Math 3315, Spring 2016, 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: Andrew Kobin (KER 121), e-mail: ak5ah@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. We will conclude by re-examining the theorems of vector calculus using the language of differential forms.

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.

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!**

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 5, due - March 15 in class;

Final - posted - May 3, due - May 9 at 5pm in the envelope on the instructor's door (KER 307).

Format: Two lectures (TuTh, 9:30-10:45, Chemistry Bldg. 303) and one discussion section (M, 17:00-17:50, Monroe 118) each week. Here is a schedule for a typical week (from Thursday through next Thursday):

Thursday	-new material is introduced; reading assignment, comprehension quiz (meant to encourage you to read the assigned material) and homework assignment are posted on UVaCollab
Friday	-homework assignment from the previous week is due by 3pm in TA's mailbox
Monday	-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
Tuesday	-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

Wednesday	-independent work on this week's homework assignment; optional problem session 5-6pm, room: TBA
Thursday	-graded homework assignment from the previous week is returned

We will have optional problem sessions virtually every Wednesday. While attendance at this sessions is not required, students find them very useful as we go over the previous exams and do extra problems. We will also use these sessions for the students' presentations. So, try to keep the time slot of W, 5-6pm, 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:

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

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

Honors policy: Review assignments, 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.