CONCORDIA UNIVERSITY
FACULTY OF ENGINEERING AND COMPUTER SCIENCE
APPLIED ORDINARY DIFFERENTIAL EQUATIONS - ENGR 213, Winter 2011

Instructor (Sec. G):	Shahin Hashtrudi Zad
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Office Hours:	Tuesdays and Wednesdays, 11:00-12:00
Lectures:	Tuesdays and Thursdays, 14:45-16:00, FG-B040
Tutorials (Sec. GA):	Mondays, 16:10-17:50, H-427
(Sec. GB):	Fridays, 17:45-19:25, H-603-1

Course Description: This course introduces first year engineering students to the theory and application of ordinary differential equations. Definition and Terminology, Initial-Value Problems, Separable Differential Equations, Linear Equations, Exact Equations, Solutions by Substitution, Linear Models, Orthogonal Trajectories, Complex Numbers, Form of Complex Numbers: Powers and Roots, Theory: Linear Equations, Homogeneous Linear Equations with Constant Coefficients, Undetermined Coefficients, Variation of Parameters, Cauchy-Euler Equation, Reduction of Order, Linear Models: Initial Value, Review of Power Series, Power Series Solutions, Theory, Homogeneous Linear Systems, Solution by Diagonalisation, Non-Homogeneous Linear Systems, Eigenvalues and Eigenvectors.
Lectures: three hours per week. Tutorial: two hours per week. NOTE: Students who have received credit for EMAT 212 or 232 may not take this course for credit. (Prerequisite: MATH 204 (cégep Mathematics 105) previously or concurrently; MATH 205 (cégep Mathematics 203)).

Textbook: Advanced Engineering Mathematics, by Zill and Wright, 4th Edition (with Student Solution Manual), Published by Jones and Bartlett, 2011.

Grading Scheme:

Term Test 1	15%
Term Test 2	15%
Assignments	10%
Final exam	60%

If the grade of the final exam is better than the mark of a mid-term exam, then the weight of the final exam will be increased by 15% to replace the midterm exam. If the student misses a mid-term test for any reason, including illness, then the weight of the final exam will be increased by 15% to replace the midterm. Students are responsible for finding out the date of the final exam. The Examination Office posts the time and place of the final exam once the schedule becomes available. Any conflicts or problems with the scheduling of the final exam must be reported directly to the Examination Office. Students are expected to be available until the end of the final examination period. Conflicts due to travel plans will not be accommodated.

You must pass the final exam to pass the course.

PLEASE NOTE: Electronic communication devices (including cellphones) will not be allowed in examination rooms. Only *Faculty-approved calculators with stickers* will be allowed in examination rooms.

Sections Topics

1.1 Definitions and Terminology
1.2 Initial-Value Problems
1.3 Differential Equations as Mathematical Models
2.1 Solution Curves without a Solution
2.2 Separable Equations
2.3 Linear Equations
2.4 Exact Equations
2.5 Solutions by Substitutions
2.7 Linear Models (Newton's Law of Cooling, Series Circuits)
2.8 Nonlinear Models (Exercises 13, 20 only)
2.9 Modeling with Systems of First-Order DEs
17.1 Complex Numbers
17.2 Powers and Roots
3.1 Theory of Linear Equations
3.2 Reduction of Order
3.3 Homogeneous Linear Equations with Constant Coefficients
3.4 Undetermined Coefficients
3.5 Variation of Parameters
3.6 Cauchy-Euler Equation
3.8 Linear Models: Initial-Value Problems
3.12 Solving Systems of Linear Equations
5.1 Series Solutions about Ordinary Points
6.1 Numerical Solutions: Euler Methods
8.8 The Eigenvalue Problem
10.1 Systems of DEs: Preliminary Theory
10.2 Homogeneous Linear Systems
10.3 Solution by Diagonalization
10.4 Nonhomogeneous Linear Systems

Assignments

Assignment 1
Section 1.1 exercises : 1,2,3,5,6,8,10,11,13,14,21,23,24. Section 1.2 exercises : 7,9,11,12,17,18. Section 1.3 exercises : 10, 13.
Assignment 2
Section 2.1 exercises : 3, 4, 26, 27. Section 2.2 exercises : 23, 25, 26. Section 2.3 exercises : 19, 22, 23.
Assignment 3
Section 2.4 exercises : 1, 8, 16, 17, 19, 22, 23. Section 2.5 exercices: 1, 8, 16, 17, 19, 22, 23.
Assignment 4
Section 2.7 exercises : 13, 33, 34. Section 2.8 exercises : 13, 20.
Assignment 5
Section 3.1 exercises : 1, 23, 31, 34. Section 3.2 exercises: 1, 2, 4, 17.
Assignment 6
Section 3.3 exercises : 1, 2, 4, 29, 31, 34, 38, 41.

Assignment 7
Section 3.4 exercises: 1, 2, 29, 31.Section 3.5 exercises: 1, 4, 22. Section 3.6 exercises: 1, 2, 4, 5.
Assignment 8
Section 3.8 exercises: 11, 32, 46. Section 3.12 exercises: 1, 11, 13.
Assignment 9
Section 5.1 exercises: 17, 18, 20, 27. Section 6.1 exercices: 1, 2.
Assignment 10
Section 10.1 exercises: 5, 16, 25. Section 10.2 exercises: 2, 13, 21, 35.
Assignment 11
Section 10.3 exercises: 2, 4. Section 10.4 exercise: 5.

In addition to the above regular assignments, two **team assignments** will be given. The statements of the team assignments will be distributed later.

Graduate Attributes in ENGR 213

All courses in the Faculty of Engineering and Computer Science, in addition to the traditional delivery of the material, address the development of Graduate Attributes. The following attributes are relevant to this course.

1. Problem Analysis which involves topics such as problem identification, modelling, analysis and evaluation, and solution.
2. Life-long Learning which is concerned with the ability to learn independently.
3. Individual and team work which addresses working effectively as a member and leader in teams.

Item 1 is met partially through the application problems involving ODEs discussed in the textbook and in the supplementary notes to be provided by the instructor. For item 2, Sections 2.1, 2.8 and 6.1 of the textbook are assigned for *self-study* by students. There will be questions in the assignments, and possibly in the exams, based on these sections. Item 3 will be met through two *team assignments* (in addition to the eleven previously-mentioned regular assignments).

Students are responsible for topics covered in assignments that have not been presented in either the regular lectures or the tutorials.