

Prerequisites: MATH 152 with a grade of C or better

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Office Hours:

Monday	Tuesday	Wednesday	Thursday	Friday
	2:00 - 2:50	2:00 - 2:50	2:00 - 2:50	8:00-8:50 2:00 - 2:50

Required Texts: *Elementary Differential Equations*, William E. Boyce, Richard C. DiPrima, 10th Edition, John Wiley & Sons, 978-0-470-45832-7.

Calculator: The TI-83 Plus/ TI 84 is the recommended calculator for this course. On some of the exams and quizzes, the instructor may ask you to solve problems without using your calculators.

Course Description: This course covers first-order differential equations, second and higher order linear differential equations, the Laplace transform, systems of first order linear equations and applications of linear, ordinary differential equations in mathematics, science and engineering.

Student Learning Outcomes: At the conclusion of MATH 310, successful students will be able to:

1. *Differential Equations:* Describe the terminology related to differential equations and classify differential equations (partial/ordinary, linear/nonlinear, etc.).
2. *First-Order Differential Equations:* Classify first-order differential equations as linear, separable, homogeneous, autonomous and exact., solve initial-value problems involving first-order differential equations, determine the existence and uniqueness of solutions, obtain mathematical models and their solutions for applications in mathematics, sciences and engineering using first-order differential equations.
3. *Second and Higher-Order Linear Differential Equations:* Solve homogeneous equations with constant coefficients, describe the linear independence of solutions and apply the principle of superposition, solve non-homogeneous equations using the method of undetermined coefficients and variation of parameters, obtain mathematical models and their solutions for applications in mathematics, sciences and engineering using second-order linear differential equations.
4. *Laplace Transforms:* Obtain the Laplace Transform and the inverse Laplace Transform of functions using the definition or a table of Laplace Transforms, solve initial-value problems using the Laplace Transform, describe the unit step and unit impulse functions, solve initial-value problems with discontinuous forcing functions, use the convolution integral in mathematical modeling.
5. *Systems of First-Order Differential Equations:* Obtain mathematical models for applications in mathematics, sciences and engineering using systems of first-order linear differential equations, generate the phase portrait for a system of equations, solve homogeneous and non-homogeneous systems of equations with constant coefficients using linear algebra methods.

This course contributes to LSSU's Institutional Learning Outcomes by addressing:

2 Use of Evidence: Students will identify the need for, gather, and accurately process the appropriate type, quality, and quantity of evidence to answer a complex question or solve a complex problem.

3 Analysis and Synthesis: Students will organize and synthesize evidence, ideas, or works of imagination to answer an open-ended question, draw a conclusion, achieve a goal, or create a substantial work of art.

Grading Scale and Policies:

Point Values:

Exams	200 points
Final exam	100 points
Quizzes	100 points
<u>Total 400 points</u>	

Grading Scale%: A 90-100 (includes +/-) B 80-89 C 65-79 D 50-64 F 0-49

Grading Policies: You will be graded on correct methodology, i.e., if you provide an answer but show no work or your work is incorrect, you will receive no credit. Your solutions must be written in a connected, step-by-step logical fashion and all variables should be clearly defined. If your solution is not written clearly, you will not receive full credit. In many cases, setting up the correct mathematical model and using this model to solve a problem will be just as important as computing a numerical answer.

The homework exercises for each section covered are on the last page of this handout. You should spend a lot of your math study time doing homework. If you are struggling with your homework seek help from your instructor or the tutors in the Learning Center.

The course outline on the next-to-last page is a projection of the general structure and content of the course. It is tentative and subject to change without prior notice.

Ground Rules:

- 1. Calculator:** The TI-83/84 Plus is the recommended calculator for this course. Your instructor reserves the right to ask you to solve problems in class, during quizzes and during exams without the use of a calculator. All other electronic devices (computers, PDAs, cell phones etc.), must be turned off for all class lecture sessions.
- 2. Purpose of Lecture:** Lectures are an opportunity for students to ask questions and seek clarification on material. This implies student preparation has been accomplished prior to class. Lecture is also the opportunity for the instructor to coordinate coverage of the material and present material that is historically or potentially difficult. It does not negate student preparation or study.
- 3. Attendance Policy:** Attendance is strongly encouraged. If you miss a class, or are late, you are still responsible for class notes and assignments. Moreover, you will be assigned a 0 score should a quiz take place during that missed lecture.
- 4. Make-up Policy:** Each exam should be taken at the designated time. An exam may be taken prior to or after the scheduled date, by agreement with the instructor, provided that the student provides a request with a documented valid excuse well in advance of the scheduled date. If an absence is unexcused, no make-up will be provided, either for exams or for quizzes.
- 5. Academic Integrity:** Students are expected to perform all assigned work themselves. Any form of cheating or plagiarism will be handled in accordance with the Academic Integrity Procedures. Violations of the University Academic Integrity Policy may result in an F course grade.
- 6. Testing:** Use of head phones, cell phones and hats during exams is prohibited.

University Policies and Statements:**Online and Blended Course Attendance Policy**

Students in online or blended classes are required to log in to the Course Management System (Moodle) and complete at least one “Academic Related Activity” within the Add/Drop period.

The Americans with Disabilities Act & Accommodations

Lake Superior State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act and Section 504 of the Rehabilitation Act. This university is also dedicated to providing equal opportunity for participation in all programs, services and activities. If you are a student with a disability or think you may have a disability, please contact Accessibility Services, KJS Library #233, (906) 635-2355, accessibility@lssu.edu to discuss your request further. Once you have registered with Accessibility Services, students should contact their instructor as early as possible for assistance with classroom accommodations.

Academic Success Center

To support you on your academic path, the Academic Success Center (ASC) is free for all students and is located on the main floor of the library. The ASC offers walk in sessions for the math center, consultations with the writing center, and tutoring sessions by appointment. In addition, many classes offer supplemental instruction, which are group sessions tailored to your course content. Contact the Academic Success Center at academicsuccess@lssu.edu to set up an appointment

Laker Success

The Laker Success program is designed to help you gain control over your learning through proactive communication and goal setting, through the development of learning skills and study habits, and through personal accountability. The Laker Success staff is committed to working with students to develop an individualized plan to achieve academic and personal goals. Students can initiate contact with Laker Success on their own via email at lakersuccess@lssu.edu or by visiting the Student Engagement Center in Cisler Center, Room 100. Students may be also directed to Laker Success by their advisor, by an instructor, by the Scholastic Standards / Financial Appeals Committees, or by the Provost’s Office. If at mid-term your grades reflect that you may not attain a passing grade in one, some, or all of your classes, a Laker Success staff member will contact you. You may email lakersuccess@lssu.edu if you want to sign up early in the semester or if you have questions or concerns.

Add/Drop Policy

Courses can be added or dropped through Anchor Access until the sixth day of the semester (fourth day for the Summer semester). After this date, students need the instructor’s permission to add a course. For additional details about add/drop or withdrawal, go to:

<https://www.lssu.edu/registrar/scheduling/adddrop-courses-withdrawal-information/>

Related dates for this semester can be viewed at: <https://www.lssu.edu/registrar/important-dates/>

Tentative Course Outline:

Week	Dates	Tuesday	Thursday
1	01/15	1.1	1.2
2	01/23	1.3-2.1	2.2
3	01/29	2.3	2.6
4	02/05	3.1	Exam 1
5	02/12	3.2-3.3	3.3
6	02/19	3.4	3.5
7	02/26	3.6	Exam 2
8	03/04	BREAK	BREAK
9	03/11	4.1-4.2	4.3
10	03/18	6.1-6.2	6.3
11	03/25	6.4	Exam 3
12	04/01	6.5	6.6
13	04/08	7.1-7.2	7.3-7.4
14	04/15	7.5	Exam 4
15	04/22	7.6	7.8

Suggested Homework Problems

Topic	Section	ASSIGNMENT
Introduction; Direction Fields	1.1	p7: 15-20, 22
Solutions of some DEs; Classification of DEs	1.2,1.3	p15: 1b, 7; p24: 1-4, 8, 11, 17, 20
1 st order linear equations	2.1	p39: 14, 16, 18, 20
Separable equations	2.2	p48: 1, 2, 7, 9, 15
Modeling with 1 st order equations	2.3	p60: 1, 3, 4, 16
Modeling with 1 st order equations	2.3	p60: 20, 21a, 22a
Exact Equations	2.6	p101: 1, 4, 7, 13, 16
2 nd order homogeneous equations	3.1	p144: 1, 5, 6, 9, 15, 21
Fundamental solutions; the Wronskian	3.2	p155: 1, 2, 23, 24, 25
Complex roots of the characteristic equation	3.3	p164: 7, 11, 12, 17, 18
Repeated roots	3.4	p172: 1, 2, 4, 12, 16
Method of Undetermined Coefficients	3.5	p184: 1, 3, 4, 14, 19a, 20a, 21a
Variation of Parameters	3.6	p190: 1, 7, 15
Higher order differential equations	4.1 - 4.3	p233: 11, 14, 18, 31; p239: 2, 11, 13, 14, 15
Definition of the Laplace Transform	6.1	p315: 5, 6, 7, 12
Inverse Laplace Transform	6.2	p324: 1, 4, 7, 8
Solution of Initial Value Problems	6.2	p324: 11, 13, 14, 21, 24
Step Functions	6.3	p333: 1, 2, 7, 8, 11, 14, 15
Diff. Eq. w/ Discontinuous Forcing Function	6.4	p340: 1, 4, 6, 9
Impulse Functions	6.5	p348: 2, 5, 14
The Convolution Integral; Transfer Function	6.6	p355: 4, 5, 8, 11, 13, 14
Systems of First Order Linear Equations	7.1	p363: 1, 3, 5, 18
Review of Matrices; Eigenvalues, Eigenvectors	7.2, 7.3	p376: 1, 22, 23; p388: 15, 16, 17, 19
Homogeneous Linear Systems	7.4, 7.5	p405: 1, 2, 15, 16
Complex Eigenvalues	7.6	p417: 1, 2, 9, 10
Repeated Eigenvalues	7.8	p436: 1, 3, 7, 8
Nonhomogeneous Linear Systems	7.9	p447: 1, 5, 7