# MT-203 Linear Algebra

**Credit Hours 3 (3-0)**

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| **Program:** BSCS | | **Semester:** III |
| **Pre Requisite:** None | | **Follow Up:** None |
| **Course Description** The course deals with elementary linear algebra and its applications. This includes: systems of linear equations and matrices, determinants, vector spaces, inner-product spaces, eigenvalues, eigenvectors, diagonalization, linear transformations, and applications. | | |
| **Course Objectives**  The following are the primary objectives for this course:   * To learn the fundamental concepts of linear algebra in the concrete setting of Rn * To learn to use linear algebra to solve problems from engineering and other fields * To learn to use computer software to apply the techniques of linear algebra * To communicate, both orally and in writing, the theoretical concepts and scientific applications | | |
| **Learning Outcomes**  Students will be able to :   * Effectively express concepts of linear algebra in written form; * Demonstrate ability to think critically about vector spaces and linear transformations; Locate and use information to solve problems of linear transformations and vector spaces; | | |
| **Textbooks**  Linear Algebra& Its Applications by Bernard Kolman | | |
| **Reference Books / Material**   * Linear Algebra by Lipschutz& Marc * Linear Algebra by Hoffman & Kunge * Gilbert Strang, Strang, Brett Coonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, Strang's Linear Algebra And Its Applications, 4th edition, Brooks/Cole, 2005 * Howard Anton, Chris Rorres, Elementary Linear Algebra: Applications Version, 9th edition, Wiley, 2005. * David C. Lay, Linear Algebra and Its Applications, 2nd edition, Addison-Wesley, 2000. | | |
| **Course Distribution** | Theory: 30%  Problem Analysis: 20%  Solution Design: 45%  Social and Ethical Issues: 5% | |
| **Marks Distribution** | ***Mid Term*** Test 1: 10 Marks; Test 2: 10 Marks; Assignment: 05 Marks; Quiz: 05 Marks  ***End Term*** Paper: No Choice, 65 Marks, 03 hours; Attendance: 05 Marks | |
| **Technology Involved** (Multimedia, Overhead Projector, Web, etc.) | | |
| **Practiced Techniques** (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.) | | |

**Theory**

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| **Week** | **Topic** | | **Learning Activities** (Assignments, Quizzes, Presentations, etc.) |
| 1 | Linear Equations & Matrices Solving linear systems, Matrices, Dot product &Matrix Multiplication | |  |
| 2 | Properties of Matrix Operations, Solving linear Systems with matrices, The inverse of a Matrix | |  |
| 3 | Determinants Definition & properties, Cofactor Expansion & Applications | |  |
| 4 | Vectors in R & R2 Vectors in Plane, Properties of vectors | |  |
| 5 | Real Vector Spaces Subspaces, Linear Independence and spannig | |  |
| 6 | Basis & Dimensions, Homogeneous Systems | |  |
| 7 | The Rank and Nullity of a Matrix & Applications | |  |
| 8 | Coordinates & Change of Basis | |  |
| 9 | | Orthonormal Basis, orthogonal basis |  |
| 10 | | Orthogonal Complements |  |
| 11 | | Eigen Values & Eigen Vectors, eigen values |  |
| 12 | | Diagonalization of Matrices |  |
| 13 | | Diagonalization of Symmmetric Matrices |  |
| 14 | | Linear Transformations |  |
| 15 | | The Kernal & Range of Linear Transformation |  |
| 16 | | The Matrix of a Linear Transformation |  |