

Linn-Benton Community College
Department of Mathematics
Course Information & Syllabus
Math 256 – Applied Differential Equations
Spring 2022

1 Your Instructor

1.1 Contact Information

Jeff Crabill

Email: crabilj@linnbenton.edu

Zoom: <https://linnbenton.zoom.us/j/5419174627>

Office Hours: MWF 12:15 pm - 12:55 pm or *by appointment*. Email or set up a time on Google calendar.

1.2 Call me Jeff, please.

This course is entirely about your learning the fascinating mathematics of differential equations, not about my credentials. Please call me Jeff.

2 Course Information

2.1 Daily Course Meetings

10:00 - 10:50 AM on Zoom MTWF

11:00 - 11:50 AM on Zoom MTWF both on Zoom!

Your attendance and participation are expected! Our class is classified as a “virtual” course, which means we will meet regularly on Zoom in a live, synchronous format. Plan to attend class regularly, webcams on, and engage in small group learning activities. **Find the course zoom link on Moodle.**

2.2 Scheduled In-Person Exam Dates

At the time of syllabus publication, we are scheduled to meet for three exam periods in person on campus. Please put these on your calendar. Masks and distancing will be required per the LBCC policy in place at the time of the exam. **Exams are scheduled at the Albany Campus in WOH-128.**

- **Midterm #1:** Wednesday, April 20, 2022 at class time
- **Midterm #2:** Friday, May 20, 2022 at class time
- **Final Exam:** Monday, June 6, 2022 at 8am (10am class) or 10am (11am class)

2.3 Course Description

Introductory course in elementary differential equations for students majoring in mathematics, sciences or engineering. Covers ordinary differential equations, series solutions, systems of first order differential equations, and Laplace transforms.

2.4 Course Text/Reference Material

See Moodle for link to open source textbook we'll use for reference.

I also have supplied at the bookstore the Schaum's outline – a great resource! **I'll do my best to post pages for reference during the term, but we do NOT follow a textbook in this course.**

2.5 Course Prerequisites

The required prerequisite for Math 256 is a course in multi-variable calculus (Math 254). The calculus and algebra techniques that students should review thoroughly at the beginning of the course are as follows:

- Completing the Square, e.g. $x^2 - 6x + 7 = (x - 3)^2 - 2$
- Partial Fractions Decomposition (both repeating and non-repeating factors)
- Elementary derivatives, including the chain rule
- Elementary antiderivatives, including u-substitution

2.6 Course Caveat

This is a capstone course in calculus and will introduce you the notion of including rates of change, as functions themselves, into equations. The focus of the course will mainly be the creation and use of models of several different physical and biological phenomena. Methods of solution are included for elementary equations. Students who focus entirely on memorizing methods of solution will find their experience less satisfying than students who focus on the modeling aspect of the course. Much of the rote methods of solutions will be communicated via videos and online exercises.

Your focus this term will not be entirely focused on memorizing algorithms. Focus on the modeling aspects of the material you learn.

2.7 Major Course Topics

- What is a differential equation?
- Modeling with differential equations, including identifying dependent and independent variables
- Theory of first-order and second-order linear differential equations
- Customary analytic solution techniques to common differential equations
- Elementary numerical solution techniques
- Modeling free and forced oscillations (mechanical and electrical)
- Introduction to the Laplace transforms
- Solving a variety of equations using the Laplace transform
- Using the Laplace transform to model forced oscillations with continuous or discontinuous forcing terms
- Introduction to systems of differential equations

2.8 Student Learning Outcomes

1. Write the appropriate differential equation to model a variety of problems and interpret the solution to the differential equation in the context of the given problem.

2. Identify the necessary method and construct the analytical solution of typical ordinary differential equations.
3. Develop at least one numerical method of solving first-order and second-order differential equations.
4. Compute the Laplace transform of continuous and discontinuous functions.
5. Apply the Laplace transform to solve a variety of differential equations, including those with discontinuous forcing terms.

2.9 Course Website

There is a course website on Moodle. Please log in via the Moodle eLearning page at LBCC.

3 Course Grading Information

3.1 Calculation of Course Grade

Your grade in Math 256 will be comprised of several different assignments that will comprise a **weighted average** to determine your final grade.

Category	Weight	Range	Grade
Assignments	15 %	90% - 100%	A
Misc In-class	8 %	90% - 100%	A
Midterm 1	20 %	80% - 89%	B
Midterm 2	22 %	70% - 79%	C
Final (indiv & group)	35 %	60% - 69%	D
		< 60%	F

Please note all enrolled students will earn one of the above grades only in Math 256. Incomplete grade policy is described below. **Please see section 3.4 of this syllabus for more information about each category.**

3.2 Grading Philosophy

Please note that your course grade is spread over a variety of assessments and types of work. Your work in this course should be thought of as a slow and steady march, not a sprint to the finish the last week. **Students should be aware of the affect of each individual assignment on their overall grade. Create your own spreadsheet so that you are aware of how each assignment impacts the overall course grade.**

3.3 Grading Policies

1. The instructor makes the final determination of your course grade based on work you have submitted, according to the grade distribution outlined in this syllabus. Course grades however tend to clump into groups, so your instructor will look for natural breaks in course grades to determine the A, B, C etc.
2. **The goal is to learn** All the assignments in the course have been chosen to help you learn, practice, and ultimately master the content. While I encourage working with classmates, a tutor, etc., your goal is to make sure you fully understand the material in the course. Any work you turn in must be your personal understanding of differential equations (not your classmates or the internet). You are personally responsible for any solution (online or written) you turn in and should be able to walk me through your process and understanding verbally if asked. At the end of the term, I reserve the right to adjust your grade to better reflect your personal understanding of the course material, if necessary.

Frustrated? Not happy leaving an assignment unfinished? That's OK! Write questions instead of the solution! If you let the frustration fester, learning stops and internet searches begin, muzzling your learning and causing potential problems. So instead, list questions and identify what you're missing as you submit an assignment.

You can continue to work on any assignment during the course, according to the policy below.

3. **Late Work** The goal of our course is for a student to meet the course objectives, however your instructor cannot be overloaded with tons of late work! That being said, every assignment is important and has value to you as your work toward the objectives.

Every assignment will have a due date for feedback. The course will be divided into three parts and all work can be submitted through the end of that part of the course. Work submitted past the

feedback date, however, will receive a score only. Once the next part of the course starts, no work will be accepted for the previous part of the course.

4. **One exception to late work** The one exception to the policy above will be all assignments in the "Misc In Class" category. All assignments in that category will be due at 11:59pm the day they are assigned. *The lowest two will be dropped.*
5. To receive credit, assignments must be **clear and easy to follow**. Students who turn in what looks like scratch work or work that is difficult to interpret will receive minimal credit. *Think edited version of a paper, instead of a rough draft!* Students may submit handwritten (neat) assignments or computer-generated work on word processors or L^AT_EX . **All submissions online MUST be in PDF format.**
6. **Incomplete Grade Policy** Grades of incomplete are given solely at the instructor's discretion to students with unusual and verifiable extenuating circumstances. You are expected to complete the course requirements within the time frame of the academic quarter.

3.4 Assignments Philosophy – Think 50,000 Foot Level To Start!

Every assignment you undertake in this course has a specific purpose and meaning that is there for you to discover as you complete the assignment. **There is always going to be something deeper than an algebraic process or a correct answer.** Since we live in a world with information at our fingertips, and homework solutions available on Google in an instant, you should seriously consider what value you add to your own knowledge as you work through your exercises!

So, think about the following when you are working on your assignments:

1. What is the big idea in this assignment?
2. What skills do I need to complete the assignment? How do those skills lead me to the big idea?
3. What is the physical situation that the given differential equation(s) model?
4. What would happen if I changed something? What other questions arise from the work I have done?
5. Investigate and experiment further!

There is more here than memorizing procedures and being graded on your short-term memory. If that is what you are looking for, we should talk soon!

3.5 Midterm & Final Exam Policies

1. Programmable calculators will not be permitted during exams. Calculators similar to the TI-36 only will be allowed.
2. Cell phones, tablets, and laptops **MUST** be turned OFF during exams and are not permitted to be used during exams. OFF means powered down. Ringing cell phones disturb other students and might result in disciplinary action.
3. You are allowed one 3”x5” notecard for reference on each exam, and one 3”x5” notecard for the final exam.
4. Any violation of these policies shall constitute a breach of the student code of conduct and will result in at least a zero on that exam, and likely disciplinary action including a report to the Dean of Students and dealt with according to the student code of conduct.

4 General Course Policies

1. Students are expected to attend the live-stream Zoom class sessions regularly. Participate, probe, ask questions! Class time will be a mixture of lecture and group work, so your interaction with your classmates and with the material is critical. **Zoom sessions will be recorded should you miss a class or two.**
2. Since this is a “virtual” course, students are expected to participate with cameras on during class time and during small group learning. *Students who consistently have cameras off in the zoom sessions may be put into the waiting room. Arrange with instructor ahead of time if you need to attend class without video.*
3. Make up exams must be coordinated with your instructor ahead of the scheduled exam. If you need alternative arrangements of any kind, simply consult with the instructor ahead of time.
4. Due dates and times for assignments will be posted on the course website.
5. I will not grade or score work that looks like chicken scratch above about half the grade value. Your work and presentation create your reputation and you should consider how you want to present yourself to college instructors and to future employers or clients. I will give you feedback roughly proportional to the clarity of your work.
6. Your instructor reserves the right to modify this syllabus at any time and any circumstances or situations that are either unclear or not addressed specifically in this document shall be handled solely at the instructor’s discretion. **This will likely happen several times since we’re running the course remotely and things may likely change!**

5 College Policies

5.1 LBCC COVID-19 Policy

Wear a mask or face covering indoors at all times. Your mask or face covering must be properly worn (fully covering nose and mouth and tight-fitting). Mesh masks, face shields, or face covering that incorporates a valve designed to facilitate easy exhalation are not acceptable. If you have a medical condition or a disability that prevents you from wearing a mask or cloth face covering, you must obtain an accommodation from CFAR (Center for Accessibility Resources) to be exempt from this requirement. State guidelines do not limit class size. Physical distancing accommodations can be made upon request and cleaning supplies are also available for personal use.

5.2 LBCC Comprehensive Statement of Nondiscrimination

LBCC prohibits unlawful discrimination based on race, color, religion, ethnicity, use of native language, national origin, sex, sexual orientation, material status, disability, veteran status, age, or any other status protected under applicable federal, state, or local laws.

5.3 Disability Services Statement

Students who have any emergency medical information the instructor should know of, who need special arrangements in the event of evacuation, or students with documented disabilities who may need accommodations, should make an appointment with the instructor as early as possible, and no later than the first week of the term. If additional assistance is required, the student should contact the Center for Accommodation Resources (CFAR) at 541-917-4789.

5.4 Student Code of Conduct

All students at LBCC are expected to be familiar with and to abide by the published Student Code of Conduct. Violations will be reported to the Associate Dean of Students for possible disciplinary action.

5.5 Academic Dishonesty

You must abide by the policies set forth by the college regarding cheating and academic dishonesty. Please see the complete policy at this link. Any evidence of academic dishonesty will result in a zero on the assignment. Please do your own work – you learn more when you approach it honestly.

5.6 Basic Needs Statement

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Roadrunner Resource Center for support (resources@linnbenton.edu, or visit us on the web www.linnbenton.edu/RRC under Student Support for Current Students). Our office can help students get connected to resources to help. Furthermore, please notify the professor if you are comfortable in doing so. This will enable them to provide any resources that they may possess.