CONCORDIA UNIVERSITY
FACULTY OF ENGINEEING AND COMPUTER SCIENCE
ENGR 233:   Applied Advanced Calculus - Winter 2017

Instructor:
Contact Info:
Office Hours:
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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,…

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 tests 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 Tests	**Midterm test#1 Sunday February 5th from 2:00 PM to 3:15PM** **Midterm test#2 Sunday March 12th from 2:00 PM to 3:15PM**	**15%** **15%**
Final Exam	Date TBD. Additional information below	**55%**

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: <u>NO CALCULATOR, NO BOOKS are allowed in Midterm tests and final exam</u>.
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.**

Course outline

Wk	Theme	Reference	Exercise Assignment Problems based on 4th ed*
1	**7-1** Vectors in 2-Space **7-2** Vectors in 3-Space **7-3** Dot product	297-302 307-306 307-311	**7-1**: 21,30,50,31 **7-2**: 24,27,29,43,47 **7-3**: 12,15,17,21,31,39,41,45,46,48
2	**7-4** Cross product **7-5** Lines and Planes in 3-Space	313-318 320-325	**7-4**: 3,13,41,44,45,47,48,51,52 **7-5**: 3,21,27,31,34,39,47,51,59,63
3	**9-1** Vector functions **9-2** Motion of a curve **9-3** Curvature. Components of Acceleration	440-445 446-448 450-454	**9-1**: 1,4,5,8,24,25,26,27,29,33,35, 38,39,41,42,45 **9-2**: 3,5,9,11,13,14,18,19 **9-3**: 9,10,12,17,18,21,22,23,24
4	**9-4** Partial Derivatives **9-5** Directional Derivative **9-6** Tangent Planes and Normal Lines	454-459 460-464 466-459	**9-4**: 2,3,6,9,15,21,24,26,27,33,34, 36,39,42,48,49,51,55 **9-5**: 3,6,12,14,15,18,24,27,28,33,41,43 **9-6**: 3,4,14,15,37,39,40
	TermTest#1 Sunday Feb5th from 2:00 to 3:15 PM		**Sections 7-1 through 9.6**
5	**9-7** Divergence and Curl **9-8** Line Integrals (to be continued)	469-473 475-482	**9-7**: 7,9,11,13,15,21,24,27,30,32,37,40 **9-8**: 3,4,6,9,15,16,21,27,28,30,33,36,40
6	**9-8** Line Integrals (end) **9-9** Independence of Path	475-482 483-492	**9-8**: 3,6,9,15,21,27,30,33,36,40 **9-9**: 3,6,15,18,21,24,26,27
7	**9-10** Double Integrals	493-499	**9-10**: 5,9,15,18,21,24,27,33,36,39,42,45 62,65
8	**9-11** Polar Coordinates **9-12** Green's Theorem	501-505 505-509	**9-11**: 3,6,11,12,24,27,29,30,33 **9-12**: 3,4,6,8,9,12,18,19,23,24,25,27
	TermTest#2 Sunday March12thfrom 2:00 to 3:15 PM		**Sections 9.7through 9-9-12**
9	**9-13** Surface Integrals **9-14** Stokes' Theorem	511-516 518-522	**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	523-531	**9-15**: 3,6,9,15,21,23,24,27,32,34,45,48, 51,54,57,69,72,75,78,81
11	**9-16** Divergence Theorem	533-538	**9-16**: 3,6,9,12,15,17,18,22
12	**9-17** Change of Variables in Multiple Integrals	539-545	**9-17**: 3,5,7,8,9,10,13,15,17,23,25,27
13	Miscellaneous & Review		**9**: 51,53,56,57,58

*Some of assignments will be discussed and reviewed in each tutorial.

Notes:

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**.

GRADING SCHEMES:
Scheme A

Tutorial workshop	15%
Midterm Test 1	15%
Midterm Test 2	15%
Final examination	55%
Total	100%

Scheme B

Tutorial workshop	15%
Best of Midterms	15%
Final examination	70%
Total	100%

The better of the two schemes will be used in awarding the final letter grade in the course. *If a midterm test is missed because of any reason, Scheme B will automatically apply*. No alternate, supplemental or make-up test will be given. During the midterm test and the final examination, only one of the two ENCS-approved calculators, **CASIO FX-300MS or SHARP EL-531**, will be allowed. No other material will be allowed inside the examination hall.

TUTORIAL WORSHOPS:
➢ Tutorial classes will commence the week of Monday **January 9** Each tutorial section will be run by a tutor.
➢ In each tutorial "workshop" you will be given a set of problems to solve.
➢ You will solve the set of problems during the tutorial class and hand in your answer at the end of the tutorial. No late submission will be accepted.
➢ Students can ask the tutor for help in solving the problems.
➢ Each workshop tutorial will be graded out of 10.
➢ Your mark will be calculated by taking the best 10 of the grades of the tutorial workshop that you earn for the problems.
➢ **The tutorial workshop problems** are intended to **get you started** doing problems on each topic of the course; so that you can go on to do the homework exercise assignments. The tutorial problems by themselves do not prepare you sufficiently for the final exam. **You must do the homework exercise assignments.**

EXERCISE ASSIGNMENTS:
➢ There will be a total of **10 to 11** assignments.
➢ Engineering is learn-by-doing! You will learn the course material by doing the exercise assignments week-by-week throughout the term. Go to the tutorial and do the tutorial problems to get started with analyzing and solving problems. Then, do the assigned homework problems each week, and check your answers against the solutions posted the following week.
➢ The solutions to each exercise assignment will be posted on your course Moodle (My Concordia) the week after it is specified in the Corse Outline.

- Exercise assignments are not to be handed in or graded. Check the correctness of your worked out assigned problems by comparing them with the exercise assignment solutions posted on the course Moodle.
- You cannot learn the course material by reading the solutions to the exercise assignments. Even if you think that you understand the solutions, you will be unable to answer the final exam questions.

CEAB Graduate Attributes

Graduate 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 for 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 Modelling Problem solving	INTRODUCTORY NTERMEDIATE NTERMEDIATE
Life-long learning *An ability to identify and to address their own educational needs 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