COLLEGE OF THE REDWOODS Syllabus for Math 55 Differential Equations

Course Information

Semester & Year: Spring 2024
Course ID & Section #: Math-55-E6083 01/17/2024-05/08/2024 Lecture and/or Discussion Monday, Wednesday 09:20AM - 11:25AM, Sciences Bldg, Room SC208 Eureka Campus
Instructor's name: Jackson
Location: SC208
Course units: 4

Instructor Contact Information

Office location or *Online: SC216L
Office hours: TBA
Phone number: 476-4219
Email address: steve-jackson@redwoods.edu

Textbook We will be using two textbooks this semester. One is Ordinary Differential Equations by Morris Tenenbaum and Harry Pollard. The other is https://math.libretexts.org/Bookshelves/Differential_Equations/Elementary_Differential_Equations_with_Boundary_Value_Problems_(Trench)

Catalog Description

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, and techniques for obtaining solutions, including series solutions and Laplace transforms. Note: Computer exploration is an integral component of this course.

Course Student Learning Outcomes *(from course outline of record)*

1. **Identify the type of a given differential equation and then find exact analytical solutions for first- and second- 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, mixt modeling.**
3. **Apply the use of computer technology to solve differential equations and systems, explore mathematical con**
4. **Compare solutions obtained by use of power series with numerical solutions.**
5. **Determine the Laplace and inverse Laplace Transform of functions and use these to solve ordinary differentia**

Skills: What abilities must students have in order to demonstrate course outcomes?

1. First-order differential equations:

- Solve separable, homogeneous, exact, and linear first-order equations and initial value problems.
- Apply differential equations theory to determine if a first-order initial value problem has a unique solution.
- Use phase line analysis to find equilibrium solutions of autonomous first-order differential equations, determine their stability, and determine the general behavior of other solutions.
- Derive and solve differential equations that model motion in one direction (including problems involving air resistance), mixtures, population growth, and/or financial scenarios.

2. Second-order and higher order differential equations:

- Find a fundamental set of solutions to a given second-order linear homogeneous differential equation with constant coefficients.
- Find the general solution to a given second-order linear inhomogeneous differential equation using the undetermined coefficients method and/or the variation of parameters method.
- Derive and solve differential equations that model the motion of springs. Also, determine the long-term behavior of the solution.
- Applications of higher order differential equations such as the harmonic oscillator and circuits.

3. Laplace transforms:

- Defintion and basic properties of the Laplace transform.
- The inverse Laplace transform
- Using Laplace transforms to solve differential equations.

4. Numerical methods:

- Apply Euler and Runge-Kutta methods to approximate the solutions of first-order differential equations.
- Use mathematical software to approximate the solutions of first-order differential equations and systems of differential equations.

5. Linear systems of differential equations:

- Use phase plane analysis to visualize the solutions of linear systems of differential equations, and analyze their long-term behavior.
- Use eigenvalues and eigenvectors to find a fundamental set of solutions to a linear 2x2 system with constant coefficients.
- Use the eigenvalues and the trace-determinant plane to determine the long-term behavior of solutions.

6. Nonlinear systems of differential equations:

- Derive systems of differential equations that model epidemic scenarios and/or predator-prey scenarios.
- Use phase plane analysis to visualize the solutions of nonlinear systems of differential equations, and analyze their long-term behavior.
- Find the nullclines and the equilibrium points of a given nonlinear system of differential equations, and then use linearization to classify the equilibrium points and thereby determine the long-term behavior of solutions.

7. Series solutions of differential equations:

- Review of power series to including the concepts of convergence, how to shift the index, Taylor series and using a computer to evaluate a series.
- Use power series to solve first order and second order differential equations.

Prerequisites/co-requisites/ recommended preparation

MATH50B - Integral Calculus

Rationale for Prerequisite: Course material involves concepts from calculus. Describe representative skills without which the student would be highly unlikely to succeed: Students must be well grounded in the art of differentiation. Students must also understand the theory of integration and possess basic integration skills.

Educational Accessibility & Support

College of the Redwoods is committed to providing reasonable accommodations for qualified students who could benefit from additional educational support and services. You may qualify if you have a physical, mental, sensory, or intellectual condition which causes you to struggle academically, including but not limited to:

- Mental health conditions such as depression, anxiety, PTSD, bipolar disorder, and ADHD
- Common ailments such as arthritis, asthma, diabetes, autoimmune disorders, and diseases
- Temporary impairments such as a broken bone, recovery from significant surgery, or a pregnancy-related disability
- A learning disability (e.g., dyslexia, reading comprehension), intellectual disability, autism, or acquired brain injury
- Vision, hearing, or mobility challenges

Available services include extended test time, quiet testing environments, tutoring, counseling and advising, alternate formats of materials (e.g., audio books, E-texts), assistive technology, on-campus transportation, and more. If you believe you might benefit from disability- or health-related services and accommodations, please contact Disability Services and Programs for Students (DSPS). If you are unsure whether you qualify, please contact DSPS for a consultation: dsps@redwoods.edu.

- Eureka: 707-476-4280, Student Services Building, 1st floor
- Del Norte: 707-465-2324, Main Building, near the library
- Klamath-Trinity: 707-476-4280

Student Support Services

Good information and clear communication about your needs will help you be successful. Please let your instructor know about any specific challenges or technology limitations that might affect your participation in class. College of the Redwoods wants every student to be successful.

The following online resources are available to support your success as a student:

- CR-Online (Comprehensive information for online students)
- Library Articles & Databases
- Canvas help and tutorials
- Online Student Handbook
- Online Tutoring Resources

To learn more about the resources available to you, click on a title bar below, or click the down arrow to expand them all.

Klamath-Trinity students can contact the CR KT Office for specific information about student support

services at 530-625-4821

Community College Student Health and Wellness

If you are in distress or are with someone at risk right now, call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255) or TEXT 741-741

Timely Care

When you're feeling under the weather physically or distressed mentally, you can find the help you're looking for in just a few quick taps. Students can schedule an appointment anytime via phone, video, and chat. Visit TimelyCARE here

Mental Health Counseling

Students should text, email, or fax Shawna Bell directly for scheduling and/or services.
Contact info
Text: 707-496-2856
Email: shawnabmft@gmail.com
Fax: 707-237-2318 (voicemail can be left via fax)

Wellness Central

Resources, tools, and trainings regarding health, mental health, wellness, basic needs and more designed for California community college students, faculty and staff are available on the California Community Colleges Wellness Central.

Counseling

Counseling & Advising can assist students in need of academic advising and professional counseling services. Visit the Welcome Center in the lower level of the student services building Monday –Friday 9am – 4pm (during the semester, summer hours may vary).

Basic Needs Center

The Basic Needs Center provides for the health and safety of students by providing access to healthy food, financial resources, and referrals to safe and secure housing. Students can submit a request for services and information here.

Contact info
Phone: 707-476-4153
Email: the-grove@redwoods.edu

Learning Resource Center

Learning Resource Center includes the following resources for students

- Library Services to promote information literacy and provide organized information resources.
- Multicultural & Diversity Center
- Academic Support Center – offers tutoring and test proctoring for CR students.
- Student Tech Help – provides students with assistance around a variety of tech problems.

EOPS

Extended Opportunity Programs & Services (EOPS)Links to an external site. provides services to eligible income disadvantaged students including: textbook awards, grants, career academic and

personal counseling, transportation assistance, tutoring, laptop, calculator and textbook loans, priority registration, graduation cap and gown, workshops, and more!

TRiO Student Success Program

The TRiO Student Support Services Program provides eligible students with a variety of services including academic advising, career assessments, assistance with transfer, and peer mentoring. Students can apply for the program in Eureka or in Del Norte.

Veterans Resource Center

The Veteran's Resource Center supports and facilitates academic success for Active Duty Military, Veterans and Dependents attending CR through relational advising, mentorship, transitional assistance, and coordination of military and Veteran-specific resources.

CalWORKS

CalWORKs – California Work Opportunity & Responsibility to Kids (CalWORKs). Provides supportive services to student parents with children under the age of 18, who are receiving cash assistance (TANF **benefits**), to become self-sufficient. Services include: transportation assistance, basic student supplies, tutoring, priority registration, laptop and calculator loans, career, academic, and personal counseling, and more!

Evaluation & Grading Policy

We will have several exams this semester. The exams will be of the traditional variety, meaning you will be given a set of problems that are to be worked. All exam points are weighted equally. We may also have several quizzes throughout the semester. Quiz points carry the same weight as exam points.
Exams/Quiz = 80%
Homework = 20%

$$Overall\ \ Score = 0.8 * \frac{number\ of\ exam\ points\ student\ earns}{number\ of\ exam\ points} + \frac{0.2(number\ of\ homework\ points\ student\ earns)}{number\ of\ homework\ points}$$

Multiply by 100 to get your Overall Percentage
The course grade is assigned as follows:
A = 90-100%
B+ = 85-89%
B = 80-84%
C+ = 75-79%
C = 70-74%
D = 60-69%
F = otherwise

Spring 2024 Dates

January 12	Last day to register for classes (day before the first class meeting)
January 13	Classes begin
January 15	Martin Luther King, Jr.'s Birthday Holiday (District-wide closure)

January 19	Last day to add a class
January 26	Last day to drop without a "W" and receive a refund
January 29	Census Date (20% of class)
February 16	Lincoln's Birthday Holiday (District-wide closure)
February 19	President's Day Holiday (District-wide closure)
March 7	Last day to petition to graduate
March 29	Last day for student initiated withdrawal (62.5% of class)
March 29	Last day for faculty initiated withdrawal (62.5% of class)
March 11-16	Spring break (no classes)
May 4-10	Final Examinations
May 10	Last day to file for P/NP Option
May 10	Semester Ends
May 17	Grades due
May 24	Grades available

Academic dishonesty

In the academic community, the high value placed on truth implies a corresponding intolerance of scholastic dishonesty. In cases involving academic dishonesty, determination of the grade and of the student's status in the course is left primarily to the discretion of the faculty member. In such cases, where the instructor determines that a student has demonstrated academic dishonesty, the student may receive a failing grade for the assignment and/or exam and may be reported to the Chief Student Services Officer or designee. The Student Code of Conduct (AP 5500) is available on the College of the Redwoods website. 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 website.

AI Use Class Policy

[There is no official CR policy on AI use. It is up to the instructor how they would like to address AI use in their courses. Below are three sample policies for you to consider, adapt, or delete.]

Recent advancements in generative artificial intelligence (AI) have made large language models such as

ChatGPT and Google's Bard widely available. However, overuse of these tools in this class can undermine your learning and curtail the development of your critical and creative thinking skills. In addition, AI outputs are often unreliable and frequently subject to bias. For these reasons, the policy of this class is that AI cannot be used at any point in the completion of class assignments, including discussion posts. Any or all of your assignment submissions and discussion posts may be screened by AI detection software, but the real penalty for AI misuse is that you will miss out on an opportunity to learn.

Recent advancements in generative artificial intelligence (AI) have made large language models such as ChatGPT and Google's Bard widely available. Sometimes, using these tools appropriately can help us overcome barriers and allow us to focus on deeper learning. However, overuse of these tools can undermine the development of our critical and creative thinking skills. In addition, AI outputs are often unreliable and frequently subject to bias. For these reasons, it is sometimes appropriate and sometimes inappropriate to use generative AI in the completion of assignments or in discussion posts. For this class, please see the specific assignment instructions for guidance on how and when generative AI tools may be used appropriately as we're working on and learning from a particular assignment. Also, please keep in mind that you are responsible for anything you submit; please carefully review all AI-generated outputs, screening them for accuracy, bias, appropriateness, and fidelity to your perspective.

Generative AI tools, such as ChatGPT and Google's Bard, are likely to be widely used in the workplace moving forward. It's important for you to understand how to use them ethically and effectively. For that reason, in this class, you will sometimes be invited to use such a tool in the completion of an assignment. In this class, using generative AI tools is not cheating if the outputs are screened by you for accuracy, bias, appropriateness, and fidelity to your perspective.

Disruptive behavior

Student behavior or speech that disrupts the instructional setting will not be tolerated. Disruptive conduct may include, but is not limited to: unwarranted interruptions; failure to adhere to instructor's directions; vulgar or obscene language; slurs or other forms of intimidation; and physically or verbally abusive behavior. In such cases where the instructor determines that a student has disrupted the educational process, a disruptive student may be temporarily removed from class. In addition, the student may be reported to the Chief Student Services Officer or designee. The Student Code of Conduct (AP 5500) is available on the College of the Redwoods website. 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 website.

Inclusive Language in the Classroom

College of the Redwoods aspires to create a learning environment in which all people feel comfortable in contributing their perspectives to classroom discussions. It therefore encourages instructors and students to use language that is inclusive and respectful.

Canvas Information

Log into Canvas at My CR Portal
For help logging in to Canvas, visit My CR Portal.
For help with Canvas once you're logged in, click on the Help icon on the left menu.
For tech help, email its@redwoods.edu or call 707-476-4160
Canvas online orientation workshop: Canvas Student Orientation Course (instructure.com)

Setting Your Preferred Name in Canvas

Students have the ability to have an alternate first name and pronouns to appear in Canvas. Contact Admissions & Records to request a change to your preferred first name and pronoun. Your Preferred Name will only be listed in Canvas. This does not change your legal name in our records. See the Student Information Update form.

Emergency Procedures / Everbridge

College of the Redwoods has implemented an emergency alert system called Everbridge. In the event of an emergency on campus you will receive an alert through your personal email and/or phones. Registration is not necessary in order to receive emergency alerts. Check to make sure your contact information is up-to-date by logging into WebAdvisor and selecting 'Students' then 'Academic Profile' then 'Current Information Update.'
Please contact Public Safety at 707-476-4112 or security@redwoods.edu if you have any questions. For more information see the Redwoods Public Safety.
In an emergency that requires an evacuation of the building anywhere in the District:

- Be aware of all marked exits from your area and building
- 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 campus authorities.
To learn more about campus-specific Emergency Procedures, click on a title bar below, or click the down arrow to expand them all.

Del Norte Campus Emergency Procedures

Please review the Crescent City campus emergency map for campus evacuation sites, including the closest site to this classroom (posted by the exit of each room). For more information, see the Redwoods Public Safety.

Klamath-Trinity Campus Emergency Procedures

Please review the responsibilities of, and procedures used by, the College of the Redwoods, KlamathTrinity Instructional Site (KTIS) to communicate to faculty, staff, students and the general public during an emergency. It is the responsibility of College of the Redwoods, Klamath-Trinity Instructional Site (KTIS) to protect life and property from the effects of emergency situations within its own jurisdiction.
In the event of an emergency, communication shall be the responsibility of the district employees on scene:

1. Dial 911, to notify local agency support such as law enforcement or fire services.
2. If safe to do so, notify key administrators, departments, and personnel.
3. If safe to do so, personnel shall relay threat information, warnings, to ensure the school community is notified.
4. Contact 530-625-4821 to notify of situation.
5. Contact Hoopa Tribal Education Administration office 530-625-4413
6. Notify Public Safety 707-476-4111.

In the even of an emergency, the responsible district employee on the scene will:

1. Follow established procedures for the specific emergency as outlined in the College of the Redwoods Emergency Procedure Booklet.
2. Lock all doors and turn off lights if in lockdown due to an active shooter or similar emergency.
3. Close all window curtains.

4. Get all inside to safe location Kitchen area is best internal location.
5. If a police officer or higher official arrives, they will assume command.
6. Wait until notice of all is clear before unlocking doors.
7. If safe to do so, move to the nearest evacuation point outside building (Pooky's Park), directly behind the Hoopa Tribal Education Building.
8. Do not leave site, unless it has been deemed safe by the person in command. Student Support Services (required for online classes