
Differential Equations

Math 340 §2 Fall 2015

MWF 3:00-3:55pm Fowler 307

BY: 2015 Ron Buckmire

<http://sites.oxy.edu/ron/math/340/15/>

INSTRUCTOR Ron Buckmire ~ Fowler 313 ~ x2536 ~ ron@oxy.edu ~ MadProfessah

SYLLABUS The official syllabus for this course is on the web at

<http://faculty.oxy.edu/ron/math/340/15/>

OFFICE HOURS I am in my office (Fowler 313) most week days until around 5pm. My official office hours in Fall 2015 are WR from 1:45-2:45pm and MWF 4:00 to 5:00pm.

You can make individual appointments at <http://ronbuckmire.youcanbook.me>

I am readily accessible by electronic mail at ron@oxy.edu and by phone at 323-259-2536. My Twitter handle is **MadProfessah** and my G-Chat name is **MadProfessah**. If you need to see me at a time not specified here, do not hesitate to contact me and make an appointment and I'll be happy to meet with you. I think out-of-classroom student-faculty interactions are important. You are also strongly encouraged to visit me in office hours several times during the semester or chat with me whenever you have a question. If you don't interact with your professors individually you really aren't getting your money's worth for attending a small college like Occidental! In addition to interacting with your professor(s) individually, I strongly encourage you to work together with your classmates.

CLASSROOM We will meet in Fowler 307 from 3:00pm-3:55pm on Mondays, Wednesday and Fridays.

TEXTBOOK *Differential Equations (Fourth Edition)* by Paul Blanchard, Robert L. Devaney and Glen R. Hall, (Brooks-Cole, 2012).

LEARNING GOALS By the end of the class you should be able to: Solve differential equations and systems of differential equations using direct techniques; Analyze solution behavior (without knowing or computing solutions) using qualitative techniques; Discuss the implications of parameter variation on solution behavior (i.e. bifurcation); Prove existence and uniqueness of solutions of some differential equations; Analyze the equilibria of a system; Utilize computer technology to appropriately analyze solution behavior; Integrate these techniques to analyze physical systems described by differential equations (i.e. mathematical models).

COURSE DESCRIPTION AND EXPECTATIONS This is a first course in the study of differential equations. I will expect familiarity with (and basic understanding of) the main ideas found in Differential and Integral Calculus as well as recall of some material from Multivariable Calculus and Linear Algebra. Differential Equations is a huge, varied and fascinating field of study. I expect students to come to class prepared so that we can use class time as efficiently as possible to facilitate learning the course material. We will not be able to "cover" the entire subject, but I should be able to give you a substantive introduction to the most important topics in the field. Since I am an applied mathematician, the style of the course will be skewed towards practical application of the material, and will generally not be very theoretical in nature. However, this is a 300-level math class and I will expect a corresponding level of mathematical rigor, individual responsibility and student maturity. This class entails a lot of work, if you are not prepared for this, you should probably consider taking an alternative course.

COURSE WORK We will be making regular use of computers to help us visualize information that can be obtained from differential equations, which includes approximating their solution numerically and representing them graphically. We will often use the textbook's software package (DETools), web-based Java applets (PPLANE) and occasionally a computer algebra system like Mathematica. (See the Resources section of the Course Website for an annotated list.)

PARTICIPATION I expect (a lot of) participation in class from every student in the class and will facilitate this through the use of daily class formats (worksheets), group work, in-class computer exercises, abbreviated lectures and online communication. One strategy I use to encourage student engagement is to use "classroom voting" using electronic devices. The goal of classroom voting (or student polling) is to encourage participation by all members of the class and to foster a class environment where all students are engaging with the concepts and ideas in the class; one of my teaching goals is to foster a classroom environment in which students realize that they can (and do) learn the course ideas from each other (this is known as "peer instruction") and not just from the professor and class materials.

HOMEWORK Homework should be completed **neatly**. Before the beginning of each week you will be given the homework problems for that week. Homework should be done after every class but will only be collected once a week. Homework should be written legibly and multiple pages should be stapled together with the student's name on each page. You are **strongly** encouraged to work on homework with your classmates. Whatever you hand in **must represent your own understanding of the material**. Copying homework is cheating and will be dealt with accordingly.

QUIZZES There will be various kinds of quizzes in this class: take-home quizzes, in-class quizzes, reading quizzes, and bonus quizzes. These are generally to be done individually under the rules one would expect for a take-home exam (no collaboration or communication with any other person about the material on the quiz).

TESTS There will be **two (2)** in-class mid-term tests in this course. The mid-terms are currently scheduled for

Friday October 9 (on material from Chapter 1 and Chapter 2)

Friday November 6 (on material from Chapter 3 and Chapter 5)

These dates are subject to change until 1 week before the scheduled date. You may not be excused from a test without notifying me at least 1 week before the scheduled test date. Please alert me to any accommodations you may receive as early as possible.

FINAL EXAM The final exam is scheduled for **Saturday December 12th from 8:30am-11:30am**. This will likely have a plurality of material from Chapter 6 with a few questions on earlier material.

COURSE PROJECT There will be more information given to you about the Course Project within the first two weeks of the semester. Deadlines to remember for the Project are:

Short Project Proposal Due Friday October 2nd

Project Paper First Draft Due Friday November 13th

Project Paper Final Draft Due Wednesday December 2nd

Project Oral Presentations Will Occur November 23, November 30th and December 2nd

The Course Project will be done in groups of two or three and generally the entire group will receive the same grade. You will have the opportunity to provide feedback individually and jointly on the fair division of effort and reward for work done on the project.

GRADES Your course grade will be composed of the following:

- Homework and Participation **20%**
- Two (2) Tests **20% (10 % each)**
- Quizzes **20%**
- Course Project **20%**
- (Cumulative) Final Exam **20 %**

GRADING SCALE Please note that there is no A+ or D- available for course grades.

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|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|-----|-----|
| Range | 92.5+ | 90+ | 87.5+ | 82.5+ | 80+ | 77.5+ | 72.5+ | 70+ | 67.5+ | 62.5+ | 60+ | 60- |
| Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |

COURSE POLICIES This a (non-exhaustive) list of course policies

- Make-up tests will not be given except for compelling reasons which have been communicated to me well-in advance (i.e. at least 7 days) of the test date.
- If you are late to a test, you will only be allowed the time remaining in which to complete your test.
- Late quizzes (or homework) will not be accepted under any condition since the solutions are made available on the same day that they are collected to be graded.

COLLEGE POLICIES Here are some official policies of the College which are in effect for this course:

Disabilities: Students with documented disabilities who are registered with Disability Services are required to present their accommodation letter to the instructor at the beginning of each semester or as soon as possible thereafter. Any student who experiences significant physical or mental impairments may contact Disability Services at (323) 259-2969 to learn about available services and support. More information is available at <http://www.oxy.edu/disability-services>.

Honest Academic Work: Shared commitment to ethical principles is essential to the educational purposes and fairness of the academic enterprise. Occidental College assumes that students and faculty will embrace a high ethical standard for academic work. Fundamental to academic ethics is a spirit of honor. A spirit of honor thrives when students challenge each other to attain the highest levels of scholarship, civility, and responsibility. For more information, see <http://www.oxy.edu/student-handbook/academic-ethics/academic-ethics>

Classroom Conduct: The goals of this course can only be accomplished in a setting of respect. Although mathematics rarely lends itself to too much controversy in this regard, we must still provide a safe environment that is conducive to learning. All are welcomed and encouraged to actively participate in the learning of course content, regardless of gender, race, nationality, native language, sexual orientation, gender identity, political ideology, and especially personal mathematical history. Any student who feels she or he is experiencing a hostile environment should speak to me immediately.

Electronic Devices: Please remember that common courtesy dictates turning off all electronic devices and cell phones (or place in silent mode) before coming to class; these devices can be a distraction for other students (and me!) in the class and thus should not be in use during class time unless I give you explicit permission to do so.

CANCELLED CLASSES We will not have class on the following dates:

Monday September 7, 2015 (Labor Day).

October 12-13, 2015 (Fall Break).

Wednesday November 4, 2015 (I will most likely be out of town).

November 25-27, 2015 (Thanksgiving Break).

I will let you know at least one week ahead of time if there may be other days on which I am absent or when class is cancelled.

ATTENDANCE Class attendance is not mandatory, but if you are going to be absent from a class, common courtesy suggests you should contact your professor by email or chat beforehand to apprise me of absences in advance. Also, approximately 10% of the course grade is class participation and it is impossible to participate in class if you are not present! Please try to attend on time as a courtesy to your classmates and the professor.

ON-LINE MATERIALS There is a class mailing list, to which all registered students are subscribed, at math340-L@oxy.edu. I have produced a website for the course, where more detailed (and current) information about the class will be published. The URL is <http://faculty.oxy.edu/ron/math/340/15/>

CLASSROOM VOTING / PEER INSTRUCTION/ STUDENT POLLING I am hoping to use the REEF polling by i>clicker app as the tool for classroom voting to foster peer instruction and student discussion during the class. This means students will need to purchase the smartphone app (\$9.99 for 6 months, \$15.99 for 1 year) and register themselves for the class on the <http://app.reef-education.com> website. If you already have an i>clicker device I believe it will be compatible with the REEF polling system. See <https://reef-education.com> for more information. There is a FREE 2-week trial period that begins once you register online. **All students should be registered with REEF Education by class time on Wednesday September 2nd.** This will be a significant fraction of your PARTICIPATION grade.

EXTRA CREDIT There are multiple opportunities for obtaining extra credit in the class. For example, there will be BONUS quizzes, extra-credit questions on in-class tests, as well as other opportunities to earn extra credit announced during the semester.

LIFE WORK BALANCE We all should strive to maintain a healthy life-work balance. As a Professor I have many other duties besides teaching such as conducting research, serving as Chair of the Department, performing service to the College in various capacities. However, I also have a home and family life. As students, you should also strive to find a healthy balance between your academic and co-curricular activities. Generally, students should expect to spend 1-3 hours working outside of class for every hour spent in the classroom.