ENGG*1500 Engineering Analysis
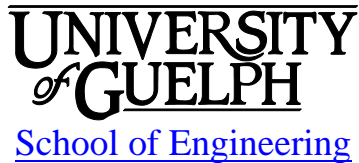# Winter 2016

UNIVERSITY
of GUELPH

School of Engineering

(Revision 0: Jan 11, 2016)

1 INSTRUCTIONAL SUPPORT

1.1 Instructors

Instructors	Soha Eid Moussa, Ph. D., P. Eng	Syeda Tasnim, Ph. D., EIT
Office	THRN 1341, ext. 56141	THRN 2413, ext. 54013
Email	smoussa@uoguelph.ca	stasnim@uoguelph.ca
Office hours	open door policy or by appointment	by appointment

1.2 Lab Technician

N/A

1.3 Teaching Assistants

GTA	Email	Office Hours
Ali Al Hashim	aalhas01@uoguelph.ca	TBA on Courselink
Amro Elhelaly	amro@uoguelph.ca	TBA on Courselink
Shannon Glassford	sglassfo@uoguelph.ca	TBA on Courselink
Mohammadhossein Hajiyan	mhajiyan@uoguelph.ca	TBA on Courselink
Yu Hou	yhou05@ uoguelph.ca	TBA on Courselink
Carolina Klabunde	cklabund@uoguelph.ca	TBA on Courselink
Brittany Reiche	breiche@ uoguelph.ca	TBA on Courselink
Nikhil Sapru	nsapru@uoguelph.ca	TBA on Courselink
Matthew Veres	mveres@ uoguelph.ca	TBA on Courselink

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*1500 Courselink site. You are responsible for checking the site regularly.

2.2 Required Resources

Daniel Norman and Dan Wolczuk, <u>Introduction to Linear Algebra for Science and Engineering</u>, Second Edition, Pearson Canada Inc., 2012.

2.3 Recommended Resources

1. Clickers: clickers will occasionally be used to verify understanding and encourage class participation, please bring your clicker to class regularly

2.4 Additional Resources

Lecture Information: All the lecture notes will be posted on Courselink (week #1-#12).

Lab Information: N/A

Assignments: Download the assignments, all the solutions will be posted.

Miscellaneous Information: Calculators are **not permitted** for use in this course. Other information may also be posted on the web page.

2.5 Communication & Email Policy:

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

3 ASSESSMENT

3.1 Dates and Distribution

Midterm Exam: 50% - *No calculator allowed*
Saturday February 27, 9:00-11:00, Room ROZ 104

Final Exam: 50% - *No calculator allowed*
Friday April 22, 11:30-13:30, Room TBA on Webadvisor

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email 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 at 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, a date will be set for a makeup midterm.

Passing grade: In order to pass the course, you must obtain a grade of 50% or higher in the course.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 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.

Prerequisite(s): MATH*1200 - Calculus

4.2 Course Aims

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.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Describe and evaluate the properties of vectors and basic vector spaces and subspaces.
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. Problem solve with academic integrity, preparing for a professional career with honesty and ethics at the forefront of engineering analysis.

4.4   Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2, 4, 5	Midterm and Final Exam
2. Problem Analysis	-	-
3. Investigation	-	-
4. Design	-	-
5. Use of Engineering Tools	2, 3, 4	Not directly assessed
6. Communication	-	-
7. Individual and Teamwork	3, 4, 5	Not directly assessed
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	-	-
10. Ethics and Equity	6	Not directly assessed
11. Business, & Project Management	-	-
12. Life-Long Learning	6	Not directly assessed

4.5   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/D2L but these are not intended to be stand-alone course notes. 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 project.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures. 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.

4.7 Relationships with other Courses & Labs

Previous Courses:

    MATH*1200: Calculus

Follow-on Courses:

    ENGG*2400: Engineering Systems Analysis – many applications of linear algebra

    ENGG*2160: Engineering Mechanics II – solving linear systems of equations involving deformable solids

    ENGG*4460: Robotic Systems – solving kinematic equations for robotic systems

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5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

    Monday, Wednesday, Friday   13:30 – 14:20   ROZ 104

Tutorials:

S01	Monday, 11:30 – 12:20	MCKN 314
S02	Tuesday, 11:30 – 12:20	MCKN 309
S03	Thursday, 12:30 – 13:20	MCKN 307
S04	Tuesday, 8:30 – 9:20	MCKN 315
S05	Thursday, 10:30 – 11:20	MCKN 307
S06	Thursday, 11:30 – 12:20	MCKN 307
S07	Wednesday, 11:30 – 12:20	MCKN 317
S08	Monday, 9:30 – 10:20	MCKN 317
S09	Thursday, 8:30 – 9:20	MCKN 306
S10	Friday, 11:30 – 12:20	MCKN 307
S11	Wednesday, 15:30 – 16:20	MCKN 308
S12	Monday, 15:30 – 16:20	MCKN 305
S13	Tuesday, 12:20 – 13:20	MCKN 314

5.2 Lecture Schedule: *The proposed schedule of topics is shown below.*

Topic	Learning Objectives
Euclidean Vector Spaces: Vectors in R^2 and R^3, Subspaces, Spanning Sets and Linear Independence, Basis,	1, 6
Systems of Linear Equations: Systems of linear equations and elimination, Matrix representation of a system of linear equations, Types of elementary row operations, Row Echelon Form (REF), Reduced Row Echelon Form, Rank, and Homogenous Systems	2, 6
Matrices, Linear Mappings, and Inverses: Operations on matrices, Transpose of a matrix, Matrix Multiplication, Identity Matrix, Matrix Mappings and Linear Mappings, Special Subspaces for systems and mappings, Inverse matrices and inverse mappings, LU-Decomposition	3, 6
Vector Spaces: Subspaces, Dimension, Extending a linearly independent subset to a basis	1, 6
Determinants: Determinants in terms of cofactors, finding the inverse of a matrix using determinants	4, 6
Eigenvectors and Eigenvalues: characteristic polynomial, algebraic multiplicity, geometric multiplicity	5, 6
Diagonalization	5, 6
Symmetric Matrices: orthogonal matrix, diagonalization of symmetric matrices, orthogonally diagonalizable, quadratic forms	5, 6

5.3 Design Lab Schedule

N/A

5.4 Lab Schedule

N/A

5.5 Other Important Dates

Monday, 11 January 2016: First class

Monday, 15 – Friday 19 February 2016: Reading Week

Friday, 11 March 2016: drop date – 40th class

Friday, 23 March 2016: Holiday

Friday, 8 April 2016: last day of class

Please refer to the undergraduate calendars for the semester scheduled dates.

6 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

7 ACADEMIC MISCONDUCT

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 discourages misconduct. 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.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or

accommodation, whether due to an identified, ongoing disability for a short-term disability should contact Student Accessibility Services as soon as possible

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/

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9   RECORDING OF MATERIALS

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

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10 RESOURCES

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The School of Engineering has adopted a Code of Ethics that can be found at: http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

The Graduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to graduate programs:

http://www.uoguelph.ca/registrar/calendars/graduate/current/