STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MATH 361 – Linear Algebra

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Canino School of Engineering Technology

Department: Mathematics

Semester/Year: Fall 2018

A. **TITLE**: Linear algebra

B. **COURSE NUMBER:** MATH 361

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 3 **per week**
 # Lab Hours: **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☐ **Yes:** GER 1 Mathematics
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☐ **Fall & Spring** ☐

G. **COURSE DESCRIPTION:**

This course is an introduction to the theory of finite dimensional abstract vector spaces and linear transformations. Topics include: systems of linear equations, matrices, matrix algebra, determinants and inverses, linear combinations and linear independence, abstract vector spaces, change of basis and coordinates, inner product spaces, orthonormal bases. We also consider linear transformations, isomorphisms, matrix representation of linear maps, eigenvalues and eigenvectors, diagonalization and similarity. The applications include computer graphics, Markov chains, chemistry, linear regression, network flow, electrical circuits, and differential equations.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

Calculus II (MATH 162) or permission of the instructor

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Analyze and Solve systems of linear equations using augmented matrices			3-Found Skills	QTR
b. Develop an understanding of the algebra of matrices in order to solve applied and theoretical problems using inverses of matrices, determinants and other algebraic operations.			3-Found Skills	QTR
Analyze linear combinations of vectors in Rn and identify sets of vectors that are linearly independent			3-Found Skills	QTR
Determine if a set of vectors is a vector space, a subspace, or a basis for a vector space			3-Found Skills	QTR
Compute eigenvalues and eigenvectors, determine if a matrix is diagonalizable, and solve systems of linear ordinary differential equations			3-Found Skills	QTR

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

J. APPLIED LEARNING COMPONENT: Yes ☐ No ☒

If YES, select one or more of the following categories:

- ☐ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. TEXTS:

Introduction to Linear Algebra with Applications, Defranza/Gagliardi, Waveland Press, First Edition, (2014).

L. REFERENCES:

None

M. EQUIPMENT: None ☐ **Needed:** A computer algebra system (such as Maple) will be used when appropriate.

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Quizzes**
- **Exams**
- **Projects**
- **Homework**
- **Participation**

P. DETAILED COURSE OUTLINE:

I. Systems of Linear Equations and Matrices
1. Systems of linear equations
2. Matrices and elementary row operations
3. Matrix Algebra
4. The inverse of a square matrix
5. Determinants

II. Linear Combinations and Linear Independence
1. Vectors in Euclidean space
2. Linear Combinations
3. Linear Independence

III. Abstract Vector Spaces

1. Definition of a vector space
2. Subspaces
3. Basis and dimension
4. Coordinates and change of basis

IV. Linear Transformations
1. Linear transformations
2. The null space and range of a linear transformation
3. Isomorphisms
4. Matrix representation of linear transformations
6. Similarity

V. Eigenvalues and Eigenvectors

1. Eigenvalues and eigenvectors
2. Diagonalization
3. Diagonalize of Symmetric Matrices

VI. Inner product spaces (Optional)
1. The dot product on Euclidean spaces
2. Inner product spaces
3. Orthonormal bases and the Gram-Schmidt process
4. Orthogonal Complements

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐