UNIVERSITY of GUELPH

ENGG*1500 Engineering Analysis

Summer 2019
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - May 12, 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 theory and applications of linear transformations, eigenvalues and eigenvectors, diagonalization, complex-variable algebra, and multi-variable functions.

Restrictions: MATH*1160, MATH*2150, MATH*2160

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:

Mon, Wed, Fri: 12:30 pm - 1:20 pm, RICH 2529

Labs:

Wednesdays, 7 PM - 8:50 PM, THRN 2313

1.4 Final Exam

Thursday, August 15th, 2019 - 7:00 pm to 9:00 pm. Location will be announced later.

Final exam will be closed-book but a formula sheet will be provided. Final exam time and

location is subject to change. Please see Web-adviser for the latest information.

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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Shelir Ebrahimi Ph.D
Email:	shelir@uoguelph.ca
Telephone:	+1-519-824-4120 x54469
Office:	RICH 1511

2.2 Teaching Assistants

Albert Jiang   zjiang@uoguelph.ca

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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.

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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.
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

5.1 Lecture and Lab Schedule

Lectures:

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

Labs:

Labs run in alternating weeks. There will be a short quiz at the beginning of each lab. Labs schedule is as follow:

Lab 1: May 22

Lab 2: June 5

Lab 3: June 19

Lab 4: July 3

Lab 5: July 17

Lab 6 - Review session: July 31

5.2 Other Important Dates

Thursday, May 9: Classes commence

Monday, May 20: Holiday--NO CLASSES SCHEDULED--classes rescheduled to Thursday, August 1

Wednesday, June 26: Midterm exam, 7:00 pm to 9:00 pm, RICH 2529

Monday, July 1: Holiday--NO CLASSES SCHEDULED--classes rescheduled to Friday, August 2

Friday, July 5: 40th class day--Last day to drop one semester courses

Wednesday, July 31: Last day for regularly scheduled classes

Thursday, August 1: Classes rescheduled from Monday, May 20, Monday schedule in effect

Friday, August 2: Classes rescheduled from Monday, July 1, Monday schedule in effect

Thursday, August 15: Final Exam, 7:00 pm to 9:00 pm. Location will be announced later.

Please see the schedule of dates for other important dates in the academic year.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c03/c03-summersem.shtml

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6 Assessments

6.1 Marking Schemes & Distributions

- Quizzes: 5%
- Labs: 10%
- Midterm: 25%
- Final: 60%

6.2 Assessment Details

Tutorials and Matlab labs (10%)
Learning Outcome: 1, 2, 3, 4, 5, 6, 7
There are five labs plus a lab review. Attendance will be taken at labs. 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.

Lab Schedule:

Lab 1: May 22

Lab 2: June 5

Lab 3: June 19

Lab 4: July 3

Lab 5: July 17

Lab 6 - Review session: July 31

Quizzes (5%)
Date: , During the lab time
Learning Outcome: 1, 2, 3, 4, 5, 6, 7
Quizzes: Quizzes are held in the first 5-10 minutes of every lab (except the review session on July 31). 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 your instructor to discuss alternate options.

Note: Some homework questions will be selected from the practice questions of the textbook so you can practice more on your own. Solutions to selected questions will be posted in Courselink, however, homework questions are not graded.

Quiz Schedule: First 5 - 10 minutes of the following dates, in labs

Lab 1: May 22

Lab 2: June 5

Lab 3: June 19

Lab 4: July 3

Lab 5: July 17

Lab 6 - Review session: July 31

Midterm (25%)
Date: Wed, Jun 26, 7:00 PM - 9:00 PM, RICH 2529
Learning Outcome: 1, 2

Final Exam (60%)
Date: Thu, Aug 15, 7:00 PM - 9:00 PM, TBD
Learning Outcome: 1, 2, 3, 4, 5, 6, 7

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7 Course Statements

7.1 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. 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 the course instructor 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 Accommodation of Religious Obligations:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Missed Midterm Exam: If you miss the midterm due to grounds for granting academic consideration or religious accommodation, the weight of the missed midterm will be added to the final exam. **There will be no makeup midterm tests.**

Labs: Short quizzes are written at the beginning of each lab. Also, your lab activity will be graded based on a combination of submitted worksheets and in-lab assessment of

Matlab code, which both require your presence in the lab. If you miss a lab due to grounds for granting academic consideration or religious accommodation, the weight of the activity will be transferred to the final exam. **There is no make-up lab or quiz.**

Passing Grades: The passing grade of this course is 50% of total mark. However, every student must obtain a grade of 50% or higher in the Final Exam portion of the course in order for the midterm exam, lab, and Quizzes portion of the course to count towards the final grade. If you do not pass the final exam, you will fail the course and the final mark of the course will be the mark obtained on the final exam.

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

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