Department of Mathematics
College of Sciences
King Saud University
Riyadh

Semester I, 1439/1440
Course outline for Math 240: **Introduction to Linear Algebra**

Text Book: Elementary Linear Algebra with Supplemental Applications Eleventh Edition by H. Anton and Chris Rorres, John Wiley & Sons, 2015

1. **Matrices**
   - Matrices and their operations
   - Types of matrices
   - Inverse of a matrix
   - Algebraic properties of matrices
   - Method for finding inverse
   - Linear systems of equations
2. **Determinants**
   - Determinants by cofactor expansion
   - Evaluating determinants by row reduction
   - Properties of determinants: Cramer's Rule

3. **Vector Spaces**
   - Real vector spaces
   - Subspaces
   - Linear dependence
   - Basis and dimension (finite)
   - Row space, column space, range space
   - Rank and nullity

4. **Inner Product Spaces**
   - Inner products
   - Angle of orthogonality in inner product spaces
   - Gram-Schmidt Process: QR-decomposition
   - Best approximation: Least Squares

5. **Linear Transformations**
   - General linear transformations
   - Kernel and range of a linear transformation
   - Isomorphism
   - Compositions and inverse transformations
   - Matrices for general linear transformations

6. **Eigenvalues and Eigenvectors**
   - Eigenvalues and eigenvectors of a matrix
   - Diagonalization
   - Eigenvalues for linear operators

Mark Distribution: **Mid Term 1 and 2: 25+25=50 and Tutorial: 10. Final: 40 Total: 100**