

CONCORDIA UNIVERSITY
FACULTY OF ENGINEERING AND COMPUTER SCIENCE
ENGR 213: APPLIED ORDINARY DIFFERENTIAL EQUATIONS

SUMMER 2007

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Office hours: Tuesdays and Thursdays 14:30 pm - 15.30 pm

Course Objectives: This course introduces first year engineering students to the theory and application of *Ordinary Differential Equations* (ODEs).

Contents to be Covered in the Course: 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, Preliminary 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, Preliminary Theory, Homogeneous Linear Systems, Solution by Diagonalisation, Non-Homogeneous Linear Systems.

NOTE: *Students who have received credit for EMAT 212 or 213 may not take this course for credit. (Prerequisite: MATH 204 (Cegep Mathematics 105) previously or concurrently; MATH 205 (Cegep Mathematics 203)).*

Lectures: Tuesdays and Thursdays, *Time:* 11:00-13:30; *Location:* SGW H-620

Tutorials: Tuesdays and Thursdays, *Time:* 08:45-10:25; *Location:* SGW H-620

Textbook: D. G. Zill and M. R. Cullen, *Advanced Engineering Mathematics*, 3rd Edition, Jones & Bartlett Pub, 2006 (ISBN-10: 076374591X; ISBN-13: 978-0763745912).

Grading Scheme:

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|-----------------|--------------------------------|
| • Midterm exams | 10% each (during the tutorial) |
| • Assignments | 10% |
| • Final exam | 70% |

If the grade of the final exam is better than the combined mark of the two mid-term examinations then it will carry 90% of the final grade. If the student misses a mid-term test for any reason, including illness, then the final examination will count for 90% of the final grade.

Students are responsible for finding out the date and time of the final exam once the schedule is posted by the Examination Office. 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

Tentative Lecture Topics:

1. Definitions and Terminology & Initial-Value Problem (Sections 1.1-1.2)
2. Differential Equations as Mathematical Models & Solution Curves without a Solution (Sections 1.3 - Section 2.1)
3. Separable Variables & Linear Equations & Exact Equations (Sections 2.2-2.4)
4. Solutions by Substitutions & A Numerical Solution (Sections 2.5-2.6)
5. Linear Models & Nonlinear Models & Systems: Linear and Nonlinear Models (Sections 2.7-2.8)
6. Preliminary Theory: Linear Equations (Sections 3.1)
7. Reduction of Order & Homogeneous Linear Equations with Constant Coefficients (Sections 3.2-3.3)
8. Undetermined Coefficients & Variation of Parameters & Cauchy-Euler Equations & Nonlinear Equations (Sections 3.4-3.7)
9. Linear Models & Solving Systems of Linear Equations (Sections 3.8 & 3.11)
10. Power Series Solutions of Linear Differential Equations (Section 5.1)
11. Numerical Solutions using Euler Methods (Section 6.1)
12. Homogeneous Linear Systems & Solution by Diagonalization (Sections 10.1-10.3)
13. Nonhomogeneous Linear Systems (Sections 10.4-10.5)

Assignments:

Assignment 1	Section 1.1: exercises 1,2,4, 5,7,8,10,11,13,14,19,20. (2 nd edition) Section 1.1: exercises 1,2,10,3,5,6,8, 11,13,14,23,24. (3 rd edition)
Assignment 2	Section 1.2: exercises 4,5,7, 8,13,14. Section 1.3 exercises: 10,11. (2 nd edition) Section 1.2: exercises 7,9,11,12,17,18. Section 1.3 exercises: 10,13. (3 rd edition)
Assignment 3	Section 2.1: exercises: 2,4,17,20,22,23. Section 2.2: exercises: 1,2,4,5,7,8,23,25,26. (2 nd edition) Section 2.1: exercises: 3,4,21,24,26,27. Section 2.2: exercises: 1,2,4,5,7,8,23,25,26. (3 rd edition)
Assignment 4	Section 2.3: exercises: 1,2,4,5,7,8,16,17,19,22,23. (2 nd edition) Section 2.3: exercises: 1,2,4,5,7,8,16,17,19,22,23. (3 rd edition)
Assignment 5	Section 2.4: exercises: 1,2,4,5,7,8,16,17,19,22,23. (2 nd edition) Section 2.4: exercises: 1,2,4,5,7,8,16,17,19,22,23. (3 rd edition)
Assignment 6	Section 2.5: exercises: 1,2,4,5,7,8,16,17,19,22,23. (2 nd edition) Section 2.5: exercises: 1,2,4,5,7,8,16,17,19,22,23. (3 rd edition)
Assignment 7	Section 2.7: exercises 13, 19. Section 2.8: exercises 13, 14, 23. (2 nd edition) Section 2.7: exercises 13, 19. Section 2.8: exercises 13, 14, 20. (3 rd edition)
Assignment 8	Section 3.1 exercises: 1,2,4,17,19,20,22,23,35,38. Section 3.2 exercises: 1, 2,4,17. (2 nd edition) Section 3.1 exercises: 1,2,4,17,19,20,22,23,31,34. Section 3.2 exercises: 1, 2,4,17. (3 rd edition)
Assignment 9	Section 3.3 exercises: 1,2,4,5,7,8,29,31,34,40,41. (2 nd edition) Section 3.3 exercises: 1,2,4,5,7,8,29,31,34,38,41. (3 rd edition)
Assignment 10	Section 3.4 exercises: 1, 2, 4,5,7,8,29,31,34. Section 3.5 exercises: 1,2,4,5,7,8,19,22 Section 3.6 exercises: 1,2,4,5. (2 nd edition) Section 3.4 exercises: 1, 2, 4,5,7,8,29,31,34. Section 3.5 exercises: 1,2,4,5,7,8,19,22 Section 3.6 exercises: 1,2,4,5. (3 rd edition)
Assignment 11	Section 3.8 exercises: 1,2,11,13,16. Section 3.11 exercises: 1,2,11,13,16. (2 nd edition) Section 3.8 exercises: 1,2,11,13,16. Section 3.11 exercises: 1,2,11,13,16. (3 rd edition)
Assignment 12	Section 5.1 exercises: 13,14,18,23. Section 6.1 exercises: 1,2. (2 nd edition) Section 5.1 exercises: 17,18,20,27. Section 6.1 exercises: 1,2 (3 rd edition)

Good Luck !

Instructor: Youmin Zhang