ENGG*1500 Engineering Analysis - DRAFT

Winter 2019
Section(s): C01,C02

School of Engineering
Credit Weight: 0.50
Version 1.00 - July 02, 2019

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1 Course Details

1.1 Calendar Description

This course deals with engineering applications of matrix algebra, vector spaces and computer techniques to solve linear systems. Topics include linear transformations, eigenvalues and eigenvectors, diagonalization and their applications. Additional topics include complex variable algebra, multi-variable functions, partial derivatives, maxima and minima.

Pre-Requisites: MATH*1200
Restrictions: MATH*2150

1.2 Course Description

This is an introductory course in linear algebra. Linear algebra is one of the most important subjects that you will study in Engineering, as it is used in many courses and design projects. The main goal of the course is to give you a solid foundation in the elementary concepts of linear algebra and to give you exposure to real problems that you will use throughout your engineering career.

1.3 Timetable

Lectures: Tuesday and Thursday

0201-0208: 10:00AM - 11:20AM, RICH, Room 2520

0101-0108: 05:30PM - 06:50PM, RICH, Room 2520

Labs and Tutorials:

101, 102, 201, 202 Tuesday 2:30 - 4:30 THRN 1319
103, 104, 203, 204 Friday 2:30 - 4:30 THRN 1319
105, 106, 205, 206 Thursday 12:30 - 2:20 THRN 1319
107, 108, 207, 208 Friday 8:30 - 10:20 THRN 1319

Midterm: Time : 10:00 AM to 11:10 AM, March 2, Saturday; Room TBA

Midterm exam will be closed-book but a formula sheet will be provided. The time and location of midterm are subject to change. Please see Couselink for the latest information.

Midterm make-up: 5:30 PM to 6:40 PM, March 6, Wednesday; Room TBA

Midterm make-up exam will be closed-book but a formula sheet will be provided. The time and location of midterm make-up exam are subject to change. Please see Couselink for the latest information.

1.4 Final Exam

FINAL EXAM, 2019/04/11, Thursday,

02:30PM - 04:30PM

Room TBA

Final exam will be closed-book but a formula sheet will be provided. Final exam time and location is subject to change. Please see Webadviser for the latest information.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Sheng Chang Ph.D., P.Eng
Email: schang01@uoguelph.ca
Telephone: +1-519-824-4120 x56619
Office: THRN 23519
Office Hours: Thursday 11:30 AM -12:30 PM, THRN 2519

Instructor: Amin Komeili
Email: akomeili@uoguelph.ca
Telephone: +1-519-824-4120 x54741
Office: RICH 1509
Office Hours: Dr. Komeili: Monday 14:00-15:00 & Wednesday14:00-15:00 in RICH1509

2.2 Teaching Assistants

Maeve Kennedy bkenne04@uoguelph.ca

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Aneela Hayder ahayder@uoguelph.ca

3 Learning Resources

3.1 Required Resources

2.1 Course Website (Website)
https://courselink.uoguelph.ca/
Course material, news, announcements, and grades will be regularly posted to the ENGG*1500 Courselink site. You are responsible for checking the site regularly.

Introduction to Linear Algebra for Science and Engineering 2nd ed. (Textbook)
D. Norman and D. Wolczuk, 1995, Pearson.

3.2 Additional Resources

Lecture Information (Notes)
Lecture Information (Notes): Lecture notes will be posted on Courselink.
Homework questions will be selected from the practice questions of the textbook. Solutions to selected questions will be posted in Courselink. Students are encouraged to post their attempts at solutions to the remaining questions in the discussion forums; GTAs and the instructor will monitor these discussions and will provide support to help students arrive at the correct solutions.
Homework questions are not graded.

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4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Describe and evaluate the properties of vectors and basic vector spaces and
2. Set up, manipulate, and solve systems of linear equations for a variety of engineering applications.
3. Describe and evaluate the properties of matrices including inverse matrices, identity matrices, and transpose matrices.
4. Calculate, comprehend, and apply determinants and their applications
5. Calculate, comprehend, and apply eigenvalues and eigenvectors and their applications
6. Calculate, comprehend, and apply complex numbers and their applications
7. Use Matlab to solve various linear algebra problems.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2, 3, 4, 5, 6, 7
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1, 2, 3, 4, 5, 6
1.2	Recall, describe and apply fundamental principles and concepts in natural science	2, 3
1.3	Recall, describe and apply fundamental engineering principles and concepts	4
1.4	Recall, describe and apply program-specific engineering principles and concepts	6, 7
2	Problem Analysis	1, 2, 3, 4, 7
2.1	Formulate a problem statement in engineering and non-engineering terminology	1, 3, 4
2.2	Identify, organize and justify appropriate information, including assumptions	2, 3
2.4	Execute an engineering solution	2, 4, 7
5	Use of Engineering Tools	2, 7
5.1	Select appropriate engineering tools from various alternatives	2, 7
5.2	Demonstrate proficiency in the application of selected engineering tools	7
7	Communication Skills	7
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	7

5 Teaching and Learning Activities

Tutorials run in alternating weeks, with the even group starting in week 2, and the odd group in week 3.

5.1 Lecture Schedule

The following is a rough guideline for the lecture topics and is subject to change:

- Week 1: Course introduction, Introduction of the matric forms of systems of linear equations (SLEs), vector definition and linear combination, vector dot product.
- Week2: Matrix linear combination, matrices multiplication, solving SLE Row echelon form (REF & RREF).
- Week3: SLE solutions, rank & SLE solutions, solutions of Ax=0, balance chemical equilibrium equations, subspace, vector spanning, columnspace, rowspace, null space.
- Week 4: Linearly dependent and independent, bases and dimensions of Col(A), Row(A), and null(A),
- Week 5: Matrix mapping, sensor aplication, and proof examples
- Week 6: Irrigation application example, coordinates with respect to a basis, midterm review
- Week 7: Norm, projection, and orthonormal vectors, determinant, inverse matrices.
- Week 8: Complex numbers, polar forms of complex numbers, operations on complex numbers
- Week 9: Eigenvalues and eigenvectors, algebraic and geometric multiplicity, system stability application
- Week 10: Markov Processes, Jordan form and Jordan blocks,
- Week 11: Matrix diagonalization, diagonalizable condition, quadratic forms, definiteness
- Week 12: Quadratic forms, definiteness, final exam review

5.2 Other Important Dates

Monday, January 7: Classes commence

Monday, February 18 – Friday, February 22: WINTER BREAK

Friday, March 8: 40th Class Day. Last day to drop winter semester courses.

Friday, April 5: Last day of classes.

Please see the schedule of dates for other important dates in the academic year.
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c03/index.shtml

6 Assessments

6.1 Marking Schemes & Distributions

- Midterm: 25%
- Final: 60%
- Quizzes: 5%
- Tutorial and Lab: 10%

6.2 Assessment Details

Quizzes (5%)
Date: Mon, Jan 14 - Fri, Apr 5
Learning Outcome: 1, 2, 3, 4, 5, 6, 7
Quizzes: Quizzes are held in the first 5-10 minutes of every tutorial. These are tightly timed quizzes designed to help you improve your mental math skills. No extra time will be given to students who arrive late. If you typically write tests with SAS, please contact Dr. Komeili: akomeili@uoguelph.ca to discuss alternate options.

Tutorials and Matlab labs (10%)
Learning Outcome: 1, 2, 3, 4, 5, 6, 7
There are five (5) tutorial/labs. Attendance will be taken at tutorials. Grades are allocated based on a combination of submitted worksheets and in-lab assessment of Matlab code. Please see courselink for guidelines and expectations for each lab. All sections are full, so please attend your assigned tutorial section. A makeup session will be available in the last week of class.

Midterm (25%)
Date: Sat, Mar 2, 10:00 AM - 11:10 AM, TBD
Learning Outcome: 1, 2

Make-up Midterm (25%)
Date: Wed, Mar 6, 5:30 PM - 6:40 PM, SOE 1006
Learning Outcome: 1, 2, 3

Final Exam (60%)
Date: Thu, Apr 11, 2:30 PM - 4:30 PM, TBD
Learning Outcome: 1, 2, 3, 4, 5, 6, 7

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7 Course Statements

7.1 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate

Attributes:

Learning

Graduate Attribute	Objectives	Assessment
1. Knowledge Base	all	all
5. Use of Engineering Tools	7	tutorials
6. Communication	all	tutorials

7.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email Dr. Komeili: akomeili@uoguelph.ca. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email Dr. Komeili: akomeili@uoguelph.ca within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Consideration of Religious Obligations:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Missed midterm: If you miss the midterm exam due to grounds for granting academic consideration or religious accommodation, please contact Dr. Komeili: akomeili@uoguelph.ca. If your documentation is adequate, you will have the opportunity to write a make-up midterm exam (March 6, Wednesday, 5:30 PM to 6:40 PM). If you are unable to attend the make-up exam as well due to grounds for granting academic consideration or religious accommodation, please contact Dr. Komeili: komeili@uoguelph.ca. If your documentation is adequate, the weight of the midterm will be moved to the final exam as there will be no further make-up midterm exam.
No extra time will be given to students who arrive late to any of these assessments.

Missed labs/tutorials: If you miss ONE lab/tutorial, you can attend the tutorial sessions during the makeup week (week of April 2). No documentation is required. If you miss more than one lab/tutorial due to grounds for granting academic consideration or religious accommodation, you must have documentation for ALL missed lab/tutorials. Please

contact Dr. Komeili: akomeili@uoguelph.ca. The weight of the missed lab/tutorials will be placed onto the final exam only if your documentation for grounds for granting academic consideration or religious accommodation is adequate.

8 School of Engineering Statements

8.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

8.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for course registration are available in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

More information can be found on the SAS website
https://www.uoguelph.ca/sas

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have

the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars