CONCORDIA UNIVERSITY
FACULTY OF ENGINEERING AND COMPUTER SCIENCE
APPLIED ORDINARY DIFFERENTIAL EQUATIONS - ENGR 233 (Winter 2018)

Instructor:
Office:
Email:
Lectures:
Location:
Office hours:

Course coordinator: Rama Bhat
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Course Description: This course introduces first year engineering students to multivariable calculus and its applications to mathematical models.

The main topics include: Vector functions; Functions of several variables; Differential vector calculus; Integral calculus for vectors; Double and triple integrals; Line and surface integrals; Stokes' Theorem; Divergence Theorem; Applications in engineering including fluid dynamics and electrostatics.

Lectures: three hours per week. Tutorial: two hours per week.

Prerequisite: MATH 204 (cégep Mathematics 105) previously or concurrently; MATH 205 (cégep Mathematics 203)).

Textbook: Advanced Engineering Mathematics, by Dennis G. Zill and Warren S. Wright, 5th Edition, Published by Jones and Bartlett, 2014.

Grading Scheme:

Midterm exams (2)	20%, (10% each, during tutorials, 90 min, 5 problems)
Assignments (WeBWorK)	10%
Pop-up Quizzes (5)	10% (2% each, during lectures or tutorials, 20 min, 1-2 problems)
Final exam	60% (3 hours, 10 problems)
Team projects (2)	5% (2.5% each, 1 hour; during tutorials in teams of 2)

WeBWorK: Every student will be given access to an online system called WeBWorK. Students are expected to submit assignments online using WeBWorK. Late assignments will not be accepted. Assignments contribute 10% to your final grade. Working regularly on the assignments is essential for success in this course. Students are also strongly encouraged to do as many problems as their time permits from the chapters of the textbooks listed below in this outline.

The grading scheme implies 5% bonus.

YOU MUST PASS THE FINAL EXAM (50% or better) TO PASS THE COURSE

If the student misses one mid-term test for any reason, including illness, then the final examination will count for 70% of the final grade. Since there is a 5% team projects bonus allocation, there will be no replacements of quizzes for any reason, including illness. 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.

PLEASE NOTE: Electronic communication devices (including cellphones) will not be allowed in examination rooms. Only "Faculty Approved Calculators" will be allowed in examination rooms [SHARP EL-531 or CASIO FX-300MS]

Topics and recommended problems:

Week 1: Review of the following topics:
- 7.1 Vectors in 2-space; problems: 1,21,30,41,50
- 7.2 Vectors in 3-space; 11,24,32,34,52
- 7.3 Dot product: 12,15,23,29,31, 41,48
- 7.4 Cross product: 3,13,22,28,41,42,45,49,52
- 7.5 Lines and planes in space: 5,12,17,24,33,36,39,49,57,61,66,75

Week 2: 9.1 Vector functions: 1,4,10,18,25,34,3639,42,45
- 9.2 Motion on a curve: 4,9,11,13,14,19,22,27,28,29
- 9.3 Curvature. Components of Acceleration: 1,6,9,16,17,20,23

Week 3: 9.4 Partial derivatives: 2,3,6,9,15,21,24,26,27,36,39,42,48,49,51,55,56,57
- 9.5 Directional derivative: 3,6,12,14,15,18,24,27,28,33,41,43

Week 4 9.6 Tangent planes and normal lines: 3,4,14,15,25,34,39
- 9.7 Curl and Divergence: 7,11,15,21,24,27,30,39,40,43,44
- 9.8 Line integrals (beginning): 3,6,9,15,21,25,

Week 5: 9.8 Line integrals (end) 27,28,30,33,36,40
- 9.9 Independence of path 3,6,15,18,21,24,26,27,28,30

Week 6: **Midterm 1** (during tutorials) **on material of Weeks 1-4**
- 9.10 Double integrals: 3,5,9,15,18,21,24,27,33,36,39,42,45,52,62,65,68

Week 7: 9.11 Double integral in polar coordinates: 3,6,11,12,19,24,27,29,30,33,34
- 9.12 Green's theorem: 3,4,6,8,12,18,19,23,24,25,27,33

Week 8: 9.13 Surface Integrals: 2,4,6,8,10,11,15,17,18,24,28, 29,32,33,36,37,39

Week 9: 9.14 Stokes theorem: 3,4,6,9,10,12,13,14,18

Week 10: 9.14 Triple Integrals: 3,6,9,13,14,15,21,23,24,27,32,34,45,48,51,54,57,68,69,72,75,76,78,81

Week 11: **Midterm 2** (tutorials) **on material of Weeks 5-9**
- 9.16 Divergence theorem: 2,3,6,9,11,12,13,15,17,21,22

Week 12: 9.17 Change of variables in multiple integral: 3,5,7,8,9,10,13,15,17,22,23,25,27

Week 13: 9 chapter in review: 1-20,24,26,29,30,32,36,38,43,46,50,51,53,54,56,57,58,60,63,65

GRADUATE ATTRIBUTES
ENGR233 emphasizes and develops the CEAB (Canadian Engineering Accreditation Board) graduate attributes and indicators:

COURSE LEARNING Outcomes (CLOs)
Upon successful completion of ENGR233, the students will be able to:

- Apply multivariable calculus to engineering problems. Extract all the pertinent information *vis-à-vis* the physics and practicality of the problem. This component is examined through an applied problem in the final exam.
- Learn how to work within a team. This is done through one or two Team Projects.
- Acquire new knowledge by self-study. This is accomplished by making students responsible for certain material on assignments and exams, without that material being lectured on.

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

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.