**University of Management and Technology**

**School of Science**

***Department of Mathematics***

**Course Code:** MA-210 **Course Title: Linear Algebra**

**Course Outline (Spring 2024)**

| **Schedule** | As per time table | **Pre-requisite** |  | |
| --- | --- | --- | --- | --- |
| **Course Coordinator** |  | **Contact** |  | |
| **Course**  **Description** | Linear Algebra is an important course for mathematics, physics, economics and computer-science majors. Students apply the concepts and methods described in the syllabus and will become capable to solve problems using linear algebra, they will know a number of applications of linear algebra, and they will be able to understand the logic (proof) behind a particular phenomenon. The text and class discussion will introduce the concepts, methods, applications, and proofs; students will practice them and solve problems on assignments, and they will be tested on quizzes, midterms, and the final. For physics majors this subject has applications in quantum mechanics, economics majors will find it useful in courses like econometrics, computer-science students will see its application in computer graphics. | | | |
| **Expected**  **Outcomes** | Understand, read and write the elementary results of Linear Algebra and acquire basic Mathematical knowledge.  Apply course knowledge creatively and critically to develop problem-solving skills based on logical and abstract explanation.  Students will be able to see the connections between the abstract topics like vector spaces/subspaces and applied topics like rotation matrices/inner product spaces which will further help them to see the similarities between Linear Algebra and other courses e.g. Computer Graphics and Quantum Mechanics and feel confident to study those courses in the future.  Value the group learning environment by demonstrating ability for working in a group and help each other to develop interest in retaining and using the results throughout the course. | | | |
| **Course content** | Introduction to Systems of Linear Equations  Matrices and Matrix Operations  Gaussian Elimination  Inverses; Algebraic Properties of Matrices  Elementary Matrices and a Method for Finding inverse  More on Linear Systems and Invertible Matrices  Diagonal, Triangular, and Symmetric Matrices  Applications of Linear Systems  Evaluating determinants by Cofactor expansion and row reduction  Vector in plane  Norm and Dot product of Vectors  Orthogonality  Real Vector Spaces  Subspaces  Spanning Sets  Linear Independence  Coordinates and Basis  Dimension  Rank, Nullity, and the Fundamental Matrix Spaces  Eigenvalues and Eigenvectors  Diagonalization  Dynamical Systems and Markov Chains  Inner Products  Gram–Schmidt Process; QR-Decomposition  Orthogonal Matrices  Orthogonal Diagonalization  General Linear Transformations  Compositions and Inverse Transformations  Isomorphism  Applications | | | |
| **Text**  **Book** | Elementary Linear Algebra, Applications Version by HOWARD ANTON, CHRIS RORRES, ANTON KAUL, 12th Edition, ISBN-13: 978-1-119-40672-3 | | | |
| **Reference Book:** | 1. Linear Algebra, 4th edition, by Friedberg, Insel, and Spence, published by Pearson, 2003. ISBN-10: 0130084514, ISBN-13: 9780130084514 2. Larson, Ron and David C. Falvo. Elementary Linear Algebra. 6th edition. 2009.Type: Textbook, ISBN: 9780618783762 | | | |
| **Assignments** | As per UMT policy | **Quizzes** | | As per UMT policy |
| **Mid Term**  **Examination** | As per UMT policy | **Final**  **Examination** | | As per UMT policy |
| **Attendance**  **Policy** | As per UMT policy | | | |
| **Grading**  **Policy** | As per UMT policy | | | |