



Mathematics Southeast Campus

Math 2320: Ordinary Differential Equations

CRN 63644 – Fall 2013

Distance Education

3 hour lecture course / 48 hours per semester/7 weeks

Textbook: A First Course in Differential Equations with Modeling Applications, 10th Ed, by Dennis Zill
ISBN-13: 9781111827052

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Course Description

MATH 2320 Ordinary Differential Equations. Topics include initial value problems for first order and linear second order equations, Picard iterations, series solutions, and boundary value problems. Laplace transforms and numerical methods.

Eagle Online Login: <https://hccs1.mrooms3.net/login/index.php>

Your must log into Eagle Online, our course management system, each week or you will be counted absent. Use the login link above. Be sure to save the link on your desktop or some other convenient location on your computer. You will have quizzes that will be due approximately every two weeks which need to be completed within EagleOnline. You will also have access to email, discussion, course notes and videos from this site.

Prerequisites

MATH 2414.

Course Goal

This course provides the background in sciences for further study in mathematics and its applications.

Course Student Learning Outcomes (SLO):

1. Classify and solve first- and second-order differential equations, and use these methods to solve applied problems.
2. Solve higher-order linear differential equations and systems of differential equations, and use these methods to solve applied problems.
3. Find Laplace transforms and inverse transforms, and apply these to solve differential equations.
4. Use numerical methods to approximate the solution of a differential equation.

Learning outcomes

Students will:

- 1.1 Verify that a function is a solution for a given differential equation.
- 1.2 Derive a differential equation from a given physical situation.
- 1.3 Determine by inspection at least two solutions of a given initial-value problem.
- 1.4 Solve a given differential equation by separation of variables or by using an appropriate substitution.
- 1.5 Solve given exact differential equations subject in indicated initial conditions.
- 1.6 Solve the given Ricatti equation.
- 1.7 Use Picard's method to find y_1, y_2, y_3 for a given differential equation.
- 1.8 Find the orthogonal trajectories of a given family of curves.
- 2.1 Determine whether a set of functions are linearly dependent or independent on $(-\infty, \infty)$.
- 2.2 Determine whether an n th-order differential equation is homogeneous, or nonhomogeneous.
- 2.3 Apply the superposition principle for homogeneous and nonhomogeneous equations.
- 2.4 Given a differential equation and one solution, find the second solution.
- 2.5 Solve a given differential equation by undetermined coefficients.
- 2.6 Find a linearly independent function that is annihilated by a given differential operator.
- 2.7 Solve given differential equations by variation of parameters or by involving Cauchy-Euler equation.
- 2.8 Solve the given system of differential equations by either systemic elimination or determinants.
- 2.9 Use the Laplace transform to solve a given system of differential equations.

- 2.10 Rewrite a given system in normal form.
 2.11 Solve a given system of equations by either Gaussian elimination or Gauss-Jordan elimination.
 2.12 Solve a given system of linear first-order equations using matrices.
 2.13 Solve a given system of homogeneous linear systems.
 2.14 Use the method of undetermined coefficients to solve a given system on $(-\infty, \infty)$.
 2.15 Use variation of parameters to solve a given system of equations.
 2.16 Use matrix exponentials.
 3.1 Find the Laplace Transform of a given function.
 3.2 Find the inverse Laplace Transform of a given function.
 3.3 Given a Laplace Transform of an integral, evaluate the transform without evaluating the integral.
 3.4 Use the Laplace transform to solve the given differential equation subject to the given boundaries.

CALENDAR

Wk	Date	Topic	Assignment
1	Aug. 26	INTRODUCTION TO DIFFERENTIAL EQUATIONS 1.1 Definitions and Terminology 1.2 Initial-Value Problems	<u>1.1 1,3,5,7,9,11,13,15,17,19,21,23,27,28</u> <u>1.2 1,3,7,32</u>
2	Sep. 2	1.3 Differential Equations as Mathematical Models FIRST-ORDER DIFFERENTIAL EQUATIONS 2.1 Solution Curves Without the Solution	1.3 5,6,9,10,11,23,25 <u>2.1 1,15,21</u>
3	Sep. 9	2.2 Separable Variables 2.3 Linear Equations	<u>2.2 1,5,9,13,17,21,25</u> <u>2.3 1,5,9,13,17,21,25,29</u>
4	Sep. 16	2.4 Exact Equations 2.5 Solutions by Substitutions 2.6 A Numerical Solution	<u>2.4 1,5,25,29,33,37</u> <u>2.5 1,5,9,13,17,21,25,29</u> <u>2.6 1,3</u> Quiz #1
5	Sep. 23	MODELING WITH FIRST-ORDER DIFFERENTIAL EQUATIONS 3.1 Linear Equations 3.2 Nonlinear Equations 3.3 Systems of Linear and Nonlinear Equations	<u>3.1 1,3,13,15,17,21</u> <u>3.2 1,3,11</u> <u>3.3 1,5,7</u> Quiz #2
Sep. 27–29		EXAM 1 (Chapter 1, 2, 3)	
6	Sep. 30	HIGHER-ORDER DIFFERENTIAL EQUATIONS 4.1 Linear Equations 4.2 Reduction of Order	4.1 1,5,9,13,17,21,25,29,33 4.2 1,7,11,15,19
7	Oct. 7	4.3 Homogeneous Linear Equations with Constant Coefficients 4.4 Undetermined Coefficients – Superposition Approach	4.3 1,5,9,13,17,21,25,29,33,37,41 4.4 1,5,9,13,17,25,29,33,37,41
8	Oct. 14	4.6 Variation of Parameters	4.6 1,5,9,13,17,21 Quiz #3
9	Oct. 21	4.7 Cauchy–Euler Equation 4.8 Solving Systems of Linear Equations by Elimination	4.7 1,5,9,13,17,21,25,29,33 4.8 1,5,9,13,17,21
10	Oct. 28	SERIES SOLUTIONS OF LINEAR EQUATIONS 6.1 Series Solutions of Linear Equations 6.2 Solutions about Singular Points	6.1 13,17,21,25,29 6.2 1,5,9,13,15,19,23
Nov. 1 – 3		EXAM 2 (Chapter 4, 6)	
11	Nov. 4	THE LAPLACE TRANSFORM 7.1 Definition of the LaPlace Transform 7.2 Inverse Transform and Transforms of Derivatives	7.1 1,5,9,13,17,21,25,29,33 7.2 1,5,9,13,17,21,25,29,33,37 Quiz #4
12	Nov. 11	7.3 Translation Theorems 7.4 Additional Operational Properties	7.3 1,5,9,13,17,21,25,29,39,43,47,51,54,55,59,63,67 7.4 1,3,5,7,9,19,27,31
13	Nov. 18	7.5 Dirac Delta Function 7.6 Systems of Linear Equations	7.5 1,5,9 7.6 1,5,9 Quiz #5

14	Nov. 25	SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS 8.1 Preliminary Theory 8.2 Homogeneous Linear Systems with Constant Coefficients 8.3 Variation of Parameters	8.1 1,5,9,13,17,21 8.2 1,5,9,13,19,23,27,33 Quiz #6
15	Dec. 2	Review for the Final Exam	
Dec. 6 – 8		FINAL EXAM (Chapter 7, 8)	

Student Assignments

Homework Problems are assigned from each section. It is your responsibility to work each of the assigned problems and to ask questions when needed.

Quizzes are assigned approximately every other week. These quizzes are given so that you can test your knowledge on the subject. The five highest quiz scores will make up your quiz grade.

Three major exams will be given during the semester. No make-up exams will be given. If you miss an exam, the score will be recorded as a zero. *All exams are in-person exams.*

A **final comprehensive exam** will be given. Every student enrolled in the course must take the final exam.

Requirement	Date	Points	Total Points	Letter Grade
Exam 1	Sep. 27–29	100	450-500	A
Exam 2	Nov. 1 – 3	100	400-449	B
Final Exam	Dec. 6 – 8	200	350-399	C
QUIZ		100	300-349	D
			0 - 299	F

All scores will be entered into our Eagle Online Course Gradebook.

HCC Policy Statement - ADA

Services to Students with Disabilities

Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Disability Services Office at his or her respective college at the beginning of each semester. Faculty members are authorized to provide only the accommodations requested by the Disability Support Services Office. Persons needing accommodations due to a documented disability should contact the ADA counselor for their college as soon as possible. For questions, please contact Donna Price at 713.718.5165. To visit the ADA Web site, please visit www.hccs.edu then click Future students, scroll down the page and click on the words Disability Information.

Be sure to read the Student Handbook for more information .

HCC Policy Statement: Academic Honesty

Students who are caught cheating will be given a zero on their exam.

A student who is academically dishonest is, by definition, not showing that the coursework has been learned, and that student is claiming an advantage not available to other students. The instructor is responsible for measuring each student's individual achievements and also for ensuring that all students compete on a level playing field. Thus, in our system, the instructor has teaching, grading, and enforcement roles. You are expected to be familiar with the University's Policy on Academic Honesty, found in the catalog. What that means is: If you are charged with an offense, pleading ignorance of the rules will not help you. Students are responsible for conducting themselves with honor and integrity in fulfilling course requirements. Penalties and/or disciplinary proceedings may be initiated by College System officials against a student accused of scholastic dishonesty. "Scholastic dishonesty": includes, but is not limited to, cheating on a test, plagiarism, and collusion.

Cheating on a test includes:

- Copying from another students' test paper;
- Using materials not authorized by the person giving the test;
- Collaborating with another student during a test without authorization;
- Knowingly using, buying, selling, stealing, transporting, or soliciting in whole or part the contents of a test not yet administered;
- Bribing another person to obtain a test that is to be administered.

Plagiarism means the appropriation of another's work and the unacknowledged incorporation of that work in one's own written work offered for credit.

Collusion mean the unauthorized collaboration with another person in preparing written work offered for credit. Possible punishments for academic dishonesty may include a grade of 0 or F in the particular assignment, failure in the course, and/or recommendation for probation or dismissal from the College System. (See the Student Handbook)

HCC Policy Statements

Class Attendance - It is important that you come to class! Attending class regularly is the best way to succeed in this class. Research has shown that the single most important factor in student success is attendance. Simply put, going to class greatly increases your ability to succeed. You are expected to be on time at the beginning of each class period. For complete information regarding Houston Community College's policies on attendance, please refer to the Student Handbook. You are responsible for materials covered during your absences. Class attendance is checked daily. Although it is your responsibility to drop a course for nonattendance, the instructor has the authority to drop you for excessive absences.

Attendance for this class is checked by your participating on exams and by viewing login information for EagleOnline. Be sure to log in at least once per week.

If you are not attending class, you are not learning the information. As the information that is discussed in class is important for your career, **students may be dropped from a course after accumulating absences in excess of six (6) hours of instruction.** The six hours of class time would include any total classes missed or for excessive tardiness or leaving class early.

You may decide NOT to come to class for whatever reason. As an adult making the decision not to attend, you do not have to notify the instructor prior to missing a class. However, if this happens too many times, you may suddenly find that you have "lost" the class.

Poor attendance records tend to correlate with poor grades. If you miss any class, including the first week, you are responsible for all material missed. It is a good idea to find a friend or a buddy in class who would be willing to share class notes or discussion or be able to hand in your work if you unavoidably miss a class

HCC Course Withdrawal Policy

If you feel that you cannot complete this course, you will need to withdraw from the course prior to the final date of withdrawal. Before, you withdraw from your course; please take the time to meet with the instructor to discuss why you feel it is necessary to do so. The instructor may be able to provide you with suggestions that would enable you to complete the course. Your success is very important. Beginning in fall 2007, the Texas Legislature passed a law limiting first time entering freshmen to no more than **SIX** total course withdrawals **throughout** their educational career in obtaining a certificate and/or degree.

To help students avoid having to drop/withdraw from any class, HCC has instituted an Early Alert process by which your professor *may* "alert" you and HCC counselors that you might fail a class because of excessive absences and/or poor academic performance. It is your responsibility to visit with your professor or a counselor to learn about what, if any, HCC interventions might be available to assist you – online tutoring, child care, financial aid, job placement, etc. – to stay in class and improve your academic performance.

If you plan on withdrawing from your class, you **MUST** contact a HCC counselor or your professor prior to withdrawing (dropping) the class for approval and this must be done **PRIOR** to the withdrawal deadline to receive a "W" on your transcript. ****Final withdrawal deadlines vary each semester and/or depending on class length, please visit the online registration calendars, HCC schedule of classes and catalog, any HCC Registration Office, or any HCC counselor to determine class withdrawal deadlines. Remember to allow a 24-hour response time when communicating via email and/or telephone with a professor and/or counselor. Do not submit a request to discuss withdrawal options less than a day before the deadline.** If you do not

withdraw before the deadline, you will receive the grade that you are making in the class as your final grade. **The last day to withdraw from this class is Friday, November 2, 2012 at 4:30 p.m.**

Repeat Course Fee

The State of Texas encourages students to complete college without having to repeat failed classes. To increase student success, students who repeat the same course more than twice, are required to pay extra tuition. The purpose of this extra tuition fee is to encourage students to pass their courses and to graduate. Effective fall 2006, HCC will charge a higher tuition rate to students registering the third or subsequent time for a course. If you are considering course withdrawal because you are not earning passing grades, confer with your instructor/counselor as early as possible about your study habits, reading and writing homework, test taking skills, attendance, course participation, and opportunities for tutoring or other assistance that might be available.

Classroom Behavior

Because this is an online class, you need to be mindful of postings and emails. Please use proper English and be respectful of all people.

Use of Camera and/or Recording Devices

As a student active in the learning community of this course, it is your responsibility to be respectful of the learning atmosphere in your classroom. To show respect of your fellow students and instructor, you will turn off your phone and other electronic devices, and will not use these devices in the classroom unless you receive permission from the instructor.

Use of recording devices, including camera phones and tape recorders, is prohibited in classrooms, laboratories, faculty offices, and other locations where instruction, tutoring, or testing occurs. Students with disabilities who need to use a recording device as a reasonable accommodation should contact the Office for Students with Disabilities for information regarding reasonable accommodations

Instructor Requirements

Your textbook is a required tool and my notes should not be a substitute for the textbook.

Personal Communication Device Policy:

All personal communication devices (any device with communication capabilities including but not limited to cell phones, blackberries, pagers, cameras, palmtop computers, lap tops, PDA's, radios, headsets, portable fax machines, recorders, organizers, databanks, and electronic dictionaries or translators) must be muted or turned off during class. Such activity during class time is deemed to be disruptive to the academic process. Personal communication devices are to not be on the student desk during examinations. Usage of such devices during exams is expressly prohibited during examinations and will be considered cheating (see academic honesty section above).

Student Course Reinstatement Policy:

Students have a responsibility to arrange payment for their classes when they register, either through cash, credit card, financial aid, or the installment plan. Faculty members have a responsibility to check their class rolls regularly, especially during the early weeks of a term, and reconcile the official class roll to ensure that no one is attending class whose name does not appear on it. Students who are dropped from their courses for nonpayment of tuition and fees who request reinstatement after the official date of record (OE Date) can be reinstated by making payment in full and paying an additional \$75 per course reinstatement fee. A student requesting reinstatement should present the registrar with a completed **Enrollment Authorization Form** with the signature of the instructor, department chair, or dean who should verify that the student has been attending class regularly. Students who are reinstated are responsible for all course policies and procedures, including attendance requirements.

Resources:

Free tutoring is available at most colleges. Additional help is also available through Student Support Services. Students can get free assistance, 24 hours a day, 7 days a week, in Math, English and other subjects, at www.hccs.askonline.net. Typically, posted questions are answered by an HCC tutor or faculty within 24 hours (usually under 6 hours). There are also several online math resources that you can find with an internet search. You may also find information on the Learning Web site accessible through your specific HCCS campus website.