Welcome to MATH 2420 – Differential Equations

Semester Syllabus

Delete these instructions after following them: Instructors must make the following customizations:

- Change all highlighted text and remove highlights. Text highlighted in yellow should be customized; text highlighted in green is instructions that should be followed and then deleted.
- It is impossible to arrange the vertical spacing correctly on the master syllabus, as each instructor will be adding and deleting items. Consider starting each of the Level 1 Headings (The Basics, Course Calendar, Getting Help, Grades, Course Content, and The Details) at the top of a new page.
- In order to make the document accessible to screen readers, the master syllabus uses styles for text. The 6 styles in use are Title, Subtitle, Heading 1, Heading 2, Normal, and hyperlink. If you would like to customize these styles with different fonts or formatting, please do so using Styles. Right click on the style you want to change and choose Modify.
- Please do not add tables without following accessibility procedures. Previous syllabi that contained critical information on the first page without a table do not meet accessibility requirements.

THE BASICS

About Your Instructor

Name: Insert info here

The best way to reach me is: Insert info here

Phone number: Insert info here

Email: Insert info here

Office location (and/or link if appropriate): Insert info here

Office hours: Insert info here

To schedule a conference outside of office hours: Insert info here

About Your Course

Instructional Methodology: **Delete these instructions after following them**: Choose the correct option and **delete the other options**

Classroom Section: This course is taught in the classroom primarily as a lecture/discussion course.

DLS—Synchronous Virtual Class Meetings Required: Instruction is fully online with required online meetings during the specified days and times listed.

ONL—Online: Instruction and testing are fully online without required class times.

HYC—Hybrid Classroom: Instruction is mostly on-campus with remaining instruction online.

Synonym: Insert info here **Section:** Insert info here

Meeting location: Insert info here **Meeting times:** Insert info here

Prerequisites: MATH 2414 with a C or better.

Required Materials

This is a First Day™ class. The cost of required course materials, including an online version of the textbook and software access, has been added to your tuition and fees bill.

Textbook: *Differential Equations: An Introduction to Modern Methods and Applications,* 3rd Edition by Brannan & Boyce. Wiley (WileyPlus software) ISBN: 9781119031871

Calculator: You must have access to technology that enables you to (1) Graph a function, (2) Find the zeroes of a function. (3) Do numerical integration. Most ACC faculty are familiar with the TI family of graphing calculators. Hence, TI calculators are highly recommended for student use. Other calculator brands can also be used. Your instructor will determine the extent of calculator use in your class section.

Other Technology: **Delete these instructions after following them**: Delete webcam info if it does not apply; add any other needed technology. Access to a webcam and microphone are required for this course. Eligible students can check out required technology at https://www.austincc.edu/students/student-technology-services.

Course Calendar

Delete these instructions after following them: This is the recommended 16-week calendar from the course committee. See the document "Suggested Course Calendars" for other options and customize this chart as appropriate.

Note: Schedule changes may occur during the semester. Any changes will be announced in class and posted as a Blackboard Announcement.

Week	Sections	Material
1	1.1, 1.2, 1.3	Introduction to differential equations – what do they mean and how do they show up in applications. Slope fields, qualitative solutions, applications (falling objects, population models, Newton's Law of Cooling), checking a solution, terminology
	2.1, 2.2	Solving using separation of variables, linear equations and integrating factors
2	2.3, 2.4	Assorted applications including tank/mixture problems, approximating loans (cont.); Linear vs. nonlinear equations, existence and uniqueness ,
	2.5	Autonomous equations and population models
3	2.6	Exact equations
	2.7	More substitutions methods: Homogeneous and Bernoulli equations
4	8.1, 8.2	Numerical methods – Euler's method, Runge-Kutta method, errors and efficiency
		Review for Test 1 (or Test 1 in class)
5	3.1, 3.2, 6.2	Introduction to systems of differential equations, checking solutions, review of matrix notation and linear systems of algebraic equations, linear independence and the theory of solutions to linear systems
	3.3, 6.3	Solving a homogeneous system of differential equations with constant coefficients in 2 dimensions, Phase portraits, considering higher dimensions
6	3.4, 6.4	Systems with complex eigenvalues
	3.5 (6.7)	Systems with repeated eigenvalues,
7	6.6	Non-homogeneous linear systems with constant coefficients and variation of parameters
	7.1, 7.2	Introduction to analyzing non-linear systems
8	7.3, 7.4	Population problems using nonlinear systems - predator/prey systems and competing species
		Review for Test 2 (or Test 2 in class)
9	4.1, 4.2, 4.3	Second order DE's for fun and profit – New equations with old methods, now with 50% less work; The Wronskian, existence and uniqueness, and phase portraits; solving homogeneous equations with constant coefficients, reduction of order
	4.5, 4.7	Non-homogeneous equations with undetermined coefficients, operator notation, the Exponential Input Theorem
10	4.4	Mechanical applications and electrical circuits
	10.3	Basic boundary value problems with eigenvalues
11	5.1, 5.2, 5.3	Laplace transforms and initial value problems,
	5.3, 5.4	The inverse Laplace transform, using Laplace transforms to solve initial value problems
12	5.5, 5.6	Piecewise functions and the unit step function
		Review for Test 3 (or Test 3 in class)
13	5.7 or 5.8	The impulse function or convolutions

	9.1, 9.2	Series solutions near an ordinary point
14	10.1, 10.2	Orthogonality and Fourier series
	10.2	More Fourier series (Sine and Cosine series)
15	11.1	Solving the one-dimensional heat equation using separation of variables
	11.1	Solving the one-dimensional heat equation using separation of variables (cont.)
16		**Review for Final Exam**
		Final Exam

Important Dates

Last day to withdraw: Insert date here
Holidays: Insert ACC holidays for current semester

(Please note these are the **ONLY** holidays this semester.)

Making Time to Learn

We learn math by thinking about and working on mathematical problems, which takes time. Practice is crucial in a math course. To ensure that you have adequate time, set aside 8-12 hours per week outside of class time to practice and study for this course. Ask for help immediately when something isn't clear.

Getting Help

ACC provides several free resources for students who need help; descriptions and links are below:

Office hours: Another name for office hours is "student hours." This is the time your instructor has set aside to answer student questions, so feel free to drop by if you have questions. Office hours may be virtual or on campus; see information above.

Instructional Associates: Instructional Associates specific to the course you are taking are available for tutoring. To make an appointment, go to https://sites.google.com/a/austincc.edu/math-students/meet/list and then click on your course.

Learning Labs: The ACC Learning Labs provide tutoring in math and other subjects. To schedule an appointment, go to https://www.austincc.edu/students/learning-lab. This site includes information about in person and virtual tutoring options.

Academic Coaching: Academic coaches offer extra support to students with study strategies; they want to help you learn to be an active participant in your own learning process. For more information or to make an appointment with an academic coach, go to https://www.austincc.edu/students/academic-coaching.

ACC Student Services: Services are offered in many areas, including Academic, Financial, Personal, and Technology Support. For more information, go to https://www.austincc.edu/student-support.

Grades

Delete these instructions after following them: Grading criteria must be clearly explained in the syllabus. The criteria should specify the number of exams and other graded material (homework, assignments, projects, etc.). **Instructors must include where students can access their grades.** Instructors should discuss the format and administration of exams. Guidelines for other graded materials, such as homework or

projects, should also be included in the syllabus. NOTE: If you are requiring online homework in your section, your grading scheme should include the weight of the online and written portions of homework. The portion of the homework grade for online homework should be no more than half of the homework grade. Written homework must still be assigned. An example is given below; you should modify it to fit your course.

Grade Components

Tests: 80%

Homework: 10%

Quizzes: 5%

Other: 5%

Grading Scale

A: 90 - 100

B: 80 – 89

C: 70 – 79

D: 60 – 69

F: < 60

Where can I find my grades?

Grades will be posted in Blackboard.

What will we do in this class?

Tests: Insert info here

Homework: Insert info here

Quizzes: Insert info here

Group work: Insert info here

What happens if I miss something?

Dropped Grade Policy: Insert info here

Late Work Policy: Insert info here

Missed Exam Policy: Insert info here

Attendance/Class Participation Policy: Insert info here

Course Content

Course Description

Credit Hours: 4, **Contact Hours:**4

MATH 2420 – Differential Equations (4-4-0). A course in the standard types and solutions of linear and nonlinear ordinary differential equations, include Laplace transform techniques. Series methods (power or Fourier) will be applied to appropriate differential equations. Systems of linear differential equations will be studied.

Course Rationale

This is a traditional introductory course in the standard types and solutions of linear and nonlinear ordinary differential equations and systems of linear differential equations usually taken by mathematics, engineering and computer science students.

Student Learning Outcomes

Upon successful completion of the course, a student should be able to:

1. Identify and classify homogeneous and nonhomogeneous equations/systems, autonomous equations/systems, and linear and nonlinear equations/systems.
2. Solve first order differential equations using standard methods, such as separation of variables, integrating factors, exact equations, and substitution methods; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.
3. Solve second and higher order equations using reduction of order, undetermined coefficients, and variation of parameters; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.
4. Solve systems of equations and use eigenvalues and eigenvectors to analyze the behavior and phase portrait of the system; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.
5. Use LaPlace transforms to solve initial value problems.
6. Solve boundary value problems and relate the solution to the Fourier series; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.

General Education Competencies

1. Critical Thinking: gathering, analyzing, synthesizing, evaluating and applying information is covered in every SLO.
2. Quantitative and Empirical Reasoning: applying mathematical, logical, and scientific principles and methods is covered in every SLO.
3. Technology Skills: using appropriate technology to retrieve, manage, analyze, and present information is covered in SLOs # 1, 2, 3, 5, and 7.
4. Written, Oral and Visual Communication: communicating effectively adapting to purpose, structure, audience and medium is covered in every SLO.

The Details

[Delete these instructions after following them: Remove the following two paragraphs if your class is not online]

Distance Education Information: This class is fully online. Successful online students actively participate in class on a regular basis just like in an on-campus class and avoid putting off classwork until the last minute. This includes reading assignments, taking quizzes and tests, and any other activities assigned by your professor. You will need to stay motivated and routinely log in to your classes in order to keep on top of your assignments.

Students will use the Blackboard learning management system for assignment instructions, submitting assignments, and collaboration. Students are encouraged to read ACC Distance Education General Information available at https://online.austincc.edu/faq/.

First Day Access: To enhance your learning experience and provide affordable access to the right course material, this course is part of an inclusive access model called First Day™. You can easily access the required materials for this course through Blackboard, at a discounted price, and benefit from single sign-on access. Austin Community College includes the discounted price as a course fee in your registration fees for this course.

It is NOT recommended that you Opt Out, as these materials are required to complete the course. You can choose to Opt Out on the first day of class, but you will be responsible for purchasing your course materials at the full retail price and access to your materials may be suspended. See your course in Blackboard for details.

Withdrawal Policy: It is the responsibility of each student to ensure that his or her name is removed from the roll should he or she decide to withdraw from the class. The instructor does, however, reserve the right to drop a student should he or she feel it is necessary. If a student decides to withdraw, he or she should also verify that the withdrawal is submitted before the Final Withdrawal Date. The student is also strongly encouraged to retain their copy of the withdrawal form for their records.

Students who enroll for the third or subsequent time in a course taken since Fall 2002 may be charged a higher tuition rate for that course. State law permits students to withdraw from no more than six courses during their entire undergraduate career at Texas public colleges or universities. With certain exceptions, all course withdrawals automatically count towards this limit. Details regarding this policy can be found in the ACC college catalog.

Reinstatement Policy: Students who withdrew or were withdrawn will not be reinstated unless they have completed all coursework, projects, and exams necessary to place them at the same level of course completion as the rest of the class. Reinstatement is up to the instructor's approval.

Incomplete Grade Policy: Incomplete grades (I) will be given only in very rare circumstances. Generally, to receive a grade of "I", a student must be up to date on coursework and have a passing grade, and after the last date to withdraw, have a legitimate reason that prevents course completion. An incomplete grade cannot be carried beyond the established date in the following semester. The completion date is determined by the instructor but may not be later than the final deadline for withdrawal in the subsequent semester.

Communication with Your Instructor: All e-mail communication to students will be sent solely to the student's ACCmail account or math software if applicable, with the expectation that such communications will be read in a timely fashion. Likewise, students should use their ACCmail account or math software when communicating with instructors. Instructors will respond to student emails within 3 business days, if

no response has been received by the student at the end of that time, then the student should send a reminder to the instructor.

Name Change Information: If you want to change how your name appears online at ACC, go to https://www.austincc.edu/admissions/update-student-information/chosen-name.

General College Policies: Policies that apply to all courses at ACC can be found here: https://www.austincc.edu/offices/academic-outcomes-assessment/master-syllabi/college-policies.