CONCORDIA UNIVERSITY
FACULTY OF ENGINEEING AND COMPUTER SCIENCE
ENGR 233: Applied Advanced Calculus - Fall 2016

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Office hours: Tuesday and Thursday, 11-12

Course objectives: To ensure that students acquire the mathematical knowledge and skills needed in their engineering courses and to provide a basis for the more advanced techniques which are needed in subsequent years of their study program. Over the course span, students should master the necessary knowledge and skills to be able to solve mathematical problems at an appropriate level in: Vectors and vector functions; Functions of several variables; Parametric representation of curves and surfaces; 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, heat conduction, waves,…

Graduate Attributes:

1. Knowledge base for engineering
2. Problem Analysis (Problem identification, Modeling, Problem solving)
3. Life-long Learning

Course Learning Outcomes (CLOs)

1- Apply vector calculus to solve several variables functions.
2- Solve multiple dimension integrals.
3- Acquires the necessary skills for the need of the program they are in.
1. Understand and use Stokes, Divergence and Green Theorem.
2. Learn how to relate the concept to actual application and how to go beyond the subject of the course.

At the end of this course, the student will be able to:

- Define and explain the concepts listed above
- Apply rules and techniques to solve problems
- Identify, formulate engineering problems into mathematical forms and solve them.

Textbook: ***Advanced Engineering Mathematics:*** D G Zill & W S Wright, Jones and Bartlett, 5th ed.

Evaluation	***Description***	***Weight***
Assignments	Assignments are posted on the course web site. However you do not hand in the solutions and they are not graded. The midterm test and final exam are based on the assignments and lectures.	**0 %**
Workshops/ Bonus quiz	To be held **during tutorial sessions**. Bonus quizzes may pop-up during the regular class time slots.	**15%**
Midterm Test	Thursday **November 3, 2016 @ 8:30 PM** (Location TBA during class). A term test missed for any reason, including illness, cannot be made up. If you miss the midterm test, the final exam will count for 85%.	**25%**
Final Exam	Date TBD. Additional information below. If the grade of final is greater than the grade of midterm, the final will be worth 75% and midterm 10%	**60%**

Course outline

W	*Theme*	*Ref.*	*Assignment Problems**
1	**7-1** Vectors in 2-Space **7-2** Vectors in 3-Space **7-3** Dot product	311-316 316-320 321-327	**7-1**: 21,30,50 **7-2**: 24,27,29,43 **7-3**: 12,21,39,45,46,48
2	**7-4** Cross product **7-5** Lines and Planes in 3-Space	327-333 331-340	**7-4**: 3,13,45,48,51 **7-5**: 3,21,27,31,39,47,51,59,63
3	**9-1** Vector functions **9-2** Motion of a curve **9-3** Curvature. Components of Acceleration	465-470 471-476 476-481	**9-1**: 4,5,1,24,25,27,29,33,39, 41,42,45 **9-2**: 3,9,13,18 **9-3**: 9,10,17,18,21,22,24
4	**9-4** Partial Derivatives **9-5** Directional Derivative **9-6** Tangent Planes and Normal Lines	481-486 486-492 492-495	**9-4**: 3,6,9,15,21,24,27,33,34, 36,39,42,48,49,51,55 **9-5**: 3,6,12,15,18,24,27,33,41,43 **9-6**: 3,14,15,37,39
5	**9-7** Divergence and Curl **9-8** Line Integrals (to be continued)	495-500 501-509	**9-7**: 9,15,21,27,30,37,40 **9-8**: 3,6,9,15,21,27,30,33,36,40
6	**9-8** Line Integrals (end) **9-9** Independence of Path	501-509 509-519	**9-8**: 3,6,9,15,21,27,30,33,36,40 **9-9**: 3,6,15,18,21,24,27
7	**9-10** Double Integrals	519-526	**9-10:** 9,15,21,27,33,36,39,42,62
	Term Test (Thursday Oct. 20, 2016@8:30pm)		**Sections 7-1 through 9-9 (included)**
8	**9-11** Polar Coordinates **9-12** Green's Theorem	527-531 531-537	**9-11**: 3,6,12,24,27,30,33 **9-12**: 3,6,9,12,18,19,24,25,27
9	**9-13** Surface Integrals **9-14** Stokes' Theorem	537-543 544-549	**9-13**: 3,6,15,18,30,33,36,37 **9-14**: 3,6,9,12,13,18
10	**9-15** Triple Integrals del operator in cylindrical and spherical coord	549-559	**9-15**: 6,15,21,24,27,34,45,48, 51,54,57,69,72,75,78,81
11	**9-16** Divergence Theorem	559-565	**9-16**: 3,6,9,12,15,17,18,22
12	**9-17** Change of Variables in Multiple Integrals	565-573	**9-17**: 3,5,7,9,13,23,27
13	Miscellaneous & Review		

**Some of the assignment problems will be discussed and reviewed in each tutorial. One of the assignment problems will appear in the quiz in each tutorial.*

Lectures, Section Q: Tuesday and Thursday; 13:15-14:30 in FG C080.

Tutorials: Sub-section QA: Monday 10:45--12:25, MB 5.275;
Sub-section QB: Monday 10:45--12:25, H521.

NB: Final exam: 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, not to your instructor.

NB: NO BOOKS are allowed in quizzes, midterm test and final exam. LEGAL calculators are permitted. A formula sheet will be provided during the midterm test and final exam.

Class Attendance: Students are expected to attend all classes and tutorials and are responsible for any missed work. **Up to a 5% bonus points (to supplement tutorial workshop marks to bring them to the maximum 15%) will be awarded to all students who submit their pop-up quizzes during regular classes.**

Important remarks, please, read carefully:

1. Your principal task in the course is to learn to solve the assigned problems. Solving the assigned problems is vital to learning the course material. The quizzes, class test and final exam are based on the assigned problems (tutorials, assignments, in-class examples, etc.).

2. You are training to be a professional engineer. Consequently, we expect you to behave like a professional. A professional engineer is polite, considerate and respectful of others. It is rude, inconsiderate, and disrespectful to your fellow students and to the professor to talk in class. No one can learn if you are chatting to your neighbor!

3. Cell Phones are not allowed in the class room. You lose attendance points if you use a cellphone.

4. Computers are allowed if you use them for course materials. No surfing on the web, please.

5. All Concordia University students must abide by the University's Academic Code of Conduct (Concordia University Undergraduate Calendar Section 16.3.13). Any suspected violation of the Code will be turned over to a University Committee for investigation. No cheating in any way is tolerated. Penalties can be as severe as dismissal from the University.

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

7. An incident report shall be filed for homework or lab reports containing "plagiarism".
- All students must read and be familiar with 'Academic Integrity', 'Code of Conduct', and 'What is Plagiarism?' These subjects can be found on the Concordia web-page at:
http://www.concordia.ca/students/academic-integrity.html
- Additional information can be found in Section 17.10 on pages 56-62 of the 2014-2015 Undergraduate Calendar.

GRADUATE ATTRIBUTES

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

ATTRIBUTE	INDICATOR	LEVEL OF KNOWLEDGE
A knowledge base for engineering *Demonstrated competence in university-level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.*	Knowledge-base of specific engineering field	INTRODUCTORY
Problem analysis An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.	Problem identification and formulation	INTRODUCTORY
	Modelling	INTERMEDIATE
	Problem solving	INTERMEDIATE
Life-Long learning An ability to identify and to address their own educational needs in in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge	Continuous improvement and self-learning	INTRODUCTORY

Course Learning Outcomes (CLOs)

Apply vector calculus to solve several variables functions	**A knowledge base for engineering**/ Knowledge-base of applied calculus **Problem analysis**/ Problem identification and formulation.
Solve multiple dimension integrals	**A knowledge base for engineering**/ Knowledge-base of applied calculus. **Problem analysis**/ Problem solving
Acquire the necessary skills for the need of the program they are in.	**Problem analysis**/ Problem solving
Understand and use Stokes, Divergence and Green Theorem.	**A knowledge base for engineering**/ Knowledge-base of applied calculus **Problem analysis**/ Problem identification, formulation and solving.
Understand and use the concept of vector space	**A knowledge base for engineering**/ Knowledge-base of applied calculus **Problem analysis**/ Problem identification and formulation.
Evaluate differentiation and integration of vector functions.	**A knowledge base for engineering**/ Knowledge-base of applied calculus. **Problem analysis**/ Problem solving