

## Math 3315, Spring 2017, Advanced Calculus and Linear Algebra II

INSTRUCTOR: Andrei Rapinchuk (KER 307), e-mail: asr3x@virginia.edu

OFFICE HOURS: Tu 11:00 - 12:00 or by appointment

TA: Richard Vradenburgh (KER 125), e-mail: rwv7tz@virginia.edu

**Required Text:** *Multivariable Mathematics* by R.E. Williamson and H.F. Trotter, Prentice Hall, 2004.

**Additional Texts** (not required):

1. C.H. Edwards, Jr., *Advanced Calculus of Several Variables*, Dover, 1994
2. S.G. Krantz, *Differential Equations, Theory, Technique and Practice*, 2nd edition, CRC Press, 2015

In addition, numerous handouts and other materials will be distributed via e-mail and posted on UVACollab.

**Prerequisites:** Math 2315 or Math 2310 and some familiarity with linear algebra (contact the instructor about the details).

**Course description:** This course is a continuation of Math 2315 and will be conducted in the same format (see below). Building on the material from linear algebra covered in Math 2315, we will present a detailed study of vector spaces (bases, dimension, coordinates etc.) and then analyze linear maps between them. We will also consider such more specialized topics as diagonalization and inner product spaces. Then our focus will shift to differential equations. We will present techniques for finding solutions of various types of first-order equations and develop a theory for solving linear equations with constant coefficients of any order. Next, we will consider systems of differential equations and describe the use of matrix methods for solving linear systems with constant coefficients. After a brief review of sequences and series, we will demonstrate how power series can be used to solve some ordinary differential equations and Fourier series can be used to solve some partial differential equations. Some classical examples from physics such as the pendulum/wave/heat equations will be considered.

In addition to the standard assignments used in Math 2315 such as comprehension quizzes, quizzes and weekly problem sets, students will independently research a topic of their choice related to the course (approved by the instructor) and present their findings in the form of a short paper and an oral presentation.

The successful completion of the MATH 2315-3315 sequence exempts math majors from the requirement to take MATH 3250 and 3351 (in terms of credits, MATH 3315 is counted as one elective credit towards a math major). We expect that after completing the sequence students should be able to take 4000-level math courses (including MATH 4250 and 4651 which are the advanced versions of MATH 3250 and 3351, respectively) in the following year paving the way to participation in our Distinguished Major Program - note that in some cases, an additional 3000-level proof-oriented class may be recommended.

**Attendance** is REQUIRED in the lectures AND the discussion sections. The fast pace of the course and the large amounts of material covered each week will make it virtually impossible to catch up once you miss a couple of classes. In addition, you need to be in class to turn in all assignments (homework, quizzes, review assignments) on time. **Late assignments (for whatever reason) will not be accepted – no exceptions!** You will be giving your presentations in our traditional Wednesdays evening sessions (5-6:30pm), so keep this time slot open in your schedule as the attendance at all presentations is REQUIRED.

**Exams:** There will be one midterm test and a final examination. Both exams will be take-home, and will be posted on UVaCollab at the appropriate times. Tentative dates are as follows:

**Midterm** – posted - March 4, due - March 14 in class;

**Final** - posted - May 3, due - May ?? at ??pm in the envelope on the instructor's door (KER 307).

**Format:** Two lectures (TuTh, 9:30-10:45, Wilson Hall 238) and one discussion section (M, 17:00-17:50, Wilson Hall 214) each week. Here is a schedule for a typical week (from Thursday through next Thursday):

<b>Thursday</b>	-new material is introduced; reading assignment, comprehension quiz (meant to encourage you to read the assigned material) and homework assignment are posted on UVaCollab
<b>Friday</b>	-homework assignment from the previous week is due by 3pm in TA's mailbox
<b>Monday</b>	-comprehension quiz is due by 3pm in the envelope on the instructor's door; discussion section, quiz on the previous week's material is handed out
<b>Tuesday</b>	-more detailed discussion of this week's material focused on the difficulties that emerged in your comprehension quizzes; quiz handed out at the discussion section is due by 3pm in TA's mailbox
<b>Wednesday</b>	-independent work on this week's homework assignment; (optional) problem session 5-6:30pm, room: TBA
<b>Thursday</b>	-graded homework assignment from the previous week is returned

We will have problem sessions virtually every Wednesday. Some of these will focus on extra problems, examples and previous exams. While these sessions are *optional* (i.e. attendance is not required), students typically find them very useful. Other Wednesday sessions (viz., about 5-6 of them) will be used for the students' presentations, and these will be *mandatory*. So, it is very important that the time slot of W, 5-6:30pm, open in your schedule.

**Grading policy:** Final grades will be assigned on the basis of your total scores calculated according to the percentages displayed below:

<b>Comprehension quizzes</b>	10%
<b>Homework</b>	10%
<b>Quizzes</b>	15%
<b>Paper</b>	10%
<b>In-class presentation</b>	5%
<b>Midterm</b>	20%
<b>Final</b>	30%

The grading scale is as follows:  $A+$  – 95-100;  $A$  – 90-94;  $A-$  – 86-89;  $B+$  – 83-85;  $B$  – 78-82;  $B-$  – 75-77;  $C+$  – 72-74;  $C$  – 69-73;  $C-$  – 65-68;  $D+$  – 62-64;  $D$  – 57-61;  $D-$  – 54-56;  $F$  – below 53.

**Honors policy:** Comprehension quizzes and homework assignments are not pledged, so you may use the text and discuss these assignments with others (in fact, we strongly encourage collaboration among students). However, what you turn in must represent your personal effort and not just be a copy of someone else's paper. Quizzes, the midterm and the final examination are pledged assignments, so no aid may be used (unless authorized by the instructor/TA).

All students with special needs requiring accommodations should present the appropriate paperwork from the Student Disability Access Center (SDAC). It is the student's responsibility to present this paperwork in a timely fashion and follow up with the instructor about the accommodations being offered. Accommodations for test-taking (e.g., extended time) should be arranged at least 5 business days before an exam.