DIFFERENTIAL EQUATIONS   11:00-11:50AM   SPRING 2016   SH306

Instructor: Jonathan White

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Office Hours: 10:00-10:50am MWF and by appointment

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Text: *Differential Equations*, 2ⁿᵈ Edition, Blanchard, Devaney, and Hall

Problem Sets   There will be occasional problem sets, WeBWorK assignments, and lab
and Labs: projects, and together these will total 200 points.

Math Culture: Up to 50 Math Culture Points may be earned by participating in various
                   activities outside of class, as detailed on page 3 of this syllabus.

Exams: There will be three in-class exams administered during class time. The dates
                   of these are indicated in the schedule on the back side of this sheet. These
                   exams will be worth 100 points each. The final exam will be held during
                   finals week at the date and time indicated on the back side of this sheet. The
                   final will be worth 200 points.

Grading: Grading will approximately follow a $[92.0\%, +\infty) \rightarrow$ A, $[90\%, 92\%) \rightarrow$ A−,
                   $[87\%, 90\%) \rightarrow$ B+, $[82\%, 87\%) \rightarrow$ B, $[80\%, 82\%) \rightarrow$ B−, $[77\%, 80\%) \rightarrow$ C+,
                   $[72\%, 77\%) \rightarrow$ C, $[70\%, 72\%) \rightarrow$ C−, $[67\%, 70\%) \rightarrow$ D+, $[62\%, 67\%) \rightarrow$ D,
                   $[60\%, 62\%) \rightarrow$ D−, $(-\infty, 60\%) \rightarrow$ F scale.

Makeups: For fairness to those who follow the schedule, makeups for exams will be
                   allowed only in extenuating circumstances, with documentation and advance
                   notice when humanly possible. Late problem sets will be penalized 20% of
                   points possible for each day late, and only accepted until others are returned.

This class is intended to give a solid modern introduction to differential equations. This means
that graphical and numerical approaches will be taken as seriously as conventional analytic
methods, and that qualitative statements will be as important as quantitative solutions.

The use of technology, particularly computer software, will be an important component of the
course. Ability to compute with pencil and paper will also be important, as will conceptual
understanding of the topics treated. This combination of approaches is likely to prove
challenging, partly because few people will find that all of these aspects play to personal
strengths. Don't let that be overwhelming, though, and remember that I'm around to help. Give
it some time, and feel free to take advantage of my office hours to help past the rough spots.

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Tentative Schedule

1/11 §1.1 Modeling via Diff. Equations	1/13 §1.2 Separation of Variables	1/15 §1.3 Slope Fields
1/18 No Class – MLK Day	1/20 §1.4 Euler's Method	1/22 §1.5 Existence and Uniqueness
1/25 §1.6 Equilibria & the Phase Plane	1/27 §1.7 Bifurcations	1/29 §1.8 Linear Differential Equations
2/1 §1.9 Changing Variables	2/3 Undetermined Coefficients	2/5 Lab
2/8 Series Solutions	2/10 Review	2/12 **Exam 1**
2/15 §2.1 Modeling via Systems	2/17 §2.2 The Geometry of Systems	2/19 §2.3 Analytic Methods
2/22 §2.3 Analytic Methods	2/24 §2.4 Euler's Method for Systems	2/26 Lab
2/29 §2.5 The Lorenz Equations	3/2 Review	3/4 **Exam 2**
No Class – Spring break		
3/14 §3.1 Linear Systems	3/16 3.2 Straight-Line Solutions	3/18 §3.3 Real Eigenvalues
3/21 §3.4 Complex Eigenvalues	3/23 §3.5 Repeated and Zero Eigenvalues	3/25 §3.7 The Trace-Determinant Plane
3/28 §3.6 2nd-Order Linear Equations	3/30 §3.8 Linear Systems in 3D	4/1 Lab
4/4 Variation of Parameters	4/6 Review	4/8 **Exam 3**
4/11 §4.1 Forced Harmonic Oscillators	4/13 §4.2 Sinusoidal Forcing	4/15 §4.3 Undamped Forcing
4/18 §5.1 Equilibrium Point Analysis	4/20 §6.1 Laplace Transforms	4/22 §6.1 Laplace Transforms
4/25 §6.2 Discontinuous Functions	4/27 Review	
Final Exam – 11am on Friday 4/29		

Any students with disabilities which might affect their performance in this class should contact me as soon as possible to arrange accommodations.

Coe's faculty has adopted an academic integrity policy. It is your responsibility to understand and follow it.

FERPA information can be found on page 42 of the 2015-2016 catalog.

Diversity, in all its forms, is valuable.

Math Culture Points

A portion of the grade for this course will take the form of Math Culture Points. These will be earned through activities outside of class including, but not necessarily limited to, those listed below. Note that none of these are mandatory – there are far more opportunities than necessary to earn full credit. You should be able to select activities that are particularly relevant to you.

Activity	Points	Max #
Colloquium Attendance	5	–
Colloquium Presentation	5-15	2
Meeting Attendance 　　Nebraska Conference for Undergraduate Women in Mathematics (January 29 - 31) 　　SIGCSE Technical Symposium (March 2 - 5) 　　University of Iowa Computing Conference (February or March?) 　　Midwest Undergraduate Mathematics Symposium (April?)	 15 15 15 15	2
Mathematics Competition Participation 　　Mathematical Contest in Modeling (February 5 – February 9) 　　Iowa Collegiate Mathematics Competition (February 21) 　　Hack-a-thon (February 19-21, register by February 9)	 15 15 15	2
Math Culture Reading 　　Some weeks specific readings will be posted on the course web page 　　Articles from Math Horizons 　　With approval, articles from *Math. Magazine*, *The College Math. Journal*, etc.	 5 5 5	 – 3 3
Math Club Activities (when appropriate) 　　Winter Break Book, Movies, Pi Day celebration, Speakers, Workshops, etc.	5-10	5
Other Appropriate Coe or Outreach Activities 　　Contemporary Issues Forum (February 3) 　　Attending a Quantitative Research Symposium Presentation 　　Chess Club Meeting 　　Job Shadowing in any relevant field 　　Other Volunteer Outreach (see page 4)	 5 5 5 10 5	 – 3 2 1 3

You should plan to spread your participation throughout the semester. In each case above, credit assumes both full participation and posting a brief summary/response on Moodle **in a timely manner**. These reflections should generally be between 100 and 300 words, and include both a brief summary and your personal thoughts on the event, and **must be submitted within one week of the event**, or within the specified time window for other activities. Up to three units of credit may be submitted after normal deadlines in the "Math Culture – Late" category on Moodle, but otherwise exceptions will not be made without serious extenuating circumstances.

Volunteer Math Outreach

Below is a preliminary list of organizations that have need for help with math tutoring and related activities. To learn more, contact Kayla Lyftogt (klyftogt@coe.edu). This list is not meant to be exhaustive, but gives you at least some idea of possibilities. If you have other ideas, talk to Jon.

McKinley Middle School
Volunteer Opportunity: Help an 8th Grade Pre-Algebra teacher by working individually with kids that are struggling/behind
Various Times Throughout Day

Garfield Elementary
Volunteer Opportunity: Assist Teachers by working individually with students that are struggling/behind
Various Times Throughout Day

Boys and Girls Club
Volunteer Opportunity: Assist with Math Homework on a case-by case basis (wider range of age groups)
After School Program

Kids on Course
Work Opportunity: Commit to tutoring two days a week at a local elementary. T/R 3:45-5:15. Some experience with youth preferred. Up to two hours of prep time paid in addition to hours spent tutoring.
Payment: $33/hour.