

**Angelina College
Science and Mathematics Division
Mathematics 2320 Differential Equations
Instructional Syllabus**

I. BASIC COURSE INFORMATION

- A. Course Description** - Differential Equations - MATH 2320. Three semester-hours credit. Ordinary differential equations, systems of equations, equations with variable coefficients, existence and uniqueness of solutions, series solutions, singular points, transform methods, and boundary value problems; application of differential equations to real-world problems. Prerequisite: MATH 2314 - Calculus II.
- B. Intended Audience**
Science, Mathematics and Engineering Majors.
- C. Instructor**
Instructor's Name: Ronnie Hall
Office Location: S203-C
Office Hours: 2:15 p.m. - 3:15 p.m. MTWR
Phone: (936) 633-5260
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II. INTENDED STUDENT OUTCOMES

- A. Core Objectives Required for this Course**
1. **Critical Thinking:** to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
 2. **Communication:** to include effective development, interpretation and expression of ideas through written, oral, and visual communication.
 3. **Empirical and Quantitative Skills:** to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.
- B. Course Learning Outcomes for all Sections**
Upon successful completion of this course, students will:
1. Identify homogeneous equations, homogeneous equations with constant coefficients, and exact and linear differential equations.
 2. Solve ordinary differential equations and systems of equations using:
 - a) Direct integration.
 - b) Separation of variables.
 - c) Reduction of order.
 - e) Methods of undetermined coefficients and variation of parameters.
 - f) Operator methods for finding particular solutions.
 - g) LaPlace transform methods.
 3. Determine particular solutions to differential equations with given boundary conditions or initial conditions.
 4. Analyze real-world problems in fields such as Biology, Chemistry, Economics, Engineering, and Physics, including problems related to population dynamics, mixtures, growth and decay, heating and cooling, electronic circuits, and Newtonian mechanics.

III. Assessment Measures

- A. Assessments for the Core Objectives**
1. **Critical Thinking:** Students will complete an out-of-class worksheet. A rubric will be used to assess critical thinking skills and correctness of the project.
 2. **Communication:** Students will make a classroom presentation of a calculus problem and will complete an out-of-class worksheet. A rubric will be used to assess oral and visual communication skills during the classroom presentation, and a rubric will be used to assess written communication skills on the worksheet.
 3. **Empirical and Quantitative Skills:** Students will complete an out-of-class worksheet. A rubric will be used to assess empirical and quantitative skills and correctness of the worksheet.

B. Assessments for Course Learning Outcomes

1. The student's ability to identify homogeneous equations, homogeneous equations with constant coefficients, and exact and linear differential equations will be assessed through imbedded test questions.
2. The student's ability to solve ordinary differential equations and systems of equations using a) direct integration, b) separation of variables, c) reduction of order, e) methods of undetermined coefficients and variation of parameters, f) operator methods for finding particular solutions, and g) LaPlace transform methods will be assessed through embedded test questions.
3. The student's ability to determine particular solutions to differential equations with given boundary conditions or initial conditions will be assessed through embedded test questions.
4. The student's ability to analyze real-world problems in fields such as Biology, Chemistry, Economics, Engineering, and Physics, including problems related to population dynamics, mixtures, growth and decay, heating and cooling, electronic circuits, and Newtonian mechanics will be assessed through embedded test questions.

IV. INSTRUCTIONAL PROCEDURES

This course will be taught using a combination of lectures, discussions, and practice exercises. The amount of time spent using any one technique will vary from class to class and from lesson to lesson as determined to be most appropriate by the instructor. The graphing calculator will be utilized as appropriate in classroom demonstrations.

V. COURSE REQUIREMENTS AND POLICIES

A. Required Textbooks, Materials and Equipment

1. Text(s) and supplementary materials
Differential Equations and Boundary Value Problems Computing and Modeling by Edwards and Penny, Pearson/Prentice Hall, Fourth Edition.
2. Specific equipment required of all students
A TI (Texas Instruments) graphing calculator is required. The TI-84 or TI-89 graphing calculator will be used by the instructor in all classroom demonstrations.
3. Additional text(s) and supplementary materials for the individual instructor - Varies with instructor

B. Assignments

1. Specific assignments required for all students (term papers, homework, speeches, participation in community activities, etc.)
See attached: Course Content and Topics
2. Appropriate due dates, schedules, deadlines, etc. as determined by the individual instructor.
See attached: Course Content, Schedule, and Assignments
3. Additional specific assignments: None

C. Course Policies - This course conforms to the policies of Angelina College as stated in the Angelina College Handbook.

1. **Academic Assistance** – If you have a disability (as cited in Section 504 of the Rehabilitation Act of 1973 or Title II of the Americans with Disabilities Act of 1990) that may affect your participation in this class, you should Ms. Sellestine Hunt, Room 200 of the Student Center. At a post-secondary institution, you must self-identify as a person with a disability; Special Student Support Services will assist you with the necessary information to do so. To report any complaints of discrimination related to disability, you should contact Mr. Steve Hudman, Student Center, Room 101 or 936-633-5292.
2. **Attendance** – Attendance is required as per Angelina College Policy and will be recorded every day. Any student with three (3) consecutive absences or four (4) cumulative absences may be dropped from the class. Records will be turned in to the Registrar's Office at the end of the semester. Do not assume that non-attendance in class will always result in an instructor drop. **You must officially drop a class or risk receiving an F.** This is official Angelina College Policy.
3. **Additional Policies Established by the Instructor**
 1. Class attendance is required and necessary.
 2. Punctuality is appreciated and expected. The instructor is not obligated to admit you after class has begun.
 3. The use of tape recorders is allowed only with the express permission of the instructor. If you wish to use such a device in the classroom, please discuss it with your instructor outside of class.

4. Guests not officially enrolled in the course, including the children of students, are not allowed in the classroom
5. Cell phones, pagers, and similar electronic devices are not appropriate in the classroom.
6. All work to be graded must be done in pencil on regulation size notebook or graph paper.
7. Class participation, questions, and discussion are encouragement appreciated, and necessary.
8. On most tests, it is necessary for you to show your work completely. Our concern is usually with procedures, not just with answers.
9. Daily quizzes cannot be made up.
10. Students are expected to do all assignments and be prepared to discuss them during the next class.

VI. COURSE OUTLINE: Description of the Course Activities including due dates, schedules, and deadlines.

See attached: COURSE CONTENT AND TOPICS, and MATH 2420 - COURSE CONTENT, SCHEDULE, AND ASSIGNMENTS

VII. EVALUATION AND GRADING

A. Grading Criteria (percents, extra credit, etc.)

1. Three major exams: 60%
Daily grades: 20%
Comprehensive final exam: 20%
2. Those who drop the course on or before February 1st will not receive a grade for the class. Those dropping between February 2nd and April 3rd (inclusive) will receive a W in the course. April 3rd is the last day for dropping a course. Dropping is your responsibility.
3. No make-up test are authorized. The final exam grade will be used a second time to replace any one missed test or the lowest test grade during the semester.

B. Determination of Grade (assignments of letter grades)

Grades will be assigned according to the scale below.

- 90 - 100% = A
- 80 - 89% = B
- 70 - 79% = C
- 60 - 69% = D
- Below 60% = F

The instructor reserves the right to adjust grades upward from this scale.

The instructor may modify the provisions of the syllabus to meet individual class needs by informing the class in advance as to the changes being made.

Course Content and Topics
Mathematics 2320, Differential Equations

<u>LESSON</u>	<u>DESCRIPTION</u>
1	1.1 Differential Equations and Mathematical Models. 1.2 Integrals as General and Particular Solutions.
2	1.4 Separable Equations and Applications. 1.5 Linear-First Order Equations.
3	1.6 Substitution Methods and Exact Equations.
4	3.1 Introduction: Second-Order Linear Equations. 3.2 General Solutions of Linear Equations.
5	3.3 Homogeneous Equations with Constant Coefficients.
6	3.4 Mechanical Vibrations.
7	Review
8	Test 1
9	3.5 Nonhomogeneous Equations and the method of Undetermined Coefficients.
10	3.6 Forced Oscillations and Resonance.
11	3.6 Forced Oscillations and Resonance. (Continued)
12	3.8 Endpoint Problems and Eigenvalues.
13	4.1 First-Order Systems and Applications.
14	4.2 The Method of Elimination.
15	5.1 Matrices and Linear Systems.
16	5.2 The Eigenvalue Method for Homogeneous Systems.
17	5.4 Multiple Eigenvalue Solutions.
18	Test 2
19	7.1 Laplace Transforms and Inverse Transforms.
20	7.2 Transformation of Initial Value Problems.
21	7.3 Translation and Partial Fractions.
22	7.4 Derivatives, Integrals, and Products of Transforms.
23	7.5 Periodic and Piecewise Continuous Input Functions.
24	Review
25	Test 3
26	8.1 Introduction and Review of Power Series.
27	8.2 Series Solutions Near Ordinary Points.
28	8.3 Regular Singular Points.
29	8.4 Method of Frobenius: The Exceptional Cases. Review.
30	Comprehensive Final Examination

Mathematics 2320
COURSE CONTENT, SCHEDULE, AND ASSIGNMENTS

<u>DATE</u>	<u>LESSON</u>	<u>SECTION</u>	<u>PAGE</u>	<u>ASSIGNMENT</u>
01/18	1	1.1 1.2	8 17	1 - 25 odd 1 - 17 odd, 24, 26, 27
01/23	2	1.4 1.5	43 56	1 - 25 alternate odd, 33, 37 *1 - 25 alternate odd
01/25	3	1.6	74	*1 - 41 alternate odd
01/30	4	3.1 3.2	158 170	*1, 5, 9, 25, 33 - 41 odd 1 - 21 alternate odd
02/01	5	3.3	183	*1 - 35 odd
02/06	6	3.4	195	1, 3, 5, 7, 15, 17, 19, 21
02/08	7			REVIEW
02/13	8			Test 1 (Sections 1.1 - 3.4)
02/15	9	3.5	210	*1 - 19 odd, 21 - 37 alt. odd, 47 - 53 odd.
02/20	10	3.6	222	*1 - 9 odd.
02/22	11	3.6	222	11 - 17 odd.
02/27	12	3.8	244	*1 - 5
03/01	13	4.1	255	*1 - 21 odd
03/06	14	4.2	266	*1 - 11 odd. Then rework 1, 3, 11 using linear operators.
03/08	15	5.1	301	*9 - 29 odd
03/20	16	5.2	316	*1 - 17 odd, 25
03/22	17	5.4	345	1 - 11 odd
03/27	18			Test 2 (Sections 3.5 - 5.4)
03/29	19	7.1	450	1 - 31 odd
04/03	20	7.2	462	*1 - 23 odd, 29
04/05	21	7.3	472	1 - 37 alt. odd (omit 25)
04/10	22	7.4	481	*1 - 33 alt. odd
04/12	23	7.5	491	1 - 19 odd
04/17	24			REVIEW
04/19	25			Test 3 (Sections 7.1 - 7.5)
04/24	26	8.1	516	1 - 13 odd, 19
04/26	27	8.2	526	1 - 21 odd
05/01	28	8.3	543	1 - 17 alt. odd
05/03	29	8.4		REVIEW
05/08	30			Comprehensive Final Examination (8:00 a.m. - 10:00 a.m.)