Massasoit Community College

Instructor:
Office:
Email:
Phone:
Office Hours:

Course: Differential Equations
Course Number: MATH230-XX
Semester:
Classroom:
Day and Time:

Course Description: This course is an introductory study of ordinary differential equations of the first and higher orders. Topics include linear differential equations with constant coefficients, power series solutions, Fourier Series solutions, Laplace transforms, higher-order forced linear equations with constant coefficients, and applications with numerical methods. Prerequisite: C- or higher in MATH 222 Calculus II; waiver by placement testing results; or departmental approval.

Required Text and Materials:

1. *A First Course in Differential Equations with Modeling Applications.* Tenth Edition, Dennis G. Zill, Cengage Learning, 2013
2. A TI-Voyage 200 graphing calculator is required for this course. All assessments will assume that you have a graphing calculator. A TI-Voyage 200 can be rented through the library for a small fee. You may not use any other technologies, such as cell phones, iPods, tablets, laptops, etc. on in-class assessments. You also may not borrow/share calculators, or borrow mine.

Course Topics:

- 1.1 Definitions and Terminology
- 1.2 Initial Value Problems
- 1.3 Differential Equations as Mathematical Models
- 2.1 Solutions Curves Without a Solution
- 2.2 Separable Equations
- 2.3 Linear Equations
- 2.4 Exact Equations
- 2.5 Solutions by Substitutions
- 3.1 Linear Models
- 4.1 Preliminary Theory – Linear Equations
- 4.2 Reduction of Order
- 4.3 Homogeneous Linear Equations with Constant Coefficients
- 4.4 Undetermined Coefficients – Superposition Approach

- 4.6 Variation of Parameters
- 5.1 Linear Models: Initial-Value Problems
- 6.1 Review of Power Series
- 6.2 Solutions About Ordinary Points
- 6.3 Solutions About Singular Points
- 7.1 Definition of Laplace Transform
- 7.2 Inverse Transforms and Transforms of Derivatives
- 7.3 Operational Properties I
- 7.4 Operational Properties II
- 7.5 The Dirac Delta Function
- Appendix II Matrices
- 8.1 Preliminary Theory – Linear Systems
- 8.2 Homogeneous Linear Systems

Teaching Procedures: This course will be taught in a lecture/discussion format with ample opportunity for student questions. Generally, class will begin with a question and answer session on the most recent homework assignment. New material will then be presented in a lecture format and homework be assigned to reinforce the topics covered in class.

Instructional Objectives:

COURSE OUTCOMES	OUTCOMES ACTIVITIES
At the end of this course, students will be able to:	
Demonstrate an understanding of the basic properties of differential equations.	1. Classify a differential equation as an ordinary differential equation or a partial differential equation. (CT, QS, R) 2. Classify a differential equation as linear or nonlinear. (CT, QS, R) 3. Identify the order of a differential equation. (CT, QS, R) 4. Classify a solution to a differential equation as explicit or implicit. (CT, QS, R) 5. Identify solutions to differential equations as general solutions or solutions satisfying specific initial conditions (initial value problems). (CT, QS, R)

COURSE OUTCOMES	OUTCOMES ACTIVITIES
Demonstrate an understanding of various techniques used to solve first order differential equations.	1. Examine the existence and uniqueness theorem for initial value problems involving first order differential equations. (CT, QS, R) 2. Solve first order differential equations by direct integration. (CT, QS, R) 3. Solve first order differential equations by separation of variables. (CT, QS, R) 4. Solve first order linear differential equations. (CT, QS, R) 5. Solve exact first order differential equations. (CT, QS, R) 6. Use substitution and transformation to solve first order differential equations. (CT, QS, R)
Demonstrate an understanding of various techniques used to solve linear differential equations of higher order.	1. Examine the existence and uniqueness theorem for initial value problems involving higher order linear differential equations. (CT, QS, R) 2. Examine the representation of solutions to higher order linear differential equations in both the homogeneous and non-homogeneous cases. (CT, QS, R) 3. Solve homogeneous linear equations of higher order with constant coefficients. (CT, QS, R) 4. Solve linear differential equations of higher order using the method of undetermined coefficients. (CT, QS, R) 5. Solve linear differential equations of higher order using the method of variation of parameters. (CT, QS, R)
Demonstrate an understanding of the Laplace transform.	1. Find the Laplace transform of a function using the definition. CT, QS, R) 2. Use the properties of the Laplace transform and a table to find the Laplace transform of a given function. (CT, QS, R) 3. Find the inverse Laplace transform of a function. (CT, QS, R) 4. Solve initial value problems using Laplace transforms. (CT, QS, R) 5. Find Laplace and inverse Laplace transforms for discontinuous and periodic functions. (CT, QS, R) 6. Examine impulses and the Dirac delta function. (CT, QS, R)

COURSE OUTCOMES	OUTCOMES ACTIVITIES
Demonstrate an understanding of series solutions to differential equations.	1. Determine singular points of a differential equation and classify them as regular or irregular. (CT, QS, R) 2. Find power series solutions to linear differential equations. (CT, QS, R) 3. Use the method of Frobenius to find series solutions to differential equations about a regular singular point. (CT, QS, R) 4. Finding general solutions of a given equation using Bessel functions. (CT, QS, R)
Demonstrate an understanding of the techniques used to solve linear systems of differential equations.	1. Solve a linear system of differential equations using the method of elimination. (CT, QS, R) 2. Solve a homogeneous linear system of differential equations with constant coefficients using eigenvalues/eigenvectors. (CT, QS, R) 3. Solve a non-homogeneous linear system of differential equations. (CT, QS, R)
Solve various applied and numerical problems involving differential equations.	1. Solve applied problems involving motion with variable acceleration. (CT, QS, R, TS) 2. Solve applied problems involving forced oscillation and resonance. (CT, QS, R, TS) 3. OPTIONAL: Use Euler's method to approximate solutions to initial value problems involving first order differential equations. (CT, QS, R, TS) 4. OPTIONAL: Use the Runge-Kutta method to approximate solutions to differential equations. (CT, QS, R, TS)
OPTIONAL: Demonstrate an understanding of introductory techniques used to solve partial differential equations.	1. Solve heat flow problems using the method of separation of variables. (CT, QS, R) 2. Solve vibrating string problems using the method of separation of variables. (CT, QS, R)
Strengthen Core Competencies** in order to increase success in this and other courses and in the workplace.	Referenced above.

**Indicate the Core Competencies that apply to the outcomes activities and assessment tools: Critical Thinking (CT); Technology Skills (TS); Oral Communications (OC); Quantitative Skills (QS); Reading (R); Writing (W).

Basis for Student Grading: Grades for this course will be assigned as follows:

Grade	Average
A	93%-100%
A-	90%-92%
B+	87%-89%
B	83%-86%
B-	80%-82%
C+	77%-79%

Grade	Average
C	73%-76%
C-	70%-72%
D+	67%-69%
D	63%-66%
D-	60%-62%
F	0-59%

The grade you earn is the grade you will receive in this course. Grades are not negotiable. You will not be allowed to make up work, substitute alternative assignments, or submit extra assignments in order to improve your grade during the semester or after the semester ends.

Grades of incomplete are given only in situations when extenuating circumstances prevent a student from taking the final exam or fulfilling a specific requirement in the course. The grade of "I" cannot be used to give students additional time to complete course assignments in order to raise their grade.

Basis for Evaluating Student Performance: The grade for this course will be weighted based on the following categories:

- *Exams (70%)*: There will be four in-class exams given throughout the semester, approximately every 3 weeks. Exams must be taken during the regular class time and no make-up exams will be given. The lowest exam grade will be dropped. Your exam average will account for 60% of your final grade.
- *Final Exam (30%)*: The course will culminate in a cumulative final exam. It will be worth 30% of your final grade.

There is no extra credit available for this course.

Tentative Test Schedule/Assignment(s) Schedule:

Assignment:	Tentative Date:
Test 1	
Test 2	
Test 3	
Test 4	
Final Exam	

Attendance: Attendance for this course is mandatory. After the third absence, students will lose two points per absence thereafter from their final average. I will take attendance at the beginning of every class, and students not present at that time will be marked absent for the class, even if they show up late. If you must miss a regular class, you are still responsible for the material that was presented in class. The average student needs to attend all class meetings in order to be successful in this course.

Accommodations Statement: Massasoit's Disability Services office provides accommodations to students who qualify for services based on a documented disability. Students interested in accessing classroom or testing accommodations must contact Disability Services directly. In an effort to avoid any lapse in services, new and returning students are encouraged to contact Disability Services at the beginning of each semester to receive an Accommodation Letter for the current semester. Students on all campuses can contact Disability Services at 508-588-9100 X 2132 or by e-mail at DisabilityServices@massasoit.edu for further information or questions.

 Title IX Statement: Massasoit Community College is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, stalking, or retaliation, we encourage you to report it to *Yolanda Dennis, Chief Diversity Officer and Title IX Coordinator, Office of Diversity and Inclusion, at 508-588-9100, x1309 or* ODI@massasoit.edu. While you may talk to a faculty member, understand that as a "responsible employee" of the College, the faculty member must report what you share to the College's Title IX Coordinator. On and off campus resources and interim measures are available to assist you. Information about both of these policies can be found at www.massasoit.edu/title-ix and www.massasoit.edu/eeo. We are here to support you.

Academic Integrity: Academic dishonesty will not be tolerated. Please see the following URL for more information on the college's policies on academic integrity:

http://www.massasoit.edu/academics/policies/academic-honesty/index