



Mathematics Department
Linear Algebra - Science
201-NYC-05

COURSE OBJECTIVES

For details, see "Dawson Science Program".

COURSE COMPETENCIES

This course will allow the student to fully achieve the competency:

00UQ: To apply the methods of linear algebra and vector geometry to problem solving.

Elements of the Competency:

1. To express concrete problems as linear equations.
2. To solve systems of linear equations using matrices.
3. To establish connections between geometry and algebra.
4. To determine equations of geometric loci (lines and planes) and determine their intersections.
5. To calculate angles, lengths, areas and volumes.
6. To demonstrate propositions.
7. To make two- and three- dimensional drawings of loci.
8. To use mathematical software with Linear Algebra problems.

This course also contributes to the partial achievement of the competency:

00UU: To apply what they have learned to one or more subjects in the sciences.

Elements of the Competency:

1. To identify the scientific aspects of a given topic from an interdisciplinary perspective.
2. To transfer what they have learned to situations requiring the contribution of more than one discipline.
3. To apply systematically an experimental method.
4. To solve problems.
5. To use data processing technologies.

6. To reason with rigor.
7. To communicate clearly and precisely.
8. To show evidence of independent learning in the choice of documentation or laboratory instruments.
9. To work as members of a team.
10. To make connections between science, technology and the evolution of society.
11. To identify the underlying values underlying their treatment of a topic.
12. To place scientific concepts used in a historical context.
13. To show attitudes appropriate for scientific work.

PRE-REQUISITE

Good standing in High school or CEGEP Functions or equivalent.

Note, however, that the majority of the students who take this course have already passed Calculus I and Calculus II, so they exhibit a fair degree of mathematical maturity.

PONDERATION

3-2-3

EVALUATION SCHEME AND SCHEDULE

The Institutional Student Evaluation Policy (ISEP) is designed to promote equitable and effective evaluation of student learning and is therefore a crucial policy to read and understand. The policy describes the rights and obligations of students, faculty, departments, programs, and the College administration with regard to evaluation in all your courses, including grade reviews and resolution of academic grievance. ISEP is available on the Dawson website.

Term Work

A minimum of 3.5 hours of in class testing is required.

Final Examination

The Final Examination will be a supervised, comprehensive examination held during the formal examination period.

Grading Policy

The final grade is the greatest between:

Option A

- | | |
|--|-----|
| 1. Term Mark (tests, quizzes, assignments) | 50% |
| 2. Final Examination | 50% |

Option B

- | | |
|--|-----|
| 1. Term Mark (tests, quizzes, assignments) | 25% |
| 2. Final Examination | 75% |

To pass the course the students must obtain at least 60%.

REQUIRED TEXT AND MATERIALS

Text: The required text is Elementary Linear Algebra (Abridged Version) - 10th Ed., by H. ANTON.

References: (1) Linear Algebra with Applications, by W.K. NICHOLSON.
(2) Linear Algebra - Ideas and Applications by R.C. PENNEY.

Calculators: Students are only permitted to use the Sharp EL-531XG calculator during tests and examinations..

TEACHING METHODS

Lectures and problem sessions.

ATTENDANCE AND COURSE PARTICIPATION REQUIREMENTS

Students should refer to the Institutional Student Evaluation Policy (ISEP section III-C) regarding attendance.

Attendance is recommended for the successful completion of the course.

LITERACY STANDARDS

Problem solving is an essential component of this course. Students will be expected to analyze problems stated in words, to present their solutions logically and coherently, and to display their answers in a form corresponding to the statement of the problem, including appropriate units of measurement. Marks will be deducted for work which is inadequate in these respects, even though the answers may be numerically correct.

STUDENT OBLIGATIONS

- (a) Students have an obligation to arrive on time and remain in the classroom for the duration of scheduled classes and activities.
- (b) Students have an obligation to write tests and final examinations at the times scheduled by the teacher or the College. Students have an obligation to inform themselves of, and respect, College examination procedures.
- (c) Students have an obligation to show respectful behavior and appropriate classroom deportment. Should a student be disruptive and/or disrespectful, the teacher has the right to exclude the disruptive student from learning activities (classes) and may refer the case to the Director of Student Services under the Student Code of Conduct.
- (d) Electronic/communication devices (including cell phones, mp3 players, etc.) have the effect of disturbing the teacher and other students. All these devices must be turned off and put away. Students who do not observe these rules will be asked to leave the classroom.

Everyone has the right to a safe and non-violent environment. Students are obliged to conduct themselves as stated in the Student Code of Conduct and in the ISEP section on the roles and responsibilities of students. (ISEP section II-D)

ACADEMIC INTEGRITY

Cheating in Examinations, Tests, and Quizzes

Cheating includes any dishonest or deceptive practice relative to formal final examinations, in-class tests, or quizzes. Such cheating is discoverable during or after the exercise in the evaluation process by the instructor. Such cheating includes, but is not limited to:

- a. copying or attempting to copy another's work.
- b. obtaining or attempting to obtain unauthorized assistance of any kind.
- c. providing or attempting to provide unauthorized assistance of any kind.
- d. using or possessing any unauthorized material or instruments which can be used as information storage and retrieval devices.
- e. taking an examination, test, or quiz for someone else.
- f. having someone take an examination, test, or quiz in one's place.

Unauthorized Communication

Unauthorized communication of any kind during an examination, test, or quiz is forbidden and subject to the same penalties as cheating.

Plagiarism on Assignments and the Comprehensive Examination

Plagiarism is the presentation or submission by a student of another person's assignments or Comprehensive Assessment as his or her own. Students who permit their work to be copied are considered to be as guilty as the plagiarizer.

Penalties

Cheating and plagiarism are considered extremely serious academic offences. Action in response to an incident of cheating and plagiarism is within the authority of the teacher.

Penalties may range from zero on a test, to failure in the course, to suspension or expulsion from the college.

According to ISEP, the teacher is required to report to the Sector Dean all cases of cheating and plagiarism affecting a student's grade. (see ISEP section IV-C.)

INTENSIVE COURSE CONFLICTS & POLICY ON RELIGIOUS OBSERVANCE

If a student is attending an intensive course, the student must inform the teacher, within the first two weeks of class, of the specific dates of any anticipated absences.

Students who wish to observe religious holidays must also inform each of their teachers in writing within the first two weeks of each semester of their intent to observe the holiday so that alternative arrangements convenient to both the student and the teacher can be made at the earliest opportunity. The written notice must be given even when the exact date of the holiday is not known until later. Students who make such arrangements will not be required to attend classes or take examinations on the designated days, nor be penalized for their absence.

It must be emphasized, however, that this College policy should not be interpreted to mean that a student can receive credit for work not performed. It is the student's responsibility to fulfill the requirements of the alternative arrangement.

Students who intend to observe religious holidays or who take intensive courses must inform their teachers in writing as prescribed in the ISEP Policy on Religious Observance. (ISEP Section III-D).

A form for this purpose is available at the end of this document.

MATH TUTORIAL ROOM

Volunteer math teachers are available for help in room 7B.1 from 10:00 to 16:00 (Monday through Friday) and from 17:00-18:00 (Monday through Thursday).

COURSE CONTENT & TENTATIVE SCHEDULE

(Number of classes listed is approximate)

Specific Competencies for the 10th Edition of Anton

| <u>TOPICS</u> | <u>SPECIFIC COMPETENCY</u> (*indicates the topic is not covered in the text) | <u>LEARNING ACTIVITIES</u> (chapter, sections & problems in text) | <u>TIME</u> (in weeks) |
|-----------------------------|--|---|---------------------------|
| Systems of Linear Equations | Solving systems of linear equations using Gaussian elimination and Gauss-Jordan elimination. Properties of matrices and matrix algebra. Definition of matrix inverse and more matrix algebra. Properties of elementary matrices, finding inverse matrices. Theorems on invertibility and solutions of systems. Diagonal, triangular and symmetric matrices. | 1.1 prob 1-17, T-F; 1.2 prob 1-32, 35, 36, 37-42, T-F 1.3 prob 1-17 (odd), 19- 23, 27- 30, T-F 1.4 prob 4-10, 14-17, 21, 25-42, 51-55, T-F 1.5 prob 1-32, 35, 37-43, T-F 1.6 prob 1-23, T-F 1.7 prob 1-28, 32-39, T-F Supp. Ex. 8-15, 17-21 | 5 |
| The Determinant Function | Evaluating determinants by cofactor expansion; Evaluating determinants by row reduction. Investigating properties of the determinant function. the adjoint of a square matrix; finding inverses using the adjoint, solving systems of linear equations using Cramer's Rule | 2.1 prob 1-39, T-F 2.2 prob 1-17 19-36, T-F 2.3 prob 3, 5, 7-39, T-F Supp. Ex. 16, 31, 32, 33 | 2 |
| Euclidean vectors spaces | The geometric definition of a vector, component notation for a vector. Norm of a vector, vector arithmetic. The dot product: vector projections and applications. Lines and Planes in Space. The cross product and its properties and applications. The Scalar Triple Product and applications. The following additional topics are covered: <ul style="list-style-type: none"> • calculations of distance: between 2 skew lines.* • near point problems: the closest point on a plane to a point,* the closest point on a line to a point.* Additional problems on lines, planes, distances, and near points will be provided | 3.1 prob 1-31(odd), T-F 3.2 prob 1-27 (odd), 3.3 prob 1-40 (odd), T-F 3.4 prob 1-25 (odd), T-F 3.5 prob 1-35, T-F | 4 |
| Vector Spaces | Vector space axioms, some properties of vectors. Subspaces, linear combinations of vectors, spanning. Linear Independence. Basis and dimension. | 4.1 prob. 2-13, 16-23, T-F. 4.2 prob. 1-5, 7-19, T-F 4.3 prob. 1-10, 13, 15, 16, T-F 4.4 prob. 1-13, 4.5 prob 1-11, 14 | 3 |

In addition, a Maple exercise module will be available for students, it contains problems on matrices, determinants, vector operations and row reduction. A few optional exercises on eigenvalues and eigenvectors are also included.

RELIGIOUS OBSERVANCE/ INTENSIVE COURSES FORM

Students who intend to observe religious holidays or who take intensive courses must inform their teachers in writing as prescribed in the ISEP Policy on Religious Observance. (ISEP Section III-D)

The following form must be submitted within the first two weeks of classes.

Name: _____

Student Number: _____

Course: _____

Teacher: _____

Date:

Description:
