Syllabus for: (name of class) Math 55 Differential Equations

Semester & Year:	Spring 2014
Course ID and Section Number:	E5276 (035276)
Number of Credits/Units:	4
Day/Time:	MWF: 10:05-11:20
Location:	SC 202
Instructor's Name:	David Arnold
Contact Information:	Office location and hours: SC 216H Phone: 476-4222 Email: david-arnold@redwoods.edu

Course Description (catalog description as described in course outline):

A study of ordinary differential equations and solutions, equations of first and second order, linear differential equations, systems of equations, phase plane analysis, existence and uniqueness theorems, applications and modeling.

Student Learning Outcomes (as described in course outline) :

1. Determine exact analytical solutions for first- and second-order differential equations, and systems of differential equations.
2. Apply the mathematics of differential equations to real-world problems and applications.
3. Use computer technology to solve differential equations and systems, explore mathematical concepts, and verify results.
4. Write solutions to mathematical exercises in differential equations using sound mathematical reasoning with appropriate use of numerical, graphical, and symbolic representations.

Special accommodations: College of the Redwoods complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. Please present your written accommodation request at least one week before the first test so that necessary arrangements can be made. No last-minute arrangements or post-test adjustments will be made. If you have a disability or believe you might benefit from disability related services and may need accommodations, please see me or contact Disabled Students Programs and Services. Students may make requests for alternative media by contacting DSPS.

Academic Misconduct: Cheating, plagiarism, collusion, abuse of resource materials, computer misuse, fabrication or falsification, multiple submissions, complicity in academic misconduct, and/ or bearing false witness will not be tolerated. Violations will be dealt with according to the procedures and sanctions proscribed by the College of the Redwoods. Students caught plagiarizing or cheating on exams will receive an "F" in the course.

The student code of conduct is available on the College of the Redwoods website at: http://redwoods.edu/District/Board/New/Chapter5/AP%205500%20Conduct%20Code%20final%2002-07-2012.pdf

Additional information about the rights and responsibilities of students, Board policies, and administrative procedures is located in the college catalog and on the College of the Redwoods homepage.

College of the Redwoods is committed to equal opportunity in employment, admission to the college, and in the conduct of all of its programs and activities.

David Arnold

Mathematics

- Department Home Page
- myCR
- WebAdvisor
- Optimath
- Calendar
- Search Site

Math 55: Instructor's Syllabus

There are files on this site in PDF format. You will need to download a free copy of the Acrobat Reader to read them. Click the following icon to obtain a free copy of the Acrobat Reader.

It is important that you have the most current version of the Acrobat Reader that your system will allow. The above links will take you to the Adobe site. The Adobe site will analyze your system, but you may be asked to choose the appropriate version of the reader for your system. If this happens, carefully select the appropriate version of the reader.

Official Course Outline

The official course outline for College Algebra, including content, objectives, and student learning outcomes, can be viewed online via the following link:

Math 55 Course Outline

Students should take some time to read the course learning outcomes on the official course outline, listed here for convenience.

1. Determine exact analytical solutions for first- and second-order differential equations, and systems of differential equations, including the existence and uniqueness of solutions.
2. Apply the mathematics of differential equations to real-world problems and applications such as circuits, mixture problems, population modeling..
3. Apply the use of computer technology to solve differential equations and systems, explore mathematical concepts, and verify results.
4. Compare solutions obtained by use of power series with numerical solutions.
5. Discuss the use of the Laplace transform in solving differential equations.

Prerequisite Classes

Successful completion of or concurrent enrollment in Math 50B (or equivalent).

Representative Skills

Students must be well grounded in the art of differentiation. Students must also understand the theory of integration and possess basic integration skills.

Recommended Preparation

Math 45 recommended. However, the instructor will cover the linear algebra that students need to be successful in the study of systems of linear differential equations.

Instructor's Schedule

The following link contains a copy of my schedule, including office hours.

Schedule and Office Hours

Note: These are "official" office hours. However, I will make myself available whenever I can. Please do not be afraid to ask for help at any time as I am always eager to help.

Office Location and Phone

- Physical Science building PS114A
- Office phone: (707) 476-4222

Cancelled Classes

Those driving long distances to attend classes are advised to call (707) 476-4210 before driving to the CR campus. Choose #5 from a menu of choices. You will then be advised of any cancelled classes for the day in the Physical Sciences complex (math/science). Thus, you can avoid the frustration of driving to campus, only to find that your class has been cancelled.

Email

My email address is: David-Arnold@redwoods.edu

myCR

Click the myCR icon that follows. This will initiate contact with myCR. Click the Account tool, then the Modify Details button. Change your password. Be sure to write down your login name and password for future reference. Once you complete your password entry, click Update Details to complete the process

Next, click the Profile tool and enter any information you wish to share. Don't enter things like phone numbers that you wish to keep private. Click the Save button when you are finished.

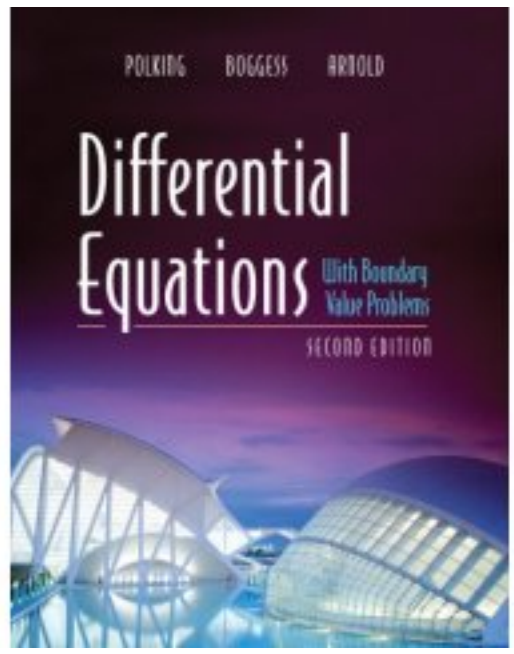
Click the Math 55 link. To forward MyCR email address to your personal email address, click the Messages tool, then the Settings tab. Select "Yes" to Autoforward Messages, then fill in the email address where you want email messages forwarded. Click Save Settings when finished. *Note: This is extremely important, particularly if you don't regularly read your MyCR email. I send out hundreds of emails each semester about homework, quizzes, exams, helpful hints, etc.*

Once you login to myCR, locate your math class and take some time to find out what is provided. Then read the "Welcome Message" in the Discussion Board and reply to to the "Welcome Message" thread. In the future, use the Discussion Board to ask questions and reply to questions posed by your classmates.

Texts

You will need the following textbook.

- *Differential Equations and Boundary Value Problems*, Second Edition, Polking Boggess, and Arnold, Prentice Hall publishers, ISBN: 0-13-186236-7.



- You do not have to buy this text. It is available for free in the library. There are none for sale in the bookstore, so go to the library with evidence that your are taking Math 55 and check out the text. You can check it out for the whole semester. Don't write in it and don't make any marks in it so they can be used by future students in Math 55.
- If you wish to purchase your own textbook, the textbook is available online. If you buy your own text online, be sure to use the ISBN given above. There is a second text that looks almost the same, called *Differential Equations*, but it doesn't have the needed additional chapters on Fourier, Boundary Value Problems, and Partial Differential Equations that you will need in the future. Here are some links I've found for *Differential Equations and Boundary Value Problems, Second Edition*, ISBN: 0-13-186236-7:
  1. Amazon search: Differential Equations and Boundary Value Problems, Second Edition, ISBN: 0-13-186236-7
  2. Campusbooks.com search: Differential Equations and Boundary Value Problems, Second Edition, ISBN: 0-13-186236-7
  3. Bookfinder.com: Differential Equations and Boundary Value Problems, Second Edition, ISBN: 0-13-186236-7

Getting Help

Help is available.

- Your instructor is always available for help in SC 216H when he isn't teaching class or attending a

meeting. Take advantage.
- We miss our study room PS 116 in the old sciences building, but the computer lab on the second floor of the new sciences building (SC 212) is a great place to meet with your colleagues to work together.
- As there are not a lot of avenues available for help, in this class, more than any other, it is extremely important that you don't work in isolation. Meet with your fellow students in the class in PS116, form study groups, work on problems together, etc. This is a very tough class to do on your own.

Classroom Environment

It is expected that everyone involved in this class, teacher and students alike, will act in a manner conducive to providing a comfortable environment for learning, a classroom where students feel free to ask and answer questions without fear of embarrassment or ridicule.

It is important to stay on task when class is in session. Hence, conversation not pertaining to the subject at hand should be taken outside the classroom.

I understand that students will have to get up and leave the room for various reasons and I also understand that students will arrive late from time to time. However, courtesy requires that you enter and leave as quietly as possible, without disturbing discussion or lecture.

It is essential for student success to maintain a good environment in the classroom. If you have any personal difficulties with the learning envrionment in the classroom, please visit me in my office to discuss them.

Calculators

Most of our computation and plotting will be done with Matlab. Whatever graphing calculator you currently own will be sufficient for your needs in this course.

One important issue is the TI89 graphing calculator, which does symbolic calculation, including differentiation and integration. It is my position that you should be able to both integrate and differentiate without the use of this calculator. Therefore, it is essential that you show all steps on your homework when performing any integrations to receive full credit for your work.

Mathematica

Mathematica is a powerful software package created by technicians at Wolfram. Mathematica software can be installed on several platforms, including Linux, Mac OS X, and Windows.

If you do not have a computer capable of running the Mathematica software, then you can take advantage of the computing power located in computer lab in the Sciences building (SC 212). Mathematica is installed on each of these machines for use by students in differential equations. Each of you will have a username and password to use the machines in the lab. If you wish to use the printer in the lab, you must donate one ream of paper for the printer.

You can also purchase the student edition of Mathematica at:

http://www.wolfram.com/mathematica/pricing/students.php.

You have several purchase options:

1. A free 15 day trial. You probably want to wait til the first day of class before downloading.

   https://www.wolfram.com/mathematica/trial/

2. As a second option, you can buy a $45 copy of Mathematica that you can use for the whole semester, after which it expires.

   http://www.wolfram.com/mathematica/pricing/students.php

3. A third option is to buy a $140 student version of Mathematica which will be allowed to be used your entire student career, undergrad and grad school. However, it will be the same version of the entire duration of your student life. There is an option called premier service, which if purchased, allows upgrades every time Mathematica comes out with a new version.

   http://www.wolfram.com/mathematica/pricing/students.php

4. As you will discover, it is an astonishing piece of software. You can view a hands-on introduction to Mathematica at:

   http://www.wolfram.com/broadcast/screencasts/handsonstart/

Computing Resources

The Eureka campus houses computing facilities for its calculus students. They are located in the physical sciences building, room PS116. There are a number of powerful software packages on the machines in this room that will aid in the study of differential equations. See your instructor for login name and password.

Computer Lab -- Code of Conduct

Please see Computer Lab Code of Conduct for a set of rules and guidelines for computer use and maintaining decorum in the study rooms available in the physical sciences building.

Quizzes

During the semester you will be administered quizzes on a regular basis. Quizzes will be posted online and you'll typically have a couple of days to work on a solution. Quizzes will typically be open notes, open book, and you will be allowed to use online resources as well. However, the work you submit must be your own personal work. You may not work with your fellow students on solutions. You may not ask your fellow students for help, nor may you offer help to your fellow students. The work must strictly be your own.

This is an excellent opportunity to garner regular feedback on your progress, but only if you follow the policy on submitting your own work. Remember, integrity is one of our most important characteristics, one that we should hold most dear.

Homework

Homework will be assigned daily and will be due the next class meeting. Each homework will be assigned a grade ranging from 0-10 points, bases on completeness, the following of directions, and the quality of work.

It is essential that students keep up with the homework on a daily basis. Each time you come to class without your homework, you are not prepared to take part in the class at a level geared to your success. Therefore, students are encouraged to hand in homework on time. However, I am acutely aware of the responsibilities that many students have to deal with outside the classroom. Consequently, I do allow a "grace period" of one class period for late work. That is, if you hand your homework in by the next class period, I will still accept the assignment. However, there is an automatic 2-point deduction for late work. Homework later than one class period will not be accepted.

If you are experiencing difficulty getting your homework in on time, or if you know an upcoming event will

interfere with getting your homework in on time, please discuss this with your instructor. We can possibly make some arrangment to help facilitate the completion of your work.

In order to facilitate the recording of homework scores, students are required to place their name in the upper right-hand corner of their homework assignment and staple the pages together with a single staple in the upper left-hand corner. On the first line of the of the first page of your homework, please write down the assignement number, the pages that encompass the assignement, and list each exercise number assigned. For example, the first line of your homework might read:

Assignment #12, Page 150, #1, 3, 5, 7, 8, 10, 11, 23, 45

Student Term Projects

Each student in differential equations is required to create a differential equations project. This project will take the place of the final examination in differential equations. The class will meet during the final examination period when students will present their projects.

Project Requirements

Each student (or student team) must prepare two reports: (1) a paper, and (2) a presenstation. Here are some guidelines:

- The relevant due dates and description of grading can be found in Student Term Project Timeline.
- You may work alone or as a team. Teams may be composed of no more than two students. If you work as a team, each student must share equally in the workload and verbal presentation of the project. That is, both students must *speak* before the class. You may not have one student give the oral part of the presentation while the other student handles the visuals, for example.
- The subject of the project must be a real world application of differential equations. There are several good sources for potential projects:
    - With a bit of effort, it is possible to locate a good article on the internet that you might find interesting and challenging.
    - The periodical stacks at the HSU library are a good source for potential projects. Often, it is best to skim the bibliographies of various textbooks for papers involving modeling in disciplines of interest to you before going to the library to search through the periodicals.
    - Harvey Mudd College has catalogued all articles in the College Mathematics Journal (Formerly the Two Year College Mathematics Journal) and the Mathematics Magazine of the MAA. A searchable database is available at http://www.math.hmc.edu/journalsearch/. The HSU library has past issues of the journals catalogued in the Harvey Mudd College website. We also have copies of these past journals in the science building, SC 212. There are more copies in the cabinet in SC 210.
    - Harvey Mudd College also sponsors the CODEE page, a superb page to explore for possible models of differential equations.
    - I personally collect papers found on the internet on applications of differential equations. I've placed piles of these papers in the bookshelf in SC 212. I might also have others in my office, so stop by. There is also a couple of nice lab books in the SC 212 bookshelf where you might find an interesting project.
    - Your instructor also has numerous textbooks on all kinds of differential equations applications. Stop by to see me if interested in taking a look at some of them. You might also ask your instructor if he has a textbook that explains a project you might be interested in.
- The individual students or student teams must present their projects to the class. This presentation should include creative and appropriate use of technology as well as use of differential equations technique learned during the semester. You may also use differential equations technique that was not covered during the semester. For example, if you do a project in mechanics that requires the use of the Euler-Lagrange equations, then you may take the time to learn the Euler-Lagrange formulation and include this technique in both your paper and presentation.

- Both your paper and presentation must be typeset using Latex.
- You will want to create two folders in your workspace on the network. One folder should be named **TermPaper**, the other should be named **PresentationSlides**. You must precisely follow the directions in

  http://msemac.redwoods.edu/~darnold/math55/ProjectTimeline.pdf

  when saving files in these directories. If you do not follow this advice, particularly if you are working with a partner, you will find you will get easily confused.
- Your project is complete when your instructor has published both your paper and presentation on the website. Some may object to their papers being placed in such a public forum. Please speak to your instructor privately if you do not wish your paper or presentation to be published on the web.
- The project is mandatory. You will not pass the class if you fail to complete and present your student project.
- Presenters should limit their talk to 15 minutes.

Some thoughts on your presentation.

- Remember that you have all semester to work through the intricate details of the mathematics required by your topic. However, you will quickly put your audience to sleep if you pound them with too much mathematical detail during your presentation. It may be better to concentrate more on the results of your topic during the presentation. Carefully built slides or programmed simulations will capture the attention of the audience, while a sea of mathematical detail might quickly put them to sleep.
- Your paper is a completely different story. It is expected that you will include both the results and images as well as all of the mathematics that produced them. Concentrate on clearly presenting all of the work that you have put into your topic, including all relevant mathematics.
- Your presentation should be completely professional. The use of "gimmicky" sounds and animations are not allowed in your presentation.
- You should not write on the whiteboard during your presentation. All of your material should be placed on slides in advance of your presentation.

Attendance Policy

A student who is absent from class for the amount of time equal to two weeks of classes, will be withdrawn from the course, unless there are extenuating circumstances that are communicated to the instructor in a timely manner. This "faculty withdrawal" can occur between Week 4 and Week 10 of the semester.

Attendance will be recorded each class session. If you know you will be missing class, you should let your instructor know.

Grades

To determine your grade in the class, points from homework, "weekly quizzes," and the project will be totaled, then weighted and curved to determine a final grade in the class.

Emergency Procedures

Please review the campus evacuation sites, including the closest site to this classroom (posted by the exit of each room) and review www.redwoods.edu/safety.asp for information on campus Emergency Procedures.

During an evacuation:

- Be aware of all marked exits from your area and building. Know the routes from your work area to the nearest exits.
- Once outside, move to the nearest evacuation point outside your building.

- Keep streets and walkways clear for emergency vehicles and personnel.
- Do not leave campus, unless it has been deemed safe by the Incident Commander or campus authorities. (Be aware CR's lower parking lot and 101 frontage are within the Tsunami Zone).

RAVE - College of the Redwoods has implemented an emergency alert system. Everyone is entered already to receive a message at their CR email address. In the event of an emergency on campus, you can also elect to receive an alert through your personal email, and/or phones at your home, office, and cell. This emergency alert system will be available to all students, staff, and other interested parties.

Registration is necessary in order to receive emergency alerts. Please go to https://www.GetRave.com/login/Redwoods and use the "Register" button on the top right portion of the registration page to create an account. During the registration process you can elect to add additional information, such as office phone, home phone, cell phone, and personal email. Please use your CR email address as your primary Registration Email. Your CR email address ends with "redwoods.edu."

We will test the system each semester to be sure that you are getting alerts at all of your destinations. Please contact Public Safety, 707-476-4112, security@redwoods.edu, if you have any questions.

The Syllabus is Subject to Change

As your instructor, I reserve the right to make adjustments to the syllabus should things not proceed as smoothly as expected. However, in general, I do not anticipate making changes.