GINA CODY SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

ENGR 233

APPLIED ADVANCED CALCULUS

GINA CODY SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Winter 2024[1][2]

Section XX: Lectures: Room:
Professor:
Office: Tel: E-mail:
Office Hours:

Course coordinator: Professor Ali Nazemi (ali.nazemi@concordia.ca)
Office: EV 6.164.

Tutorials:

Section	Day/time	Location

Tutors and Markers Info

Name	Role/section	Contact information

WeBWorK: Within the first two weeks of semester, students will be given access to an online system called WeBWorK to work on assignments and submit them online. Late submissions will not be accepted. Students are also strongly encouraged to do as many problems as their time permits from the chapters of the textbooks – see below recommended examples only as starting points.

- Any questions related to WeBWorK assignments should be directed to WeBWorK administrator, Mr. Masood Shamsaiee; email: webwork.engr@concordia.ca;
- **Students are also responsible for topics covered in assignments that have not be presented in either the regular lectures or during tutorials.** Acquiring self-study skills should be one of the Course Learning Outcomes for ENGR233 – see below.

WeBWorK administrator: Masood Shamsaiee (webwork.engr@concordia.ca)

Course Calendar Description:
This course introduces first year engineering students to multivariable calculus and its applications to mathematical modeling within engineering disciplines. The main topics include (1) Vector functions; (2) Functions of several variables; (3) Differential vector calculus; (4) Integral calculus for vectors; (5) Double and triple integrals; (6) Line and surface integrals; (7) Green's Theorem; (8) Stokes' Theorem; (9) Divergence Theorem; (10) Applications in applied science and engineering.

Prerequisites: MATH 204 and 205 previously or concurrently (cégep Mathematics 105 and 203).

[1] This course outline has FIVE pages, with critical and equally important information with regard to the content, schedule, evaluation, and codes of conduct of this course. READ EVERY SECTION (VERY) CAREFULLY.
[2] Changes to the information in the course outline, if any, will be announced through Moodle and will override the course outline information accordingly.

Specific Knowledge and Skills Needed for this Course:

Students taking this course are expected to have sufficient knowledge of the following topics. Should you have difficulties in any of these topics, you are strongly encouraged to review them before the DNE deadline.

Calculus; Ordinary functional differentiation and integration.

Course materials

Required Textbook: Advanced Engineering Mathematics, by Dennis G. Zill and Warren S. Wright, 7th Edition[3], Published by Jones and Bartlett.

All lecture materials related to this course except the textbook (e.g. lecture notes; along with live recording and/or pre-recorded lectures etc., if applicable) will be uploaded to the course Moodle website. WeBWorK and tutorial materials will not be provided in the course Moodle.

Grading Scheme:

1. Assignments (WeBWorK) 10%
2. Pop-up Quizzes[4] (5) 5% (1% each, during lectures or tutorials, 10-20 min, 1-2 problems)
3. Team projects (2) 5% (2.5% each, in teams of 2; take-home and/or during tutorials)
4. Term tests (2) 20% (10% each, during tutorials, 60 min each)
5. Final exam 60% (3 hours)

Grading rules:

- 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. **Students cannot miss both midterms. In such a case, the students are encouraged to drop the course immediately.**
- There will be no replacements of quizzes, midterms, missed assignments and/or project submission for any reason whatsoever, 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.
- In order to pass the class, both your cumulative score and the final examination must be **above 50%**
- In the event of extraordinary circumstances beyond the University's control, and pursuant to the Academic Regulations, the delivery, content, structure, location and/or evaluation scheme in this course is subject to change. In the event of such extraordinary circumstances, students will be informed of the changes through course Moodle.

Electronic communication devices (including cellphones) **will not be allowed** in examination rooms in both Term Tests and the Final Exam. Only "Faculty Approved Calculators" will be allowed for midterm and final exams [SHARP EL-531 or CASIO FX-300MS].

Schedule, topics and recommended problems:

[3] Please note that 5th and 6th editions have very minimal difference with the 7th section. Some exercises at the end of each sections might have been re-ordered.

[4] These are pop-up quizzes and therefore are unannounced.

Week 1 (Jan. 15)[5]:	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
Week 2 (Jan. 22):	7.5	Lines and planes in space: 5,12,17,24,33,36,39,49,57,61,66,75
	9.1	Vector functions: 1,4,10,18,25,34,3639,42,45
Week 3 (Jan. 29):	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 4 (Feb. 5):	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: 3,6,12,14,15,18,24,27,28,33,41,4344
Week 5 (Feb. 12):	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
Week 6 (Feb. 19):	9.8	Line integrals: 3,6,9,15,21,25,27,28,30,33,36,40
	9.9	Independence of path: 3,6,15,18,21,24,26,27,28,30

Reading week (26 February – 3 March)

Week 7: Midterm 1
during tutorials; 60 minutes on material 7.1-7.5 and 9.1-9.7

Week 7 (March 4):	9.10	Double integrals: 3,5,9,15,18,21,24,27,33,36,39,42,45,52,62,65,68
	9.11	Double integral in polar coordinates: 3,6,11,12,19,24,27,29,30,33,34
Week 8 (March 11):	9.12	Green's theorem: 3,4,6,8,12,18,19,23,24,25,27,33
Week 9 (March 18):	9.13	Surface/flux Integrals: 2,4,6,8,10,11,15,17,18,24,28, 29,32,33,36,37,39

Week 10: Midterm 2 (except Sections R and U)
during tutorials; 60 minutes on material of Sections 9.8- 9.12

Week 10 (March 25)[6]:	9.14	Stokes theorem: 3,4,6,9,10,12,13,14,18
Week 11 (April 1)[7]:	9.15	Triple Integrals:15, 24,27,32,34,45,48,51,54,57,68,69,72, 75,76, 78, 81.
	9.16	Divergence theorem: 2,3,6,9,11,12
Week 12 (April 8):	9.16	Divergence theorem: 13,15,17,21,22
	9.17	Change of variables in multiple integral: 3,5,7,8,9,10,13

Graduate Attributes:

[5] Dates refer to the Monday in each week.
[6] Friday March 29th is a holiday (Good Friday). Make up classes are on April 15th for affected lectures and tutorials.
[7] Monday April 1st is a holiday (Easter Monday). Make up classes are on April 16th for affected lectures and tutorials.

ENGR233 emphasizes and develops the CEAB (Canadian Engineering Accreditation Board) graduate attributes and indicators: Knowledge base for engineering -Problem Analysis (Problem identification, Modeling, Problem solving) -Life-long Learning.

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 and projects.
- 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.

Health and Safety Guidelines

All health and safety rules specific to this course can be found in the lab manual. General health and safety instructions and available health and safety trainings can be found at:
Safety Programs - Concordia University (https://www.concordia.ca/campus-life/safety/general-safety.html)

On Campus Resources

Please visit Student services at Concordia University for the services available Gina Cody School students.

See the addendum on the next page.

ADDENDUM

ACADEMIC/PROFESSIONAL CODE OF CONDUCT

The Undergraduate Engineering program is set to satisfy most of the requirements for your education and prepares you for a professional engineering career that requires dedication and knowledge. What you learn, and how you learn, will be used extensively in your engineering profession for the next 30 to 40 years. Therefore, the four years spent in the engineering program are crucial towards your professional formation. The first step is for you to learn to "think like an engineer" which means:

- Accept responsibility for your own learning.
- Follow up on lecture material and homework.
- Learn *problem-solving skills*, not just how to solve each specific homework problem.
- Build a body of knowledge integrated throughout your program.
- Behave professionally, ethically and responsibly.

One of the mainstays of being a professional engineer is a professional code of conduct and as an engineering student this starts with the Academic Code of Conduct (Article 16.3.14 of the undergraduate calendar). However, you may encounter situations that fall outside the norm and in such cases, you use your common sense. Further, the following issues should be given serious consideration:

- Attendance at lectures and tutorials are major learning opportunities and must not be missed. Class and tutorial attendance is important for you to comprehend the discipline and make the connections between engineering skills. You are strongly encouraged to participate in the class, ask questions and answer the instructor's questions. Tutorials are just extensions of the classes in which application of the concepts presented during the lectures are presented and problems are practically solved.
- One key objective of midterms is to check on your comprehension of the material and allow time for whatever action is necessary (from more study time to discontinuing a course). Plan to attend the class tests. If you pay attention in the lectures, it will take you significantly shorter time to comprehend the material. **Note also** that if you are unable to write a final exam due to medical reasons and seek a deferral, this may not be possible if the instructor has no information indicating that you have been attending the course and assimilating the material (i.e. through midterms, quizzes, assignments etc.).
- Homework is mandatory and it has some weight in the final grade (see information above). Homework may also be conceived as training material for the class tests. Under all circumstances, it is highly recommended to carry out the homework on time and submit it on the prescribed date. Late submissions will not be accepted (see the related information above). This is part of the training for being in the workforce where deadlines have to be met. Plan your work to submit all the assignments on time and in the correct form.
- Office hours with class instructors are listed in the course outline. Please respect these office hours and in case you have a serious conflict, contact the instructor asking for a special time arrangement.
- Exams are not returned to the student. If you wish to discuss your exam, be aware that most instructors allow only a narrow window of time for that purpose.
- When you see your marked work (assignments, midterms, final exam etc), be aware that you are supposed to review your material and see the type of errors you made and if marks have been added incorrectly. This is not an opportunity to try and "negotiate" a higher grade with the instructor. If you believe that your grade is not right, you may apply for a formal Course Re-evaluation through the Birks Student Centre.
- Writing tests and exams represents a major component of your course work. These tests and exams have rigorous requirements that are communicated in the UG Calendar. These requirements are there to eliminate any possible misunderstanding. Disciplinary measures are taken when the rules are not followed.
- Respect your colleagues and those that you meet during the class: tutors, instructors, lab instructors, technical personnel, assistants, etc. Use appropriate communication means and language. Be considerate for all human beings. Concordia University is a very diverse group of people and a very large multicultural community.
- Communication is part of your future profession. Learn how to communicate effectively and efficiently in the shortest time possible. Write short but meaningful e-mails, make effective phone calls, etc. If your instructor accepts emails, make sure that your request is clear with the course number and your name in the *Subject* line. Do not ask for special treatment as instructors have to treat all students equitably.