Master Syllabus
Math 256: Intro to ODE
2021-2022 (some remarks regarding RETURN TO IN-PERSON)

Course coordinator: Dr. Micah Warren, Fenton 318, 541-346-5618.

Standard Course description: Introduction to differential equations and applications. Linear algebra is introduced as needed. Prerequisites: MATH 253 or equivalent. A good understanding of differentiation and integration is assumed.
Textbook: The official textbook is Elementary Differential Equations, 11th edition, by William E. Boyce, Richard C. DiPrima. The subject of ODE has been around for centuries, nonetheless, this particular book has 11 editions and even the 10th newest version is expensive. (If students choose to use an older version, this should be fine, provided they have access to the homework problems which will be selected in the current version. WebWork obviates this issue.) I've experimented in the past with the open access textbook https://www.jirka.org/diffyqs/. This is OK, but doesn't include discussion of the Wronskian. You can make mention this textbook to the students as a close resource.
Material: We cover Chapters 1,2,3 and 4, along with parts of Chapters 7. If time, some Chapter 8. (Note: In the past sometimes Chapter 6 has been used in time that would be used for chapter 7. There's WebWork problems set up for this.)
Prerequisites: C- in Math 253 or equivalent calculus coursework (as determined by instructor.)
Other Resources: (The following applies in a typical, non-COVID situation). There are tutoring and ad-hoc study groups available in the Math Library Reading Room (Fenton Hall) and also the Teaching and Learning Center (recently moved to 4th floor, Knight Library). For students interested in extra practice problems, there are plenty of problems in the textbook (this may seem obvious but it needs to be said explicitly.) *We will wait and see what this looks like this year.*
Learning Outcomes: The goal of this course is to teach students to work with ordinary differential equations. Students should learn all of the following:

- How to recognize them.
- How to explicitly solve simple ODEs: i) Basic Integrable, ii) 1st Order Separable, iii) 1st Order Linear, iv) 2nd Order Linear Homogeneous (with Constant Coefficients or Euler Form), v) 2nd Order Linear Nonhomogeneous, vi) Higher Order Linear Homogeneous (with Constant Coefficients or Euler Form), vi) 1st Order Linear Systems
- Identify when ODEs can or cannot be solved uniquely
- Linear algebra sufficient to solve linear systems of first order ODEs
- How to analyze the stability and long-time behavior of solutions of general 1st order ODEs.
- How to use ODEs for modeling and predicting the behavior of physical, biological and other systems.
- (If time) How to numerically approximate solutions to ODEs .

Grading: There will be weekly assignments, two midterms (recommended) and weekly quizzes (recommended) and a final. A sample breakdown is as follows.

Homework/Worksheets/Webwork	25%
20 Minute Quizzes	25%
Midterms	25%
Final	25%.

Homework: Webwork is now recommended and possibly soon-to-be mandatory for this course. (This wasn't always the case.) *As of September 2021, one must explicitly talk to the chair in order to have grader for math 256*

If there is a grader, traditional homework can be assigned on Canvas. No late homework accepted, or moral depravity ensues. Typically, lowest score will be dropped. I typically assign about 12 - 15 problems per set. This comes out to about 4-5 per section. A few from the easy section and then some fun ones. The grader will typically score only a few randomly selected problems, hopefully grading these in depth. I encourage this explicitly when I meet with the grader - otherwise the grader can get into a rhythm of just checking answers to every problem very quickly and not offering good feedback.

Note that an advantage of WebWork is that students can have any version of the textbook. When there are multiple versions of the textbook you have to be careful with assigning problems, but this problem does not arise with WebWork.

If Webwork: you don't have to worry about the grader, you just have to make sure to stay on top of how the assignments are lining up with the lectures and carefully pick the problems because some of the problems can be difficult or beyond the scope of what you have covered.

I taught the course in Winter 2021, and used some webwork problems that accompanied the open source textbook *Notes on Diffy Qs: Differential Equations for Engineers:* https://github.com/jirilebl/diffyqs-webwork. There's a specific, efficient and not necessarily intuitive process for loading in webwork and creating assignments - I forget this at the start of every quarter, but every quarter the time it takes for me to remember seems to decrease. I'm happy to explain if anyone finds themselves staring blankly at the webwork UI.

Students are encouraged to work with each other on the homework outside of class, however, each should write up or webwork their own assignment. Any technology useful to gain intuition or check work is not discouraged. My general rule for fair-game material for exams is that "this type of problem was assigned on a homework due before the exam."

Worksheets: These are a good idea for Monday or Tuesday, to get the students talking to each other and the instructor, and to get a real-time feeling for how the material is taking. I sometimes make these due if it seems the students are using this for social hour.

COVID update: The above paragraph describes a format that worked for me during traditional in person courses. I plan to try this same format using breakout rooms this year. I can't say from experience whether it produces the same result. Obviously, 4 hours is a lot to just lecture, so it's good to build in some break-out time.

POST-COVID update: Use your judgment if group work makes sense.

Quizzes: I typically offer a short quiz every Friday, unless there's a midterm. The material up through the Wednesday of that same week will be fair game. Most Fridays, they will be 20 minutes long. The lowest 20 minute quiz score will be dropped. No calculators/smart watches, etc are available for the quizzes/exams. Quizzes/exams can only be taken other than the scheduled time if arrangements are made in **advance** and a valid and admissible reason for not attending the scheduled time is provided. Obviously, no collaboration on the exams.

Exams: The final exam is cumulative and scheduled by the Registrar. The same rules apply as for quizzes. Faculty legislation prohibits final exams from being administered early.

Academic dishonesty: Any type of academic dishonesty will not be tolerated. In the event of academic dishonesty, the offense will be reported to the Office of Student Conduct and Community Standards and the student will be sanctioned up to receiving a failing grade in the course. Two students sitting near each other on an exam having significantly similar answers to each other will be considered evidence of dishonesty and will be reported.

Students with Disabilities: If you are a student with a documented disability, please meet with me during the first week of class to discuss your needs. If you have not already requested a notification letter from Disability Services outlining recommended accomodations, please do so soon.

Sample Schedule :	Week 1: Chapter 1, start Chapter 2 .	Week 2: Middle of chapter 2.
	Week 3: Finish Chapter 2.	Week 4: Start chapter 3, midterm on Chapters 1-2.
	Week 5: Middle of Chapter 3	Week 6: Later parts of Chapter 3.
	Week 7: Finish Chapter 3, 4.1, 4.2.	Week 8: Start chapter 7, midterm on Chapters 3-4
	Week 9: Chapter 7.	Week 10 Chapter 7, 8.1,8.2 if time. Review.

The final obviously has to be a little bit heavier on the Chapter 7 material. Thanksgiving throws a special wrench in the last two weeks.

YOUR SYLLABUS SHOULD INCLUDE STATEMENTS AS SPECIFIED HERE:

https://provost.uoregon.edu/academic-council-fall-2021-guidance-and-expectations-during-covid-19-pandemic