Math 20580
Introduction to linear algebra and differential equations
Spring 2020

Course Webpage: http://www3.nd.edu/∼craicu/20580Spring2020/math20580.html

Class meetings:

Section	Instructor	Meeting Time	Room
20580–01	Matthew Dyer	MWF 8:20–9:10 a.m.	Hayes-Healy 117
20580–02	Eric Riedl	MWF 10:30–11:20 a.m.	Hayes-Healy 117
20580–03	Claudiu Raicu	MWF 11:30–12:20 p.m.	Hayes-Healy 117
20580–04	Eric Riedl	MWF 09:25–10:15 a.m.	Hayes-Healy 117
20580–05	Pavel Mnev	MWF 12:50–1:40 p.m.	Hayes-Healy 117
20580–06	Pavel Mnev	MWF 2:00–2:50 p.m.	Hayes-Healy 117

Tutorial section meetings:

Tutorial Section	TA	Meeting Time	Room
22580–11	Lyda Urresta	R 11:00–11:50 a.m.	O'Shaughnessy Hall 114
22580–12	Lyda Urresta	R 9:30-10:20 a.m.	O'Shaughnessy Hall 114
22580–21	Richard Birkett	R 11:00–11:50 a.m.	Pasquerilla Center 109
22580–22	Michael Perlman	R 2:00–2:50 p.m.	Hayes Healy Center 129
22580–31	Yichao Li	R 3:30–4:20 p.m.	Pasquerilla Center 105
22580–32	Michael Perlman	R 12:30-1:20 p.m.	Hayes Healy Center 231
22580–41	Richard Birkett	R 9:30-10:20 a.m.	O'Shaughnessy Hall 115
22580–42	Yichao Li	R 12:30–1:20 p.m.	Hayes Healy Center 229
22580–51	Hari Rau-Murthy	R 12:30–1:20 p.m.	Hayes Healy Center 117
22580–52	Wern Yeen Yeong	R 9:30-10:20 a.m.	O'Shaughnessy Hall 116
22580–61	Wern Yeen Yeong	R 11:00–11:50 a.m.	O'Shaughnessy Hall 116
22580–62	Hari Rau-Murthy	R 2:00–2:50 p.m.	Pasquerilla Center 105

Instructor and TA contact information:

Instructor or TA	Section	Office	Office Hours	Email
Matthew Dyer	20580–01	140 Hayes-Healy	Mon 11-12pm	dyer@nd.edu
			Wed 1:30-2:30pm	
Eric Riedl	20580–02/04	122 Hayes-Healy	Mon 11:30-12:30pm	eriedl@nd.edu
			Tue 1-2pm	
Claudiu Raicu	20580–03	112 Hayes-Healy	Mon 2-3pm, Wed 4-5pm	craicu@nd.edu
Pavel Mnev	20580–05/06	124 Hayes-Healy	Mon 5-6pm, Wed 5-6pm	pmnev@nd.edu
Lyda Urresta	22580–11/12	253B Hayes-Healy	Wed 2-3pm, Fri 1-2pm	lurresta@nd.edu
			(Math Helproom)	
Richard Birkett	22580–21/41	295 Hurley	Tue 3-4pm, Wed 4-5pm	rbirkett@nd.edu
			(Math Helproom)	
Michael Perlman	22580–22/32	B20 Hayes-Healy	Wed 4-6pm	mperlman@nd.edu
			(Math Helproom)	
Yichao Li	22580–31/42	289 Hurley	Thu 2-3pm, 5-6pm	yli20@nd.edu
			(Math Helproom)	
Hari Rau-Murthy	22580–51/62	235 Hayes-Healy	Tue 5-7pm	hraumurt@nd.edu
			(Math Helproom)	
Wern Yeen Yeong	22580–52/61	295 Hurley	Mon 3-4pm, Fri 3-4pm	wyeong@nd.edu
			(Math Helproom)	

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, 2016.
- Elementary Differential Equations and Boundary Value Problems, 11th edition, by William E. Boyce and Richard C. DiPrima, Wiley, 2019.

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 otherwise necessary. 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 exam days. Tutorials *will* be held the first week of classes. 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
Ex 1	R 02/13	8:00–9:15 a.m.	101 Stepan Center (all sections)
Ex 2	R 03/05	8:00–9:15 a.m.	101 DeBartolo Hall (sections 01, 03, 04)
			102 DeBartolo Hall (section 02)
			141 DeBartolo Hall (sections 05, 06)
Ex 3	R 04/16	8:00–9:15 a.m.	101 Stepan Center (all sections)
Final	R 05/07	1:45–3:45 p.m.	TBA

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.