HCC HOUSTON COMMUNITY COLLEGE

Ordinary Differential Equations – Syllabus for MATH 2320
Spring 2011
Math 2320 CRN 69606

Catalog 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. Prerequisite: MATH 2414.
3 credit (3 lecture).

Prerequisites: MATH 2414.

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

Textbook: Zill, Dennis, *A First Course in Differential Equations with Modeling Applications*, Brooks Cole Publishing Company, 8th ed., 2005.

Instructor Information: Susan Fife. Phone: (713) 718-7241.   email: susan.fife@hccs.edu

Course Objectives: Upon completion of this course, a student should be able to:

1. Verify that a function is a solution for a given differential equation.
2. Derive a differential equation from a given physical situation.
3. Determine by inspection at least two solutions of a given initial-value problem.
4. Solve a given differential equation by separation of variables or by using an appropriate substitution.
5. Solve given exact differential equations subject in indicated initial conditions.
6. Determine whether a set of functions are linearly dependent or independent on $(-\infty,\infty)$.
7. Determine whether an nth-order differential equation is homogeneous, or nonhomogeneous.
8. Given a differential equation and one solution, find the second solution.
9. Solve a given differential equation by undetermined coefficients.
10. Find a linearly independent function that is annihilated by a given differential operator.
11. Solve given differential equation by variation of parameters or by involving Cauchy-Euler equations.
12. For a given differential equation, find two linearly independent power series solutions about a point.
13. Use the method of Frobenius to obtain two linearly independent series solutions about the point $x_0=0$.
14. Find the Laplace Transform of a given function.
15. Find the inverse Laplace Transform of a given function.

16. Given a Laplace Transform of an integral, evaluate the transform without evaluating the integral.
17. Use the Laplace transform to solve the given differential equation subject to the given boundaries.
18. Solve the given system of differential equations by either systemic elimination or determinants.
19. Use the Laplace transform to solve a given system of differential equations.
20. Rewrite a given system in normal form.
21. Sketch the direction field for a given differential equation.
22. Given an initial-value problem, use Euler formula to obtain a four-decimal approximation.
23. Given an initial-value problem, use Runge-Kutta methods to obtain a four decimal approximation.

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.

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.

A final comprehensive exam will be given during the December 10 − 12 weekend. Every student enrolled in the course <u>must</u> take the final exam. The final exam score may replace the score earned on one exam.

Requirement	Date	Points	Total Points	Letter Grade
Exam 1	Feb. 11 − 13	100	450−500	A
Exam 2	Mar. 11 − 13	100	400−449	B
Exam 3	Apr. 8 − 10	100	350 − 399	C
Final Exam	May 6 − 8	200	300 − 349	D
			0 - 299	F

Attendance Policy: Any student who misses the first two exams should expect to be withdrawn from the class. Otherwise, as long as you are regularly attending the class, and logging into BlackBoard you are considered to be actively participating in this class. However, do not assume that you are automatically dropped from this course from nonattendance. The last day to withdraw from this course is April 21, 2011 at 4:30 p.m.

MATH 2320 Calendar

Week	Date	Topic	Assignment
1	Jan. 18 - Jan. 23	**INTRODUCTION TO DIFFERENTIAL EQUATIONS** 1.1 Definitions and Terminology 1.2 Initial–Value Problems 1.3 Differential Equations as Mathematical Models	1.1 1,3,5,7,9,11,13,15,17,19,21,23,27,28 1.2 1,3,7,32 1.3 5,6,9,10,11,23,25
2	Jan. 24 - Jan. 30	**FIRST-ORDER DIFFERENTIAL EQUATIONS** 2.1 Solution Curves Without the Solution 2.2 Separable Variables 2.3 Linear Equations	2.1 1,15,21 2.2 1,5,9,13,17,21,25 2.3 1,5,9,13,17,21,25,29 Sep 10: Official Day of Record
3	Jan. 31 - Feb. 6	2.4 Exact Equations 2.5 Solutions by Substitutions 2.6 A Numerical Solution	2.4 1,5,25,29,33,37 2.5 1,5,9,13,17,21,25,29 2.6 1,3
4	Feb. 7 - Feb. 13	**MODELING WITH FIRST-ORDER DIFFERENTIAL EQUATIONS** 3.1 Linear Equations 3.2 Nonlinear Equations 3.3 Systems of Linear and Nonlinear Equations	3.1 1,3,13,15,17,21 3.2 1,3,11 3.3 1,5,7
	Feb. 11 - 13	**EXAM ONE: Chapters 1, 2, and 3**	**In Person Exam**
5	Feb. 14 - Feb. 20	**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
6	Feb. 21 - Feb. 27	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
7	Feb. 28 - Mar. 6	4.5 Undetermined Coefficients – Annihilator Approach 4.6 Variation of Parameters	4.5 1,5,9,13,17,21,25,29,33,35,39,43,47,51,55,59,63,67,71 4.6 1,5,9,13,17,21
8	Mar. 7 - Mar. 13	4.7 Cauchy–Euler Equation 4.8 Solving Systems of Linear Equations by Elimination 4.9 Nonlinear Equations	4.7 1,5,9,13,17,21,25,29,33 4.8 1,5,9,13,17,21 4.9 1,5,9b,13
	Mar. 11-13	**EXAM TWO: Chapter 4**	**In Person**
	Mar. 14-20	**SPRING BREAK**	**SPRING BREAK**
9	Mar. 21 - 27	**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
10	Mar. 28 - Apr. 3	**THE LAPLACE TRANSFORM** 7.1 Definition of the LaPlace Transform 7.2 Inverse Transform and Transforms of Derivatives 7.3 Translation Theorems	7.1 1,5,9,13,17,21,25,29,33 7.2 1,5,9,13,17,21,25,29,33,37 7.3 1,5,9,13,17,21,25,29,39,43,47,51,54,55,59,63,67

11	Apr. 4 - Apr. 10	7.4 Additional Operational Properties 7.5 Dirac Delta Function 7.6 Systems of Linear Equations	7.4 1,3,5,7,9,19,27,31 7.5 1,5,9 7.6 1,5,9
Apr. 8 - 10		**EXAM THREE:** **Chapters 6 and 7**	**In Person**
12	Apr. 11 - Apr. 17	**SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS** 8.1 Preliminary Theory 8.2 Homogeneous Linear Systems with Constant Coefficients	8.1 1,5,9,13,17,21 8.2 1,5,9,13,19,23,27,33 Nov. 18 **4:30pm**: Last Day for **Administrative Drop**
13	Apr. 18 - Apr. 24	8.3 Variation of Parameters	8.2 1,5,9,13,19,23,27,33 Nov. 25 - 28: Thanksgiving Holiday
14	Apr. 25 - May 1	**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS** 9.1 Euler Methods and Error Analysis 9.2 Runge-Kutta Methods 9.3 Multistep Methods	9.1 1,11 9.2 1 9.3 1
15	May 2 - May 8	Review for the Final Exam	
May 6 - 8		**FINAL EXAM**	**In Person**

Americans With Disabilities Act (ADA): Persons needing accommodations due to a documented disability should contact the ADA counselor for their college as soon as possible.

Withdrawal Policy: Withdrawal from the course after the official day of record will result in a final grade of "W" on the student transcript and no credit will be awarded. Prior to the official day of record, it is the student's responsibility to initiate and complete a request for withdrawal from any course.

Academic Integrity. HCCS is committed to a high standard of academic integrity in the academic community. In becoming a part of the academic community, students are responsible for honesty and independent effort. Failure to uphold these standards includes, but is not limited to, the following: plagiarizing written work or projects, cheating on exams or assignments, collusion on an exam or project, and misrepresentation of credentials or prerequisites when registering for a course. When there is clear evidence of cheating, plagiarism, collusion or misrepresentation, disciplinary action may be taken.

Equal Opportunity Statement: It is the policy of the HCCS System to provide equal employment, admission and educational opportunities without regard to race, color, religion, national origin, sex, age, or disability. HCCS strives to provide an excellent learning environment free from harassment or intimidation directed at any person's race,

color, religion, national origin, sex, age, or disability. Any form of harassment will not be tolerated.

Please see the course calendar for due dates, section–by–section coverage, and assigned homework.

DISTANCE EDUCATION FALL 2010 SYLLABUS INCLUSIONS

BLACKBOARD STUDENT USER ID
Your Blackboard login user ID will be your HCC User ID (sometimes referred to as the "W" number). All HCC students have a unique User ID. If you do not know your User ID you can look it up by visiting the HCC home page:
- From www.hccs.edu, under the column "CONNECT", click on the "Student System Sign In" link
- Then click on "Retrieve User ID" and follow the instructions.

Or use the direct link to access the Student Sign In page:
https://hccsaweb.hccs.edu:8080/psp/csprd/?cmd=login&languageCd=ENG

The default student password is "distance." Students will then be prompted to change their password after their first login. Please visit the Distance Education Technical Support website if you need additional assistance with your login.

DISTANCE EDUCATION (DE) ADVISING AND COUNSELING SERVICES
Much DE student information can be found on the DE Student Services website: de.hccs.edu. Advising or counseling can be accomplished through our online request form AskDECounseling. Counselors and Student Services Associates (SSA) can assist students with admissions, registration, entrance testing requirements, degree planning, transfer issues, and career counseling. In-person, confidential sessions can also be scheduled to provide brief counseling and community referrals to address personal concerns affecting academic success.

ASKDECOUNSELING FORM
AskDECounseling is a student services online help form. This is the best and quickest way for students to get accurate assistance with DE registration, enrollment, advising, and counseling. The online help form is simple to fill out, convenient, and readily accessible through the internet. Students do not have to travel to campus sites, leave work, or wait in an office or lobby to receive assistance. Upon submission, student requests are answered in the order they are received.

EARLY ALERT
HCC has instituted an Early Alert process by which your professor may "alert" you and DE counselors that you might fail a class because of excessive absences and/or poor academic performance. A counselor will then reach out to you to discuss your progress and offer any relevant resources. This initiative is designed to provide students with support services and resources to assist them in successfully completing their course.

HCC COURSE WITHDRAWAL POLICY

Beginning Fall 2007, the State of Texas imposes penalties on students who withdraw/drop courses excessively. Students are limited to no more than SIX total course withdrawals throughout their educational career at a Texas public college or university. Students are encouraged to review the HCC 6 Drop Policy.

To help you avoid having to withdraw from any class, contact your DE professor regarding your academic performance. You may also want to contact your DE counselor to learn about helpful HCC resources (e.g. online tutoring, child care, financial aid, job placement, etc.).

HOW TO DROP
- **If a student decides to withdraw from a class upon careful review of other options, the student can withdraw online prior to the deadline through their HCC Student Center.**
- **HCC and/or professors may withdraw students for excessive absences without notification** (see Class Attendance below).
- **Students should check HCC's Academic Calendar by Term for withdrawal dates and deadlines.** Classes of other duration (flex-entry, 8-weeks, etc.) may have different final withdrawal deadlines. Please contact the HCC Registrar's Office at 713.718.8500 to determine mini-term class withdrawal deadlines.

CLASS ATTENDANCE
As stated in the HCC Catalog, all students are expected to attend classes regularly. Students in DE courses must log into their Blackboard class or they will be counted as absent. Just like an on-campus class, your regular participation is required.

Although it is the responsibility of the student to withdraw officially from a course, the professor also has the authority to block a student from accessing Blackboard, and/or to withdraw a student for excessive absences or failure to participate regularly. DE students who do not log into their Blackboard class before the Official Day of Record will be automatically dropped for non-attendance. Completing the DE online orientation does not count as attendance.

DISABILITY SERVICES
Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Disability Support Services Office at the beginning of each semester. Professors are authorized to provide only the accommodations requested by the Disability Support Services Office.

DE students who are requesting special testing accommodations may choose the most convenient DSS office for assistance each semester:

District ADA Coordinator – Donna Price – 713.718.5165

Central ADA Counselors – Jaime Torres & Martha Scribner – 713.718.6164

Northeast ADA Counselor- Kim Ingram – 713.718.8420

Northwest ADA Counselor – Mahnaz Kolaini – 713.718.5422

Southeast ADA Counselor – Jette Lott - 713.718.7218

Southwest ADA Counselor – Dr. Becky Hauri – 713.718.7910

Coleman ADA Counselor – Dr. Raj Gupta – 713.718.7631

After student accommodation letters have been approved by the DSS office and submitted to DE Counseling for processing, students will receive an email confirmation informing them of the Instructional Support Specialist (ISS) assigned to their professor.

LIBRARY RESOURCES
As a DE student you have the same access to first-rate information resources that the HCC Libraries make available to all HCC students. A special website pulls together all the tools DE students will need to complete research. Visit Library Resources specifically for Distance Education students.

Library services are available throughout HCC. Through a daily library delivery service and a listing of all materials belonging to HCC libraries, books may be requested from and delivered to any campus library. HCC also has cooperative borrowing agreements with the University of Houston libraries and provides a copy of the Houston Public library catalog at each library. These arrangements provide students with access to over 4 million volumes.

Special services provided by the library system include photocopying facilities; specialized equipment for disabled students; group and personalized instruction in library use, including a self-instructional media program to orient students to the use of the HCCS libraries; a "term paper" workshop; and online bibliographic search services.

ONLINE TUTORING
HCC provides free online tutoring in writing, math, science, and other subjects. Look for Ask Online on your Blackboard log-in page. This directs students to the HCC AskOnline Tutoring site: http://hccs.askonline.net/. Use your student ID or HCC e-mail address to create an account. Instructions, including a 5-minute video, are provided to make you familiar with the capabilities of this service.

SOCIAL NETWORKING
DE students are encouraged to become a fan of DE on Facebook and follow DE on Twitter. These social networking sites can provide a sense of community for the online learner, as well as up-to-date information and announcements related to HCC and DE.

VIRTUAL CLASSROOM CONDUCT
As with on-campus classes, all students in HCC Distance Education courses are required to follow all HCC Policies & Procedures, the Student Code of Conduct, the Student Handbook, and relevant sections of the Texas Education Code when interacting and communicating in a virtual classroom with your professor and fellow students. Students who violate these policies and guidelines will be subject to disciplinary action that could include denial of access to course-related email, discussion groups, and chat rooms or even removal from the class.