Reedley College

CREDIT COURSE OUTLINE

I. COVER PAGE

(1) MATH 26	(2) ELEMENTARY LINEAR ALGEBRA	(3) 3
Number	Title	Units

(4)	Lecture / Lab Hours:			
	Course Hours			
		Weekly Lec hours:		3.00
		Weekly Lab hours:		0
		Total Contact hours:		54.00
	Lec will generate __ hour(s) outside work.			
	Lab will generate __ hour(s) outside work.			
(5)	Grading Basis:	Grading Scale Only		
		Pass/No Pass option		X
		Pass/No Pass only		
(6)	Advisories:			
(7)	Pre-requisites (requires C grade or better):			
	Corequisites:			

(8)Classification:		
	Degree applicable:	X
	Non-degree applicable:	
	Basic skills:	
(9)RC	Fulfills AS/AA degree requirement: (area)	
	General education category:	
	Major:	Mathematics (AS-T)
	Certificate of:	
	Certificate in:	
(10)CSU	Baccalaureate:	X
(11)Repeatable: (A course may be repeated three times)		0
(12)C-ID:		
Proposed Start Date:		Fall 2011

(12) Catalog Description:
This is a course in linear algebra designed for math, computer science, and some engineering transfer students. Topics include: matrices and linear transformations; vector spaces; determinants; eigenvalues and eigenvectors; applications.

II. COURSE OUTCOMES:

(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)

Upon completion of this course, students will be able to:

I. Read, write, and speak accurately about mathematical ideas and use correct mathematical notation.
II. Use computer technology to perform matrix computations, explore mathematical concepts, and verify their work.
III. Use the theory of matricies as a fundamental problem-solving tool.
IV. Perform matrix computations, solve linear systems of equations and determine the bases of related vector spaces, find eigenvalues and eigenvectors, and diagonalize matricies when applicable.
V. Apply mathematics of linear algebra to real-world problems and applications.
VI. Read and write mathematical proofs.
VII. Use numerical, graphical, symbolic, and verbal representationsto solve problems and communicate with others.

III. COURSE OBJECTIVES:

(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)

In the process of completing this course, students will:

I. solve systems of linear equations by using a variety of methods.
II. perform matrix operations and determine various characteristics of matrices.
III. given a set of vectors, determine if it's a linear independent or linearly dependent set, and determine if it's a subspace.
IV. determine various characteristics of a given subspace.
V. analyze various characteristics of a linear transformation.
VI. compute the determinant of a matrix.
VII. calculate the eigenvalues of a square matrix and find the eigenvectors that correspond to a given eigenvalue.

IV. COURSE OUTLINE:

Lecture Content:

A. Vectors: 2 weeks
1. Determine the length of a vector and the distance between vectors;
2. Determine the sum, difference, and dot product of two vectors;
3. Determine the vector equivalent to a given directed line segment; and
4. The cross product of two vectors in R3.

B. Linear Equations, Matrices and Determinants: 3.5 weeks
1. Determine the equations of lines in R2, , lines and planes in R3, and lines and hyperplanes in Rm
2. Identify systems of linear equations, as well as their augmented and coefficient matrices, writing them in matrix form;
3. Solve linear systems using Gauss-Jordan, Gaussian elimination, and the method of inverses;
4. Determine the sum, difference, product, and powers of matrices;
5. Determine the negative, transpose, and inverse of a matrix;
6. Determine the rank of a matrix;
7. Calculate determinants of square matrices of all orders;
8. Use elementary row (and column) operations to reduce the work involved in finding a determinant; and
9. Find the adjoint of a square matrix, then use it to compute the inverse of the original matrix.

C. Subspaces: 2 weeks
1. Determine whether a set of vectors in Rm is linearly independent or dependent, and if dependent, express one of its vectors as a linear combination of the others;
2. Determine whether or not a subset of Rm is a subspace;
3. Determine whether or not a set of vectors spans a given subspace of Rm;
4. Determine whether or not a set of vectors is a basis for a given subspace of Rm;
5. Find a basis for, and the dimension of, a given subspace of Rm (including the solution space of a homogeneous linear system);
6. Extend a linearly independent set to a basis for a given subspace of Rm; and
7. Reduce a set that generates a subspace of Rm to a basis for that subspace.

D. Vectors Spaces: 2 weeks
1. Determine if a set in a given vector space is linearly independent, and if not, express one vector as a linear combination of the other vectors;
2. Determine if a set spans a given vector space;
3. Determine if a set is a basis for a given vector space;
4. Determine the dimension of a given vector space; and
5. Determine the coordinate vector of a vector with respect to a given basis for vector space.

E. Inner Producers, Linear Transformations, and Inverse Transformation: 3.5 weeks
1. Determine whether or not a set of vectors in an orthogonal (or orthonormal) set is an inner product space;
2. Use the Gram-Schmidt process to construct an orthonormal basis for an inner product space;
3. Determine whether or not a function is a linear transformation;
4. Determine the matrix that represents a linear transformation from Rn to Rm;
5. Determine the sum, difference, and product (composition) of linear transformations;
6. Determine the kernel of a linear transformation and its nullity;
7. Determine the image of linear transformation and its rank;
8. Determine whether or not a linear transformation is one-to-one and/or onto;
9. Determine whether or not a linear transformation has an inverse;
10. Determine the matrix that represents a linear transformation from one vector space to another; and
11. Determine the change of bases matrix needed to express a given vector in RN as the coordinate vector with respect to a given basis.

F. Eigenvalues and Eigenvectors: 2 weeks
1. Calculate the eigenvalues of a square matrix;
2. Calculate the eigenvectors that correspond to a given eigenvalue and find a basis for each eigenspace;
3. Diagonalize a square matrix or demonstrate that it cannot be diagonalized; and
4. Orthogonally diagonalize a symmetric matrix or, in the complex case, a hermitian matrix.

G. Applications: 2 weeks
1. Least square polynomials;
2. Markov chains;
3. Fourier series.

V. APPROPRIATE READINGS

Reading assignments may include but are not limited to the following:

I. Sample Text Title:
1. Recommended - Leon, Steve *Linear Algebra with Applications,* ed. 8th Pearson, 2010,

II. Other Readings

___ Global or international materials or concepts are appropriately included in this course
___ Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

A. Writing Check either 1 or 2 below			
	1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.		
X	***2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.***		
	a) essay exam(s)		d) written homework
	b) term or other paper(s)		e) reading reports
	c) laboratory report(s)		f) other (specify)

Required assignments may include but are not limited to the following:

B. Problem Solving Computational or non-computational problem-solving demonstrations, including:			
X	a) exam(s)		d) laboratory reports
	b) quizzes		e) field work
X	c) homework problems		f) other (specify):

Required assignments may include but are not limited to the following:
1. problems assigned from the problem sets found in each chapter of the text.
2. worksheets generated by the instructor to reinforce or clarify concepts presented in the text.

C. Skill demonstrations, including:			
	a) class performance(s)		c) performance exams(s)
	b) field work		d) other (specify)

Required assignments may include but are not limited to the following:

D. Objective examinations including:			
	a) multiple choice		d) completion
	b) true/false	X	e) other (specify): Exams will be comprised of open-ended questions in which students show all steps of their solution process.
	c) matching items		

COURSE GRADE DETERMINATION:
Description/explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.
15% Homework 85% Exams

VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

Validation Language Level (check where applicable):	College-Level Criteria Met YES	NO
Textbook	X	
Reference materials		X
Instructor-prepared materials		X
Audio-visual materials		X

Indicate Method of evaluation:
Used readability formulae (grade level 10 or higher) ____
Text is used in a college-level course X

Used grading provided by publisher _____
Other: (please explain; relate to Skills Levels) _____

Computation Level (Eligible for MATH 101 level or higher where applicable)	X	
Content		
Breadth of ideas covered clearly meets college-level learning objectives of this course	X	
Presentation of content and/or exercises/projects:		
Requires a variety of problem-solving strategies including inductive and deductive reasoning.	X	
Requires independent thought and study	X	
Applies transferring knowledge and skills appropriately and efficiently to new situations or problems.	X	

List of Reading/Educational Materials
Recommended - Leon, Steve *Linear Algebra with Applications,* ed. 8th Pearson, 2010,

Comments:

_____ This course requires special or additional library materials (list attached).
__X__ This course requires special facilities:
Calculators or computers with software to solve linear algebra problems

Attached Files:

BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 201. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least three major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.

Check the appropriate spaces.

_____ Eligibility for Math 201 is advisory for the target course.
_____ Eligibility for English 126 is advisory for the target course.
_____ Eligibility for English 125 is advisory for the target course.

If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.

REQUISITES

Prerequisite -- MATH 5A MATH ANALYSIS I

1. Familiarity with polynomial, rational, exponential, logarithmic, and trigonometric functions. 2. Find the derivative of polynomial, rational, exponential, logarithmic, and trigonometric functions. 3. Find the integral of polynomial, rational, exponential, logarithmic, and trigonometric functions. 4. Describe the continuity of functions.	1. Students will encounter trigonometric polynomials with using Fourier series. 2. All of the functions and their derivatives are encountered in this course. 3. Some inner products are found using integrals. 4. Some vector spaces are sets of real-valued continuous functions on an interval so students must be familiar with the underlying concept of continuity.

ESTABLISHING PREREQUISITES OR COREQUISITES

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

_____Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
Justification: Indicate how this is so.
_____The health or safety of the students in this course requires the prerequisite.
Justification: Indicate how this is so.
__X__The prerequisite course is part of a sequence of courses within or across a discipline.
_____The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
Justification: Indicate how this is so.
_____The prerequisite/corequisite is required by law or government regulations.
Explain or cite regulation numbers:
_____The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of

this course.
Justification: Indicate how this is so.
_____The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
Justification: Indicate how this is so.
_____Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course:

Justification:

JUSTIFICATION OF LIMITATION ON ENROLLMENT

Enrollment in courses or blocks of courses may be limited based on performance, honors, or other performance based criteria. Be mindful of the disproportionate impact the limitation will have on specific groups of students. It is important to determine if the limitation will disproportionately keep under-represented students from enrolling in the course or block of courses.

Describe the reasons for limiting the enrollment.

Course Designator: MATH 26
Course Title(s): ELEMENTARY LINEAR ALGEBRA
Rationale for Limiting Enrollment: 0