

Course Name: A FIRST COURSE IN LINEAR ALGEBRA
(MATH2410)

Level: 2

Semester: 1

Number of Credits: 3

Pre-requisites: (MATH 1141 & MATH 1152) or (M10A & M10B)

RATIONALE: At the core of any Mathematics Programme are Real Analysis, Linear and Abstract Algebra. The course being proposed is a first course in Linear algebra and covers the fundamental topics found in such a course.

AIM: To introduce students to the notion of vector spaces and to define and perform algebra in these spaces.

COURSE DESCRIPTION: In this course we take an axiomatic approach in defining a vector space. Functions on vector spaces are then defined. Various other spaces are defined such as innerproducts and eigenspaces. The course will be take a formal approach, containing definitions, theorems, lemmas and proofs. Examples will be interspersed throughout.

LEARNING OBJECTIVES: At the end of the course, students will be able to:

1. Define various spaces
2. Comprehend the various properties of linear transformations
3. Compute eigenvalues and eigenvectors

CONTENT

(a) Properties of Matrices and Determinants

Review matrices and systems of linear equations, row equivalence, the sigma-notation definition, proof of familiar results

(b) Vector spaces

Definition, independence, basis and dimension

(c) Linear transformations

Definition, Kernel and image, Invertible operators

(d) Inner products [

Definition, Cauchy-Schwarz, orthogonality, projections, Gram-Schmidt

(e) Eigenspaces

Characteristic polynomials, Cayley-Hamilton, eigenvalues and eigen-vectors, diagonalization of matrices

TEACHING METHODOLOGY: There will be a total of 39 contact hours. The course will be delivered via lectures and tutorials in the ratio of 2 to 1: New material will be presented in lectures with the help of a white board and a projector. Exercise sheets will be discussed during tutorial sessions. This will be interactive and less formal than lectures. Lecture notes, exercise sheets, solutions and interesting readings will be posted on the OURvle webpage:

<http://ourvle.mona.uwi.edu/>

ASSESSMENT: The course assessment will have a course-work component worth 30% and a final exam worth 70%. The Final theory exam will be two hours in length. The Coursework consists of

One one-hour in-class In-semester examination 20%

Two take-home graded assignments (problem papers) 5% each

REFERENCE MATERIAL:

Books:

- 1) LAY, David C. *Linear Algebra with Applications 3rd edition*, 2003. Prentice Hall. ISBN-10: 0131453343 [prescribed]
- 2) SEYMOUR, Lipschutz. *Linear Algebra, 3rd edition*, 2000. McGraw-Hill. ISBN-10: 0071362002 [recommended]

Online Resources:

1. <http://mathforum.org/library/topics/linear/>
This is a website associated with Drexel University. Here students will find a variety of lecture notes and join in online discussions
2. <http://tutorial.math.lamar.edu/Classes/LinAlg/LinAlg.aspx>
Here students will find a variety of well put together modules. They are in pdf form and hence are easily downloadable.