



CEGEP CHAMPLAIN - ST. LAWRENCE

201-105-RE: Linear Algebra
Winter 2006

Instructor: Martin Huard
Office: 318
Web Site : <http://web2.slc.qc.ca/mh/>

e-mail : mhuard@slc.qc.ca
Telephone: 656-6921, ext. 261

Ponderation: 3-2-3

Credits: 2 2/3

Prerequisite Compulsory : Secondary V Mathematics (Math 526)
Recommended: Differential Calculus (Math 201-103-RE)
Integral Calculus (Math 201-203-RE)

Program Objectives

In this course you will use the methods of linear algebra and vector geometry to the study of various phenomena of human activity (satisfying objective 022Z for the Social Science Program). You will also apply what has been learned to one or more subject in the Social Sciences (partially satisfying objective 022R and 022S for the Social Science Program).

Course Objectives

The Vectors and Matrices course introduces that branch of mathematics called Linear Algebra. In this course you will learn to apply the methods of Linear Algebra and Matrix methods to problem solving. To meet this objective, you will learn:

- 1) to situate the historical context of the development of linear algebra and vector geometry;
- 2) to use matrices to solve concrete problems;
- 3) to apply different methods of solving systems of linear equations;
- 4) to use vector operations to solve concrete problems;
- 5) to establish connections between vector geometry and linear algebra;
- 6) to apply the methods of linear algebra and vector geometry to the study of line and plane geometry;
- 7) to solve optimization problems using methods of solving systems of linear inequations with two or more variables.

Teaching Method

The course is given in an interactive lecture form, with frequent interludes for you to try out the ideas being considered.

Textbook (Optional)

Elementary Linear Algebra: Abridged version (9th Edition) by Howard Anton and Chris Rorres, John Wiley & Sons (2006).

Additional References

Elementary Linear Algebra (5th edition) by R. E. Larson and B. H. Edwards, Heath (2004).

Elementary Linear Algebra (4th edition) by S. Venit and W. Bishop, Brooks and Cole (1996).

Course Content

- 1) Systems of Linear Equations - definition of a system of linear equations, Gaussian elimination, Gauss-Jordan elimination, homogeneous systems of linear equations, applications.
- 2) Matrices - definition of a matrix, operations on matrices, row reduction, elementary matrices, inverse of a matrix.
- 3) Determinants - the determinant function, evaluating determinants, properties of determinants, cofactor expansion, Cramer's Rule.
- 4) Geometric Vectors - definition in \mathbb{R}^2 and \mathbb{R}^3 , arithmetic of geometric vectors, position vectors, interesting theorems proven with geometric vectors.
- 5) Algebraic Vectors - definition in \mathbb{R}^n (emphasis on \mathbb{R}^2 and \mathbb{R}^3), the arithmetic of vectors, the dot product, the cross product, the scalar triple product.
- 6) Vector Spaces - definition of a vector space, subspaces, linear span of a set of vectors, linear dependence, bases and dimension, coordinate vectors.
- 7) Equations of Lines and Hyperplanes - hyperplanes in \mathbb{R}^2 and \mathbb{R}^3 , lines in \mathbb{R}^3 , vector, parametric and symmetric equations, distances and intersections.
- 8) Systems of Linear Inequalities – linear programming, the simplex method.

Evaluation

The evaluation in this course will verify that you have learned:

- 1) to use appropriate concepts;
- 2) to accurately represent situations using matrices, vectors, and systems of equations and inequations;
- 3) to graphically represent loci;
- 4) to solve systems of linear equations exactly;
- 5) to manipulate algebraic expressions correctly;
- 6) to select and apply the correct method of solving systems of linear equations;
- 7) to apply correctly algorithms
- 8) to arrive at exact answers;
- 9) to be able to justify your reasoning in the steps you take;
- 10) to arrive at correct interpretation of results;
- 11) to use the appropriate terminology (notation).

There will be 4 term tests (12 % each), four assignments (3% each) and a final examination (40%). A student missing a test will be given zero (0). Late assignments will be severely penalised, and will not be accepted once I have given back the graded assignments.

Tests and assignments (including the final examination) will be graded on the proper use of English and Mathematics. That means that written passages must be grammatically correct and that proper mathematical style and notation will be required.

Absences, Rules & Regulations

St. Lawrence Campus has definite regulations concerning cheating, plagiarism and the quality of written English. Any student caught cheating or plagiarizing on an assignment or a test will automatically receive a zero for that assignment or test. If a student is caught a second time, automatic failure in the course will result and disciplinary action may be taken. For more information, the student can consult The Student Handbook, where these rules and regulations are clearly indicated.