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# Math 2080-100 (honors): Introduction to Ordinary Differential Equations

FALL 2017

Daniel Hall 209, MWF 1:25-2:15pm, R 2:00-2:50

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Textbook	<i>Differential Equations: An Introduction to Modern Methods and Applications</i> by Brannan and Boyce. The e-book comes with a WileyPlus subscription, so you don't need to buy a hard copy if you don't want one.
Course Description	MATH 2080 is an introduction to the theory and practice of ordinary differential equations (ODEs). These are equations involving functions and their derivative(s), and they arise all over applied mathematics, engineering, and science, especially in modeling. For many students, especially engineering majors, MATH 2080 is arguably the most important math class they will take at Clemson. We will cover most of Chapters 1-5, 8.1, 9-11 in the third edition of Brannan and Boyce's textbook. This covers standard topics such as: solving and modeling with 1st and 2nd order ODEs; systems of two first order ODEs; Laplace transforms; Euler's method of approximation; power series solutions; Fourier series; boundary value problems; elementary partial differential equations (PDEs).
Prerequisite	Math 2060 (Calculus III).
Access	I prefer to make non-copyrighted materials freely available to everybody on the course webpage. <i>Warning:</i> Websites such as <i>Course Hero</i> , that download such materials and try to repackage and sell it to students, are a SCAM! (Spread the word!)
Homework	Homework will be assigned using WileyPlus, which can be accessed from Canvas: <a href="https://www.clemson.edu/canvas/">https://www.clemson.edu/canvas/</a> . Students who obtain texts from sources that do not include a WileyPlus access code can purchase one separately online. Those students who registered in WileyPlus for previous sections of Math 2080 will not have to purchase a new access code. Late assignments will NOT be accepted, but every student gets one (and <i>only one</i> ) free 24 hour extension, no questions asked.
Lectures	<p>This class meets four days a week. Approximately three of those will be traditional lectures, with the other day being hands-on time devoted to working on and solving problems from homework and worksheets. To make up for this "missed lecture", students will be required to view a YouTube lecture on their own time.</p> <p>When I taught this course online, I made a series of 48 video lectures that can be found on YouTube. I have linked to them from the course webpage with the understanding that they are <i>not</i> intended to be a substitute for coming to class. Rather, you should use them as a supplemental resource, like if you want to re-watch a particular example or concept, or if you have to miss class due to illness, a job interview, etc.</p>

Worksheets	To go with every online lecture, I made an <i>Essential Skills Worksheet</i> that consists of what I feel are the most important concepts and problems that you should be able to do from that lecture. These problems are very typical of what I would put on quizzes and (especially) exams. They will not be collected or graded, but it is STRONGLY recommended that the students attempt these within 48 hours of seeing the corresponding material in class. I will send out hints and “pseudo-solutions” – which will help you verify whether you got the right answers. Knowing how to check your work on your own is an extremely important skill in mathematics which is too often neglected in a standard class. It involves problem solving, critical thinking, and is fantastic self-assessment.
Quizzes	I will give in-class quizzes roughly once a week.
Tutoring	The <i>Academic Success Center</i> holds free tutoring sessions for Math 2080, six days a week. The current weekly schedule can be found here: <a href="https://www.clemson.edu/asc/services/tutoring/index.html">https://www.clemson.edu/asc/services/tutoring/index.html</a>
Policies	<ul style="list-style-type: none"> <li>• All use of cell phones, laptops, and tablets are prohibited during lecture and exams.</li> <li>• I do not impose arbitrary numeric cutoff lines for final grades, e.g., A=90+, B=80–89, etc. Rather, I grade by natural “clusters.”</li> <li>• I prefer to know in advance if you cannot make a lecture, as that’s just simple courtesy. Attendance will not factor into your final grade, but I will use it, and possibly your homework score, to decide borderline cases (e.g., if you end up “between clusters”).</li> <li>• Quizzes will be given roughly once a week, to encourage you to keep up with the material, and as self-assessment.</li> <li>• If you get an A or B on the final exam, then you will get at least that grade in the course, as long as you (i) attend class very regularly, AND (ii) maintain a passing grade on the homework.</li> </ul>
Learning Outcomes	<p>By the end of the semester, students will be able to:</p> <ul style="list-style-type: none"> <li>• Model natural and physical phenomena from biology, physics, chemistry, engineering, and finance with ODEs and PDEs.</li> <li>• Explicitly solve a variety of 1<sup>st</sup> and 2<sup>nd</sup> order ordinary differential equations (ODEs).</li> <li>• Visualize and plot solutions to ODEs using direction fields.</li> <li>• Have a basic understanding of linear algebra and its role in the study of ODEs, and how to solve systems of linear ODEs.</li> <li>• Take a Laplace transform and use this to solve certain ODEs.</li> <li>• Derive the Fourier series of a periodic function.</li> <li>• Solve partial differential equations (PDEs), and recognize the differences between the heat, wave, and Laplace equations, as well as different boundary conditions.</li> <li>• Explain in simple terms, e.g. to grandparents or to younger siblings, how differential equations are relevant to several familiar settings in your major.</li> <li>• Be <i>well-prepared</i> and <i>confident</i> to succeed in your upper-division math, science, and engineering courses.</li> <li>• ... and much more!</li> </ul>

Grading The final grade will be calculated as follows:

QUIZZES:	12%
HOMEWORK:	22%
MIDTERM 1:	22%
MIDTERM 2:	22%
FINAL EXAM:	44%

Note that this adds up to 122% – your lowest midterm grade OR half the weight of your final exam will be dropped.

Portfolios This course contributes to general education requirements in the Mathematical, Scientific, and Technological Literacy competency. Any exams or activities, particularly the more challenging or complex ones, could be placed in a portfolio as evidence for *Objective 1: Demonstrate mathematical literacy through solving problems, communicating concepts, reasoning mathematically, and applying mathematical or statistical methods using multiple representations*. Any learning activities where computer software or a graphing calculator was used to advance learning and understanding of mathematical concepts could be placed in a portfolio for *Objective 4: Apply information technologies to intellectual and professional development*.

Key Dates	Aug 23 (Wed)	Classes begin; late enrollment fee applies
	Aug 29 (Tue)	Last day to register or add a class
	Sep 5 (Tue)	Last day to drop a class or withdraw from the University without a W grade
	Oct 16-17 (M-Tu)	Fall break
	Oct 31 (Tue)	Last day to drop a class or withdraw from the University without final grades
	Nov 22-24 (W-Fr)	Thanksgiving break
	Dec 8 (Fri)	Last day of class
	Dec 15 (Fri)	Final Exam, 3:00–5:30pm.
	Dec 21 (Thu)	Graduation

Copyright Statement Some of the materials in this course are possibly copyrighted. They are intended for use only by students registered and enrolled in this course and only for instructional activities associated with and for the duration of the course. They may not be retained in another medium or disseminated further. They are provided in compliance with the provisions of the Teach Act. Refer to the Use of Copyrighted Materials and “Fair Use Guidelines” policy on the Clemson University website for additional information: <http://clemson.libguides.com/copyright>.

### The official statement on Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson’s vision of this institution as a *high seminary of learning*. Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

When in the opinion of a faculty member, there is evidence that a student has committed an act of academic dishonesty, the faculty member shall make a formal written charge of academic dishonesty including a description of the misconduct, to the Dean of the Graduate School. At the same time, the faculty member may, but is not required to, inform each involved student privately of the nature of the alleged charge.