

## Master Syllabus

### **MAT 2320 - Linear Algebra**

**Division:** Science, Mathematics and Engineering

**Department:** Mathematics

**Credit Hour Total:** 3.0

**Lecture Hrs:** 3.0

**Prerequisite(s):** MAT 2280

**Other Prerequisite(s):** AND Other with a grade of C or better or satisfactory score on math placement test

**Date Revised:** March 2015

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### **Course Description:**

Systems of linear equations, matrices, determinants, linear transformations, Euclidean  $n$ -space, coordinate vectors, abstract vector spaces, dimension and rank, eigenvalues and eigenvectors.

### **General Education Outcomes:**

- Critical Thinking/Problem Solving Competency

### **Course Outcomes:**

#### **Gauss-Jordan reduction and inverse matrices**

Solve linear systems of equations using Gauss-Jordan reduction and the inverse matrix method.

**Assessment Method:** Locally developed exams

**Performance Criteria:** Passing grade on exams with a score of 70% or better

#### **Bases, eigenvalues, and eigenvectors**

Determine a basis for a vector space, determine eigenvalues and eigenvectors of a matrix and then use them to diagonalize the matrix.

**Assessment Method:** Locally developed exams

**Performance Criteria:** Passing grade on exams with a score of 70% or better

#### **Proofs from Linear Algebra**

Prove elementary theorems from linear algebra; prove that given sets are vector spaces or subspaces; prove that given transformations are linear.

**Assessment Method:** Locally developed exams

**Performance Criteria:** Passing grade on exams with a score of 70% or better

### **Outline:**

Understand algebraic and geometric properties of vectors in  $R^n$ . Solve systems of linear equations by using Gauss-Jordan elimination and by using the inverse of the coefficient matrix. Perform matrix operations such as addition, scalar multiplication, and multiplication. Discuss spanning sets and linear independence for vectors in  $R^n$ . Prove elementary theorems concerning rank and nullity of a matrix. Interpret a matrix as a linear transformation from  $R^n$  to  $R^m$ . Discuss the transformation's kernel and image in terms of nullity and rank of the matrix. Use determinants and their interpretation as volumes. Describe how row operations affect the determinant. Use characteristic polynomials to compute eigenvalues and eigenvectors. Use eigenspaces of matrices, when possible, to diagonalize a matrix. Use axioms for abstract vector spaces. Discuss the space of all polynomials and of all matrices. Describe coordinates of a vector relative to a given basis. For a linear transformation between vector spaces, discuss its matrix relative to given bases. Discuss orthogonal and orthonormal bases, and the Gram-Schmidt orthogonalization process.