**APPM 2360  Differential Equations with Linear Algebra**  Fall 2019

| Lecture 111, MWF 8:30–9:20 AM, AERO N240 |
| Eric Thaler, ECCR 217,  
| eric.thaler@colorado.edu  
| Office Hours: MWF 11:00-11:50 AM, MW 2.00 2.40 PM |

| Lecture 160, MWF 1:00–1:50 PM, ECCR 245 |
| Patrick Sprenger, ECCR 217, MWF 1.00 - 2.00 PM  
| Office Hours: MWF 1.00 - 2.00 PM |

| Lecture 130, MWF 10:00–10:50 PM, ECCR 245 |
| Bengt Fornberg, ECOT 334, 492-5915  
| fornberg@colorado.edu  
| Office Hours: M 11:00-12:30 PM, W 12.00 1.30 PM |

| Lecture 170, MWF 2:00–2:50 PM, DUAN G125 |
| Igor Rumanov, ECCR 257,  
| igor.rumanov@colorado.edu  
| Office Hours: MTF 11.00 AM-12.00 |

| Lecture 150, MWF 12:00–12:50 PM, ECCR 265 |
| Keith Julien, ECOT 324, 492-5753  
| julien@colorado.edu  
| Office Hours: M 1:00 -2:30 AM, W 12:00 - 1:30 PM |

**NOTE: Office hours for instructors are in their offices, while office hours for TAs are always in the room ECCR 211**

**Course Objective:** To learn the concepts and techniques of ordinary differential equations and linear algebra. Topics include qualitative methods, linear and nonlinear ODEs, Laplace transforms, and first and second order systems.

**Text:** *Differential Equations and Linear Algebra,* by Farlow, Hall, McDill, & West, 2nd edition. (Please note that the exercises are different from the first edition.) We have a list of errata at this webpage.

**Course websites:** There are two relevant websites and you will need to check both on a regular basis.


2. [Canvas](https://canvas.colorado.edu) for grades, homework solutions, and submitting projects

**Recitations:** Recitations meet for 1 hour on Thursdays. The purpose of the recitation is only partly to help you with the homework. More importantly, the recitation is intended to further clarify the course concepts. Recitations do not meet the day after our midterm exams. Signing up for a recitation (and attending) is mandatory (whereas the companion lab course APPM2460 is optional)

**Office hours:** Instructor and TA office hours and locations will be posted on the course webpage. Instructor office hours are usually held in their offices. All TA office hours will be held in ECCR 211.

**Homework:** To do well in this course, attend the lectures and do (and understand) the homework. Ask questions. Homework is due in recitation on Thursdays, except during exam weeks, when they are due the following Monday at 4 pm under your TAs office door. Late homework will not be accepted or graded. You must show all your work in your homework. Homework problems and due dates will be posted on the course webpage. The problems listed are those that are to be turned in for credit; however, it is your responsibility to do as many problems as necessary to understand the material. Graded work will be returned during the next recitation, and the solutions will be posted on Canvas. There are 11 homeworks. One homework will be dropped (this also accounts for a homework not submitted due to unexpected circumstances).

**Exams:** There are three midterm exams and a comprehensive final. The midterms are on Wednesdays Sep. 25, Oct. 23, and Nov. 20, 5:00 PM – 6:30 PM. The final exam is Tuesday, Dec. 17, 7:30 AM – 10:00 AM. There will be no early or make-up exams. If you are sick during a midterm, please bring a note from your doctor verifying your illness. Your course grade will then be determined by the rest of your course work. Please bring your CU ID to each exam. You will be allowed one single-sided crib sheet for the midterm exams and one double-sided crib sheet for the final exam; handwritten sheets are suggested. Electronic devices are not allowed during the exams. If you have any unavoidable schedule conflicts with the exams, including three or more final exams on the same day, you must notify your instructor and supply documentation by the Friday prior to the first scheduled midterm.

**Computer projects:** You will turn in two projects for APPM 2360. In these projects, you will investigate certain topics in differential equations in more detail, perform some of your analysis using a computer software package (Matlab is suggested), and turn in a written report of your results. Projects and due dates will be posted on the course web site, and you will submit a PDF copy to Canvas by 11:59 PM on the due date. You may only work in groups of two or three people, and you can work
with students in any section of this course; do not wait to the last-minute to create your group. Email the lab coordinators if you need help forming a group. Only one PDF needs to be submitted for your group. All group members will receive the same grade, and neither the instructors nor TA's will arbitrate internal group disputes. Late projects will not be accepted or graded. These projects are required of all students registered in APPM 2360.

**Regrades:** If your exams or projects were misgraded, within one week of when the documents were returned to the class, submit a clear, detailed written explanation addressing the specific grading errors. A penalty may be assessed for frivolous or nebulous regrade requests. Exam regrades should be submitted to your instructor, and project regrades should be submitted to one of the APPM2460 lab coordinators: Joy Mueller (joy.mueller@colorado.edu) and Daniel Ferguson (daniel.ferguson@colorado.edu).

**APPM 2460:** This is an optional, 1 credit Pass/Fail lab-based course in which one can learn more about the material associated with the projects, as well as Matlab. Students wanting such additional help are strongly encouraged to sign up for this lab.

**Grade determination:** There is a total of 1000 points for the course. The points are distributed over homework (150 points), quizzes (50 points), two projects (50 points each), three midterm exams (150 points each), and a cumulative final exam (250 points).

In order to earn a C- or better in APPM 2360, students must have an exam average of 55% or better (midterms plus final) and an overall course average of 65% or better. The rest of the grading scheme is not fixed (so 90.0 is not necessarily an “A-”) but is curved at the instructors’ discretion. Typical values from past semesters are in the range of 87–89 for the A-/B+ cutoff, for example.

**Dropping the course:** Advice from the Dean’s office and your department advisor is recommended before dropping any course. After 11:59 PM Sep. 11, dropping a course results in a “W” on your transcript and you will be billed the tuition. After 11:59 PM November 1, dropping the course is possible only with a petition approved by your instructor and the Dean’s office.

**Blue books:** Each student is required to purchase five 8.5”×11” blue books and give them to the TA by the second recitation (Sep. 5). You will be awarded 5 bonus homework points for turning in your blue books on time. These will be used for the exams, so please do not write anything on the front of the books.

**Accommodation for Disabilities** If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website. Any student requiring exam accommodations should contact their instructor and the Help Room Coordinator, Seneca Lindsey (Daniel.Lindsey@Colorado.EDU; office: ECCR 241). Make sure to schedule arrangements with Dr. Lindsey 5 business days in advance of any exam requiring accommodation.

**Accommodations for University-Related Extracurricular Activities** Students formally affiliated with curricular and extracurricular University-related activities are required to communicate in writing with the instructor about potential conflicts within the first week of class or as soon as the student learns of a conflicting event. This deadline is established in order to provide students with time to change their course schedule if necessary. Instructors are not obligated to accommodate any potential conflicts, but may, at their own discretion, allow reasonable accommodations for these absences.

**CU policies** Information about CU policies on Disability Services, Religious Observances, Classroom Behavior, Discrimination and Harassment, Academic Honesty and Honor Code, and Final Examination Policy can be found on the CU Policies page and are considered part of the syllabus for APPM 2360.
TA office hours: These TA office hours are tentative and may change. Please refer to course websites periodically. These office hours are in addition to the TA-led recitations on Thursdays.

Syllabus

Course-level Learning Objectives: Explain the importance of ordinary differential equations in science and engineering, identify appropriate analysis methods, and develop mathematical thinking with the exposure to abstract vector spaces.

Topic-level Learning Objectives:

- Categorize types of differential equations (ordinary/partial, linear/nonlinear, separable)
- Qualitative methods: construct and interpret direction fields and phase planes
- Analytic methods: solve separable first-order equations, and inhomogeneous linear second-order equations
- Laplace transform: know when to recommend the Laplace transform method, and to how to compute solutions to second-order equations using the method
- Linear algebra: explain the concept of a vector space, determine whether a given set of vectors are linearly independent, compute eigenvalues and eigenvectors, apply the methods of linear algebra to a system of linear differential equations