Math 256: Introduction to Differential Equations
CRN:13821
Master Syllabus Archetype
Fall 2015

Professor: Jim Isenberg
Office: 10C Deady and 449 Willamette
Phone: 541 346-4715 or 541 346-4725
e-mail: isenberg@uoregon.edu

Office Hours: MWF 2-3 pm in 449 Willamette Hall

Text: *Elementary Differential Equations and Boundary Value Problems* (10th edition) by Boyce & DiPrima.
–We cover Chapters 1,2,3 and 4, along with parts of Chapters 7, 8 and 9.
–While I prefer that you have the 10th edition, you may use an earlier edition, so long as you make sure that you have the correct problems (from the 10th edition).
–There are 2 versions of this text book: with and without "and Boundary Value Problems". Either is ok for the course.
–There are *lots* of other books on ordinary differential equations, in the library or online. It can be very helpful to look at other treatments of a given topic (such as 2nd order linear ODEs).

Prerequisites: You need to know calculus. Integration is especially important.

Course Goals: The goal of this course is to teach you to work with ordinary differential equations. You 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.
- How find numerical approximations for solutions of general 1st 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.

Blackboard→Canvas: "Blackboard" has been replaced by "Canvas" as the website on which I will post the syllabus, review sheets for upcoming exams, answer sheets for just-completed exams, and other stuff of this nature. This may not happen for a week or so, since the mandate to use Canvas is new, and I have not yet learned the protocol in working with it. Canvas can be found at http://canvas.uoregon.edu/.

Accessibility: The University of Oregon is working to create inclusive learning environments. Please notify me as soon as possible if there are aspects of the instruction or design of the course that result in disability-related barriers to your participation. You may also wish to contact Disability Services at 164 Oregon Hall, phone number 541-346-1155, email: disabsrv@uoregon.edu.

Homeworks: Homework problem sets are generally assigned to you each Monday in class, and should be handed in 9 days later, at the beginning of that day's class. I will let you know exactly which days each assignment is due. There may be some additional problems given to you during lectures. If there is student interest, I will schedule a problem session the day before the HWs are due, sometime in the late afternoon or early evening. In doing the HWs, you should focus on understanding and explaining how to do each problem, not just on getting the right answer.

Project: *Archetype Note (JI): A project of the type noted here is a feature of the way I like to teach 256. Most instructors of this course do not include such a feature.*
As an optional part of your grade, you may do a project consisting of a 5-10 page written paper on a topic related to ODEs which is *not* covered in class. In your project paper, you should (*all in your own words*) i) describe what your topic is, ii) discuss the workings of any procedures used, iii) state any important and relevant results and theorems, and iv) discuss applications. I really want to see, from your project paper, that you have learned about a new topic, that you understand, and that you can explain it.

Among the topics you might consider are the following:

- Proving existence and uniqueness of solutions of the initial value problem for 1st order ODEs.
- 1st order ordinary *difference* equations.
- Laplace transforms
- Modeling competing populations (predator-prey, competing hunters, etc).
- Numerical solution simulation procedures that are more accurate than Euler's method.
- 2nd order linear ODEs with non constant coefficients.
- The wave equation
- The heat equation

Exams: There will be two midterm exams, and a final exam. The first midterm will be around the beginning of the 4th week, and the second will likely be during the 8th week. The final is scheduled for 10:15 on Friday the 11th of December. I will provide review sheets, including sample problems, for each of these exams. I will hold review sessions just before each of them.

You will be allowed to bring a 3 x 5 note card to each exam.

No calculators or electronic devices of any sort will be allowed at any of the exams. *Archetype Note (JI): Some instructors allow calculators or the like to be used in class and in exams. I don't.*

Grades: *Archetype Note (JI): This is one possible grading scheme, which includes the Project. Other instructors may prefer other grading schemes.*
The calculation of your grade is based on the following weighting:

Homework	20%
1st Midterm	20%
2nd Midterm	20%
Project	20%
Final	40%

If the HW, or one of the Midterms, or the project are your lowest grades, I will drop that. If the Final exam is your lowest grade, I will weight the Final as 20%.

Please note that I will *not* provide a running tally of exam and HW grades for each student on Canvas or on Duckweb.

On Electronic Devices: Calculators, computers, I-pads, cell-phones, and the like are *very* useful tools for studying ODEs and their solutions. However, they are useful *only* after you understand what is going on. So they will not be needed (or used) in this class. They will not be allowed during exams, and should not be used during lecture classes.

Cheating: Don't. Don't. Don't. Don't. Don't. Don't. Don't. Don't. Don't.

Study Tips

- Go over your notes after each class. Explain to yourself—preferably in writing—what the lecture was about, what the key ideas were, and how the examples work. Even better, explain this to someone else.
- If you are puzzled by something in lecture, *ask about it*, either in class or in Office Hours.
- Reading math is not like reading a sports blog or a novel: You may need to read a section in the book a number of times before you understand it. There's nothing wrong with that; it is expected!
- Read ahead in the book. It helps a lot to have already read, at least once, the material covered in class.
- Form a study group with others in class. The best way to learn something is to try to explain it to someone else.
- Keep your old (marked) homework assignments and exams. Make sure that you understand how to do each problem correctly, especially the ones you may have gotten wrong. Use these for studying for future tests, especially the final exam.
- If you are having trouble, get a tutor as soon as possible. They can be found at the Teaching and Learning Center in the basement of PLC.
- Don't miss class.