travel plans, marriages or graduations of friends and family etc are not considered an acceptable excuse for absence from an exam. Exam conflicts involving mid-semester or final exams or exams worth 15% or more of the final course grade (i.e. 2 or more such exams simultaneously, 3 or more in a single day, or 4 or more in a 24 hour period) must be resolved well in advance of the exam date. Please check your courses' exam schedules, and contact your dean's office as soon as you become aware of any such conflict, and in any case at least a week before the exam. Athletes should notify their athletic advisor of their exam schedule, so if an excused athletic absence falls on an exam day, your advisor can make arrangements to administer the exam to you while you are away. Students with disabilities wishing to take exams at the Sara Bea Center should make arrangements to do so well before the first exam.

The Math 20580 exam schedule is:

Exam	Date	Time	Room
			For Exams 1–3, rooms are by instructor:
Ex 1	T 9/19	8:00–9:15 a.m.	
			Misiolek (20580-01) 129 Hayes-Healy
Ex 2	R 10/26	8:00–9:15 a.m.	
			Raicu (20580–02) 127 Hayes-Healy
Ex 3	T 11/14	8:00–9:15 a.m.	
			Shah (20580-03) 117 Hayes-Healy
Final	T 12/12	1:45-3:45 p.m.	Misiolek (20580-01) 126 DeBartolo Hall Raicu (20580-02) 283 Galvin Life Science Center Shah (20580-03) 356 Fitzpatrick Hall of Eng.

Grades: Your course grade will be based on your total score out of 550 possible points:

Homework	Quizzes	Exam 1	Exam 2	Exam 3	Final Exam	Total
60 pts	40 pts	100 pts	100 pts	100 pts	150 pts	550 pts

The lowest scores giving an A-, B-, C- and D grade for each midsemester exam will be announced after the exam to give an indication of your performance. In fairness to all students, your course grade simply reflects how well you have done overall in the assessed course activities and instructors are not at liberty to adjust your grades because you (or even they) think that you could have done better in other circumstances.

Honor Code: Notre Dame students are expected to abide by the Academic Code of Honor Pledge: "As a member of the Notre Dame community, I will not participate in or tolerate academic dishonesty." The homework, quizzes and all exams are conducted under the honor code. Exams and quizzes are closed book and are to be done completely by yourself with no assistance from others. Although collaboration on homework is encouraged, directly copying the work of others without contributing to working out the solution or fully understanding the work constitutes an infringement of the honor code. Discussing quizzes with other students on Thursday before the final tutorial ends at 4:20 p.m. is also a violation of the honor code.