COURSE SYLLABUS

Course: Linear Algebra
Number: Math 331
Credit-Hours: 3 credits [semester credit hours]

Course Description: Presents matrices, determinants, vector spaces, linear transformations, eigenvectors and eigenvalues, diagonalization, solution of systems of linear equations by the Gauss-Jordan method, and applications.

Prerequisites: Successful completion (C- or higher) of MATH 214 (Calculus II) or equivalent.

Course Workload: 3 semester credit hours • 3 student work hours per credit hour • 14 week Carnegie semester = 126 hours student course workload average

Examination Requirements: Proctored written final examination must be passed at 60% or higher to earn passing grade in course. "B" and "A" grade paths have additional examinations. See http://www.distancecalculus.com/grades/ for more information.

Course Professor: Robert R. Curtis, Ph.D. <robert@distancecalculus.com>

University Information: Roger Williams University, University College, 1 Empire Plaza, Providence, RI, USA 02903. Accredited by New England Commission of Higher Education (NECHE). See https://www.rwu.edu/academics/accreditations for more information.

E-Textbook: "Matrices, Geometry, and Mathematica" by Davis/Porta/Uhl et al
Mathematics Software: Mathematica™ Computer Algebra & Graphing System
and/or LiveMath™ Computer Algebra & Graphing System

Detailed Syllabus

1. Getting Started
    - 1.1. Email and Chat
    - 1.2. Learning About the Course
    - 1.3. Required Hardware
    - 1.4. Software Fundamentals

2. Vectors
    - 2.1. Geometry of Vectors
    - 2.2. Perpendicular Frames
    - 2.3. Curves in 2D: Change of Frames/Basis
    - 2.4. Dot Products
    - 2.5. Cross Products
    - 2.6. Ellipses and Ellipsoids
    - 2.7. Area and Volume

3. Matrices
    - 3.1. Basics
    - 3.2. Transforming Curves
    - 3.3. Matrix Arithmetic
    - 3.4. Translations and Rotations
    - 3.5. Shears
    - 3.6. Linear Transformations
    - 3.7. Inverses
    - 3.8. Determinants
    - 3.9. Transposes
    - 3.10. Matrix Decomposition: Singular Value Decomposition
    - 3.11. Rank
    - 3.12. Projections
    - 3.13. Higher Dimensions

4. Linear Systems
    - 4.1. Conversion to Matrix Notation
    - 4.2. Gaussian Elimination
    - 4.3. Vector Spaces and Subspaces
    - 4.4. Numerical Considerations
    - 4.5. Applications: Least Square Fit
    - 4.6. Spanning Sets; Basis
    - 4.7. Linear Independence
    - 4.8. Pseudo Inverses
    - 4.9. Approximate Solutions
    - 4.10. Null Space and Image Space

5. Eigenvalues and Eigenvectors
    5.1. Diagonalization of a Matrix
    5.2. Eigenvalues
    5.3. Eigenvectors
    5.4. Exponential of a Matrix