COMSATS Institute of Information Technology

Linear Algebra

Code: MTH231

Module Handbook

Spring 2012
BCS-IV-C/BCE-II-Section I

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Introduction

This is a 3 credit hour course, comprising 3 hours of teaching per week.This course is potentially the most interesting and worthwhile undergraduate mathematics course. In Linear Algebra the concepts are as important as the computations. Students use this text occasionally as a reference in their careers at several major fields of natural sciences, social sciences, engineering and technology. The Importance of Linear Algebra for applications has increased with the invention of computer technology. Computer science and Electrical Engineering are thus linked with linear algebra through the explosive growth of parallel processing and large scale computations.

Objective

At the end of this course the students will be able to setup and seek the solutions of several equations in several variables, matrices and their properties, determinants and their properties. Students will also learn about the linear independence and of vectors. They should know about vector spaces, subspaces, bases, and their dimension. They will learn about inner product spaces, linear transformations, eigenvalues and eigenvectors. Along with this the computational techniques that can serve both the theory itself and its applications will be another objective of the course**.**They should about the application of these concepts in fields of engineering, computer sciences and natural sciences.

The students will also learn to use the computer Algebra System to perform matrix computations and to explore and analyse linear algebra concepts.

Contacting the Module Instructor

You can contact your module instructor in the following ways:

Email: fazeel_anwar@comsats.edu.pk

Office: Mathematics Department, 1st Floor, Faculty Block - I

Office hours: By appointment

Rationale Including Aims

The module will explore in detail the major concepts and issues that are essential to in today'sscientific world. It will equip the students with the sufficient background needed to study the advanced courses with basics in linear algebra. It will also provide you with a solid background of linear algebra to apply in the industries operating nationally and internationally.

Prerequisites

The prerequisite of this course is MTH101 (Calculus-I). As per scheme of study.

After studying this course the participants should be able

- To understand the mathematical concepts and terminology involved in Linear Algebra.
- To gain an acceptable level of computational proficiency involving the procedures in Linear Algebra.
- To understand the axiomatic structure of a modern mathematics subject and learn to construct simple proofs.
- To able to apply his or her knowledge to applications of Linear Algebra.

Teaching Methodology

It is important to me that each of you is successful in this course. The topic as well as the concepts will be discussed in the classroom. Illustrations, exercises and problems will also be solved in the classroom. Work will be assigned to the students that will be done by them at home and the problems arising will be removed in the tutorials as well as during the consultation hours. Problems given to the student as homework may or may not be a part of assignment. During the semester, student will be involved in the activities of solving problems, discussing theories, their applications, and attempting of quizzes and the sessional exams.

Assessment Scheme

The assessment and evaluation of the students will be based on the below stated areas.

Sessional Iafter 04 week	10%		
Sessional II after 10 week	15%		
Quizzes		15%	
Assignments			10%
Terminal Examination after 16 week			50%

Reading Materials

Core Texts:

- Bernard Kolman, Elementary Linear Algebra with Applications, 9th edition,Prentice-Hall.

Additional reading:

- Serge Lang, Algebra, 3rd edition, Addison-Wesley
- Steven Roman, Advanced Linear Algebra, 3rd edition, Springer.
- David C. Lay,Linear Algebra, 3rd edition, Addison-Wesley.
- W. Keith Nicholson, *Linear Algebra with Applications*, 3rd edition, PWS Publishing Company.
- Gilbert Strang, *Linear Algebra and its Applications*, 4th edition, Thomson Brooks/Cole, 2006.

Course Requirements and Expectations

Grades: Letter grades will be assigned based on the university's standard grading scale.

Being Prepared for Class: Student must go through the assigned readings before coming to the class. You should be ready to discuss the undergoing concepts by different perspectives.

Attendance: Students are required to attend all the classes; minimum attendance requirement by rule is 80% in CIIT. You are fully responsible for the information missed in the class due to absence.

Quizzes: may be surprised orannounced and there will be no make-up for missed quizzes.

Assignments: In fairness to students who complete assignments on time, late assignments will not be accepted. You must turn in the assignments at the end of the lecture on the day they are due.

Minimising disruptions: All cell phones should be turned off during class. Do not involve in side conversations.

Class Participation: Positive, healthy and constructive class participation will be monitored for each class. Particular emphasis will be given during the presentation sessions. The manner in which the question is asked or answered will also be noted. Your behaviour in the class will contribute to the class participation marks.

Academic Dishonesty

Academic dishonestyis an offence that will not be tolerated in any form. Any student who is involved in any such activity will be penalised to the fullest extent possible allowed by university regulations. If you have any doubts about whether an action constitutes academic dishonesty, before consult with your instructor before taking the action.

Plagiarism and Cheating: the presentation by a student as his or her own work but is actually stolen from someone else. Whenever a student submits a piece of writing claiming it to be his own authorship, it is generally understood that all the ideas, opinions, facts, figures, conclusions, revisions, words are the student's original work, unless he/she has explicitly indicated otherwise using citations, footnotes, attribution in the text, and/or used quotation marks.

The use of unauthorised material during an **examination** in order to secure or give help will not be tolerated. Academic dishonesty also encompasses unauthorised copying and distribution of examinations, assignments, reports, projects or term papers or the presentation of unacknowledged material as if it were the student's own work.A person failing to acknowledge and recognise the contribution of the original author will be held responsible under academic deception. Such action will necessitate measures to discipline the student under the University's academic dishonesty policy. Any academic dishonesty would call for swift punitive action by the faculty and the names of the students involved would be reported to the concerned Head of Department.

Module Contents

Week	Activity
1	• Systems of Linear Equations • Row Reduction and Echelon Forms
2	• Vector Equations • The Matrix Equation
3	• Solution Sets of Linear Systems • Linear Independence
4	• Introduction to Linear Transformations • The Matrix of a Linear Transformation, Applications
5	• **1st Sessional Examination** • Matrix Operations
6	• The Inverse of a Matrix • Characterization of Invertible Matrices
7	• Matrix Factorizations • Applications
8	• Introduction to Determinates and Properties of Determinants • Vector Spaces and Subspaces
9	• Bases • Null Spaces, Colum Spaces
10	• **2st Sessional Examination** • Coordinate Systems
11	• The Dimension of a Vector Space • Rank, Applications
12	• Eigenvectors and Eigen values • The Characteristic Equation, Cayley Hamilton Theorem
13	• Diagonalization, Applications • Inner Product, Length and Orthogonality
14	• Orthogonal sets • Orthogonal Projections
15	• The Gram-Schmidt Process • Applications
16	• Revision