

**Math 7-52945**

Mr. Jim Gilmore

**Office:** FEM-1M

**Office Hours:** M 10:00, T 10:00, W 12:00

**E-Mail:** jim.gilmore@reedleycollege.edu

**Differential Equations**

**REEDLEY COLLEGE**

Spring 2014

**Meeting Rooms: FEM 4E**

**Meeting Days: MTWTh**

---

**Course Description:** This is a course in ordinary differential equations and linear algebra. Topics include: first order ODE's; linear systems and matrices; vector spaces; higher order ODE's; eigenvalues and eigenvectors; linear systems of ODE's; Laplace transforms; power series solutions.

**Basic Skills Advisories:** Eligibility for ENGL 125 AND ENGL 126

**Subject Prerequisites:** MATH 6 or equivalent

**TEXT:** Edwards and Penny, Differential Equations and Linear Algebra, ed. 3<sup>rd</sup> Pearson, 2010.  
ISBN 978-0-13-605425-2

**REQUIRED NOTES:** Notes will be available on Blackboard daily. They must be printed out and brought to class.

**ATTENDANCE:** Students are expected to attend all class meetings, be on time, and be in class the entire class session. Calling me to tell me you will be absent **does not** excuse you. **STUDENTS LEAVING CLASS BEFORE THE END OF CLASS WILL BE COUNTED AS BEING ABSENT! Three (3) absences** may result in a drop from the course. However, if you decide to drop the course, it is **your** responsibility to make the drop official in the Administrations and Records office or else possibly receive a grade of **F**.

**Behavioral Standards:** Your classmates and I would greatly appreciate that students in the class take care of any personal needs (i.e., using the restroom, getting a drink, sharpening a pencil) before class begins. Please turn your phone off when entering the class. You may not use your phone as a calculator. I would appreciate that you not bring guests to class.

**NOTE:** The drop deadline is **March 14, 2014**.

**TARDIES:** Students are expected to be on time. It is distracting, rude and unfair to fellow classmates and to the instructor when a student is late. If you are not present when roll is taken you will be counted as absent.

**HOMEWORK: NO LATE HOMEWORK WILL BE ACCEPTED!** When a student has not satisfactorily completed 3 homework assignments they will be dropped

**TESTS:** There are no makeup exams for missed tests.

**FINAL EXAM:** A two-hour comprehensive final exam worth 1 test will be given at the end of the semester during finals week.

Students are required to participate in all class discussions and activities. You may not start the homework during class. You may not study for another class or read a book during class.

**GRADING:**

- *Homework:* Homework will be worth 20% of the grade. Homework worth 10 points and homework worth 15 points will count the same.
- *In Class Tests:* All of your test percentages will be averaged and will count as 80% of your grade.

<u>Percent of Total Points</u>	<u>Grade</u>
89-100	A
79-88	B
70-78	C
60-69	D
0-59	F

**WHERE TO FIND YOUR GRADE:**

Available at <http://sc.webgrade.classmanager.com/ReedleyCollege/> Your class will be identified by schedule number. Username and password is sent to your email that you have on record with Blackboard.

**SPECIAL NEEDS REQUESTS:** If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact me as soon as possible.

**Academic Dishonesty**

Students at Reedley College are entitled to the best education that the college can make available to them, and they, their instructors, and their fellow students share the responsibility to ensure that this education is honestly attained. Because cheating, plagiarism, and collusion in dishonest activities erode the integrity of the college, each student is expected to exert an entirely honest effort in all academic endeavors. Academic dishonesty in any form is a very serious offense and will incur serious consequences.

**Cheating** is the act or attempted act of taking an examination or performing an assigned, evaluated task in a fraudulent or deceptive manner, such as having improper access to answers, in an attempt to gain an unearned academic advantage. Cheating may include, but is not limited to, copying from another’s work, supplying one’s work to another, giving or receiving copies of examinations without an instructor’s permission, using or displaying notes or devices inappropriate to the conditions of the examination, allowing someone other than the officially enrolled student to represent the student, or failing to disclose research results completely.

**Plagiarism** is a specific form of cheating: the use of another’s words or ideas without identifying them as such or giving credit to the source. Plagiarism may include, but is not limited to, failing to provide complete citations and references for all work that draws on the ideas, words, or work of others, failing to identify the contributors to work done in collaboration, submitting duplicate work to be evaluated in different courses without the knowledge and consent of the instructors involved, or failing to observe computer security systems and software copyrights.

Incidents of cheating and plagiarism may result in any of a variety of sanctions and penalties, which may range from a failing grade on a particular examination, paper, project, or assignment in question to a failing grade in the course, at the discretion of the instructor and depending on the severity and frequency of the incidents.

## **Course Objectives**

In the process of completing this course, students will:

- A. Add, subtract, multiply, and find the inverses of matrices.
- B. Calculate and use determinants.
- C. Use Gaussian elimination and Gauss-Jordan elimination to solve linear systems.
- D. Evaluate the properties of a vector space and determine whether or not a subspace is a subset.
- E. Determine the dependence and independence of vectors.
- F. Find the basis and dimension for a subspace of vectors.
- G. Define and use column spaces and the Null space.
- H. Find matrix eigenvalues and eigenvectors.
- I. Solve first order separable differential equations.
- J. Solve exact differential equations, including finding integrating factors to make non-exact differential equations exact.
- K. Solve linear first order equations.
- L. Solve Bernoulli equations and first order systems with homogeneous coefficients by the use of an appropriate variable substitution.
- M. Apply first order differential equation modeling to problems in engineering and the sciences.
- N. Solve second and higher order homogeneous linear differential equations with constant coefficients.
- O. Solve second and higher order non-homogeneous linear differential equations using the methods of undetermined coefficients and variation of parameters.
- P. Apply higher order differential equation modeling to problems in engineering and the sciences.
- Q. Solve homogeneous and non-homogeneous systems of differential equations using matrix methods.
- R. Use the Laplace transform technique to solve initial value problems.
- S. Use the power series method to solve ODE's

## **Course Outcomes**

Upon completion of this course, students will be able to:

- A. Use matrices and their applications to solve linear systems of equations.
- B. Find the basis for, and the dimension of, a given subspace of  $\mathbb{R}^n$ .
- C. Find the solutions to first order and higher order differential equations and apply them to various application problems.
- D. Find the solutions to systems of differential equations using matrix methods.
- E. Use Laplace transforms to find the solution to initial value problems.

## COURSE CONTENT OUTLINE:

### Lecture Content:

- I. Linear Algebra
  - I. Linear systems
  - II. Matrix notation and matrix operations
  - III. Gaussian elimination and Gauss-Jordan elimination
  - IV. Inverses and their uses
  - V. Determinants and their uses
  - VI. The vector space  $\mathbb{R}^3$
  - VII. The vector space  $\mathbb{R}^n$  and subspaces
  - VIII. Linear combinations and independence of vectors
  - IX. Bases and dimension for vector spaces
  - X. Column spaces and the Nullspace
  - XI. Eigenvalues and eigenvectors
- II. First Order Differential Equations
  - I. Basic concepts of differential equations
  - II. Slope fields
  - III. Separable equations
  - IV. Modeling of physical phenomena and population growth/decay
  - V. Linear first-order differential equations
  - VI. Equations reducible to separable or linear form
  - VII. Exact differential equations
  - VIII. Integrating factors
- III. Higher Order Linear Differential Equations
  - I. Basic concepts and solution forms
  - II. Homogeneous second order equations with constant coefficients
    1. Real distinct roots of characteristic polynomial
    2. Degenerate roots of characteristic polynomial
    3. Complex roots of characteristic polynomial
  - III. Spring/mass applications
  - IV. Non-homogeneous linear differential equations
    1. Method of undetermined coefficients
    2. Variation of parameters
  - V. Forced oscillations and resonance
  - VI. Application to electric circuits
- IV. Systems of Differential Equations
  - I. Basic concepts and solution forms
  - II. Homogeneous linear systems solutions
    1. Real distinct eigenvalues
    2. Degenerate complex eigenvalues
    3. Complex eigenvalues
    4. Degenerate defective eigenvalues and generalized eigenvectors
  - III. Non-homogeneous linear systems
    1. Variation of parameters
- V. Laplace Transforms
  - I. Intro to Laplace transform and inverse transform
  - II. Application to initial value problems
  - III. Exponential shift
  - IV. Differentiation and integration of transforms

- V. Convolution
- VI. Laplace of step and delta functions
- VII. Applications to physical systems having forcing functions defined in pieces.
- VI. Power Series Solutions
  - I. Review of power series fundamentals
  - II. Power series method for solving ODE's

*Important Dates*

January 13	Class Begins
January 20	Martin Luther King Day
February 14-17	Presidents Day
March 14	Last day to drop
March 14-17	Easter Break
May 19	Final 8:00-9:50 for 8:00 Class
May 21	Final 9:00-10:50 for 9:00 Class

**The final is a test. Be sure you plan to be there!**

### How to send an Email to Mr. Gilmore

**Read the syllabus.** Often, the question you would like to ask has already been answered in the material I have provided for you.

**Use your Reedley College email.** I am deluged with emails every day, and by using your school account, you'll have a better chance of avoiding the spam filter. Last semester I received about 800 emails from students.

**Your Subject line should be the class name and time of the class only.**

- Example: Math 103 8:00 AM

This information helps me organize and prioritize student emails. The section information is especially important since I often teach multiple sections of the same course.

**Always use a greeting.** Do not begin with "Hey" or similar colloquialisms. You should use "Dear Mr. Gilmore:"

**Briefly and politely state the reason you are emailing.** Offer only as much information as is relevant to the situation. Get to the point right away.

- Name the assignment or projects you are referring to instead of using pronouns or phrases, such as "this assignment".
- Example: Homework problem number 7 in section 7.1.

**If you are emailing with a problem, suggest a solution.** Be considerate, however, of how your solution might create additional work for me.

**Sign it with your name and your student ID number (but never your Social Security number).** Use your first and last name, even if you know that I know you.

**Your email should be professional.** It is important to use punctuation, capitalization, and complete sentences in all email correspondence to me.

**Read it over.** If you do not have spell-check on your email, then you can copy the message, paste it into a word-processing program, and run spell-check there. Consider not only the mechanics, but also what you have said. Strive for a polite tone, concise language, and clear purpose.

- **Allow adequate time for a reply.** Follow up if more than a few days have passed and you have not gotten a response, then it is appropriate to politely ask if I received your email and had time to consider what you wrote.

If you are simply sending me information then I may not consider a reply necessary. In this case, you are done. Example: "I have the flu and will not be in class on Tuesday, but Sue will turn my paper in for me."

**If your issue is not resolved then consider an office visit.**

Often the tone in emails cannot be properly judged. Rather than becoming upset, a visit in person can often remedy the situation.

- Use the words "please" and "thank you"--they really help and are universally appreciated.
- Try to contact a peer first if the purpose of your email is to find out what you missed when absent.
- Recognize that requests that may take only a few seconds to write and send, may take much longer to fulfill.
- Leave enough time for a response.

To... [Jim Gilmore](#)

Cc...

Bcc...

Subject: Math 103 8:00

Tahoma 10 **B** **I** **U**         

Dear Mr. Gilmore:

I will not be in class on Tuesday because I am not feeling well tonight. I will ask [John Smoltz](#) to take notes for me. I will also watch the video that is located in Blackboard and then do the assigned homework in [CourseCompass](#).

[Greg Maddux](#)  
0123456