

Math 326: Differential Equations

Instructor: Aaron Heap **Office:** South 330C **Phone:** 245-5391 **E-mail:** heap@geneseo.edu

Lecture: MWF 10:30-11:20am, Sturges 208A

Office Hours: MTWF 12:30 – 1:20 pm, or by appointment, or anytime I'm there

Web Page: <http://www.geneseo.edu/~heap>

Textbook: *Elementary Differential Equations, 6th edition*, by Henry Edwards and D. Penney.

Technology: MATLAB and TI-89 (or equivalent)

Course Info: We may skip around a little, but we will do our best to cover most of the textbook. Topics include first-order differential equations, linear differential equations, power series solutions, Laplace transforms, linear systems of differential equations, and various applications. If time permits, we may be able to study some higher-order, nonlinear systems. We will take a multifaceted approach, including both analytical and numerical solution methods, as well as qualitative methods which enable us to discover properties of solutions without actually having a formula. Topics are subject to change depending on the progress of the class, and various topics may be skipped due to time constraints.

Please note that we will work on developing your independent reading skills in Mathematics. I certainly won't be able to cover in class all the material you will be required to learn. As a result, you will be expected to do a lot of reading. You should read the sections of the textbook which correspond to the material covered during the lectures. It is in your best interest to stay ahead in your reading. If you read about a topic *before* it is discussed in class, it will enable you to answer my questions and ask your own focused questions during the lecture. Whether you choose to read a section before or after we cover it in class, the reading will help you to better understand the material.

The material covered in this course relies heavily on material from Calculus I and II. You should review differentiation and integration techniques early. Furthermore, besides demonstrating competence in learning definitions, theorems, and problem-solving techniques of elementary differential equations, you may also be required to demonstrate the ability to do **simple proofs** on homework and exams. We will find that matrix algebra will be a useful tool, and we will cover the parts of that subject which will be necessary for our use. The program MATLAB (or an equivalent program) may be an extremely helpful resource throughout the course, both as a computational tool and as a remarkable aid to visualization.

We are embarking on a systematic study of ordinary differential equations and will be taking calculus to a new and exciting level. This topic represents the completion of the calculus of functions in a single variable. This calculus is initiated by the study of derivatives in an attempt to solve the tangent problem and to determine the rate of change of some fluctuating quantity. One then moves on to the integral in an attempt to solve the area problem. Then these two seemingly unrelated notions are finally connected via the amazing Fundamental Theorem of Calculus. And now, finally, we begin the final chapter of this story. The use of differential equations will make available to us the full power of the calculus of single variable functions. Differential equations stand on the frontier of human knowledge and have a far reaching impact beyond the realm of mathematics. The notions of ordinary differential equations are fundamental in almost all areas of science, engineering, and economics. Differential equations are widely used to model phenomena that arise in these areas, including populations, circuits, spread of disease, flames, springs, bird flight, ocean waves, and many, many more.

Grading: There will be regular homework assignments, two midterm exams, and a final exam. Your overall grade will be determined as shown below. **Exams** will be given during class. Exams are closed book, closed notes, closed friends, and open brain. Cell phones, iPods, and other electronic devices will NOT be permitted in exams. Whether or not calculators are allowed on an exam will be determined at a later time. Unannounced **quizzes** may be given from time to time and will be based on material from homework and previous lectures. **Class participation** will be based on your willingness to **ASK and ANSWER questions** in class.

Homework, Quizzes, Class Participation ----- 25%			
Exam 1:	Friday, February 24*	----- 25%	
Exam 2:	Friday, March 30*	----- 25%	
Final Exam:	Tuesday, May 8, 8:00-11:00 am	----- 25%	
* The exam dates may change by a day or two depending on the pace of the course, but it will give you an idea of when to expect an exam.			
	B+...87-89	C+...77-79	D...60-69
A...93-100	B...83-86	C...73-76	F...Below 60
A-...90-92	B-...80-82	C-...70-72	

In all written work, you must show your work neatly and legibly in order to receive credit. You should clearly show the process and reasoning you went through in order to solve the problem. The problems I work for you in class will provide good examples of how your homework and exam problems should be written up. All assessment will be based on your ability to communicate a correct solution and explain your reasoning. It is absolutely essential to write clearly and completely. It is your responsibility to write in a way that tells me that you understand the problem and its solution.

Homework: Most homework will be done through the internet-based homework system called WeBWorK. However, there may occasionally be problems you must write out and hand in to me. All assignments must be completed by the given due date. To receive credit, assignments must be completed on time. **WeBWorK extensions will NOT be given without a legitimate excuse.** Complete as much of the assignment as you can by the deadline to receive partial credit. If you have a legitimate conflict you must tell me ahead of time.

Each student is responsible for completing his or her own WeBWorK assignment and any written assignments. However, **you are strongly encouraged to discuss the homework and to work together on the problems with your classmates.** Please be careful that you are actively participating in the process: many students find that they can understand a problem while they are watching a classmate work through it and explain it, and then conclude that they understand the material well enough. This leads to an unpleasant surprise at test time, when students who "thought they understood" the material find they are unable to work the problems on their own. Please be careful that you are able to work all of the problems on your own before the exam time arrives, with no coaching from a friend. Please use whatever resources aid you in learning the material, including computer assistance, office hours, other students, professors, other math books, etc.

Moreover, while it is not required that you complete a handwritten version of WeBWorK assignments, it is strongly encouraged. Writing a problem out by hand, showing all calculation steps, and keeping them collected in a notebook will greatly assist you as you prepare for exams.

Extra Help: There are many ways for you to get some help in this class. I am willing to spend a few minutes in class answering questions about homework problems. However, if you have a lot of questions, I recommend taking advantage of my office hours. I'll say it again...USE MY OFFICE HOURS! My job is to help you -- come to office hours even if you have just a small question. Don't wait until you get too far behind. If my office hours are not convenient for you, make an appointment by sending an email or asking after class. Please come see me as soon as you feel lost -- it is important that I know how you are doing so I can adjust the level of the class if necessary. I WANT to help you, and I WANT everyone to do well. There may also be help available in the Math Learning Center (South Hall 332) but don't expect it.

Don't let yourself get too far behind! I would be happy to see you if you feel you need some assistance. Come and get your questions cleared up right away.

Please Note: Any student with a disability requiring accommodations is encouraged to contact me after class or during office hours. All discussions will remain confidential.