Los Angeles Community College District

COURSE OUTLINE

SECTION I: BASIC COURSE INFORMATION

1. **COLLEGE:** Pierce

2. **SUBJECT (DISCIPLINE) NAME**[1] (40 characters, no abbreviations): Math

3. **COURSE NUMBER:** 270

4. **COURSE TITLE:** Linear Algebra

5. **UNITS:** 3.00

6. **CATALOG COURSE DESCRIPTION --** Provide a description of the course, including an overview of the topics covered:

   Covers vector spaces, linear transformations and matrices, matrix algebra, determinants, solutions of systems of equations, eigenvectors and eigenvalues.

7. **CLASS SCHEDULE COURSE DESCRIPTION --** Provide a brief description of the course, including an overview of the topics covered:

   Covers vector spaces, linear transformations and matrices, matrix algebra, determinants, solutions of systems of equations, eigenvectors and eigenvalues.

8. **COLLEGE APPROVAL DATE:**

9. **UPDATES** (check all applicable boxes):

☒ **Content**	**Last Update:**	Jan. 17, 2005
☒ **Objectives**	**Last Update:**	Jan. 17, 2005
☐ **College Specific Course Attributes/Data Elements**	**Last Update:**	
☐ **Districtwide Course Attributes/Data Elements**	**Last Update:**	
☐ **Other** (describe)	**Last Update:**	

10. **CLASS HOURS:**

	Hours per week (based on 18 weeks)	Total Hours per term (hrs per week x 18)	Units
Lecture:	3.00	54.00	3.00
Lab/activity (w/ homework):			
Lab/activity (w/o homework):			
Total:	3.00	54.00	3.00

Note: The Carnegie Rule and Title 5, section 55002 sets forth the following minimum standards: 1 unit = 1 hour lecture per week, 2 hours homework per week; **OR** 2 hours per week of lab with homework; **OR** 3 hours of lab per week without homework. The hours per week are based on a standard 18-week calendar. Lecture also includes discussion and/or demonstration hours, laboratory includes activity and/or studio hours.

[1] Underlined course attributes are the same for the course throughout the LACCD; all other course attributes are college specific.

PREREQUISITES, COREQUISITES, ADVISORIES ON RECOMMENDED PREPARATION, and LIMITATION ON ENROLLMENT

Note: The LACCD's *Policy on Prerequisites, Corequisites and Advisories* requires that the curriculum committee take a separate action verifying that a course's prerequisite, corequisite or advisory is an "appropriate and rational measure of a student's readiness to enter the course or program" and that the prerequisite, corequisite or advisory meets the level of scrutiny delineated in the policy.

Prerequisites: Yes (If yes, complete information below)

Subject	Number	Course Title	Units	Validation Approval Date (for official use only)
Math	262	Calculus II	5	

Corequisite: None (If yes, complete information below)

Subject	Number	Course Title	Units	Validation Approval Date (for official use only)

Advisories: Yes (If yes, complete information below)

Subject	Number	Course Title	Units	Validation Approval Date (for official use only)
Math	263	Calculus III	5	

11. OTHER LIMITATIONS ON ENROLLMENT (see Title 5, section 58106 and Board Rule 6803 for policy on allowable limitations. Other appropriate statutory or regulatory requirements may also apply):

Approved 12/13/02
Revised 4/11/03

SECTION II: COURSE CONTENT AND OBJECTIVES

1. COURSE CONTENT AND OBJECTIVES:

COURSE CONTENT AND SCOPE –**Lecture:** If applicable**,** outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours per topic	COURSE OBJECTIVES - **Lecture** (*If applicable)*: upon successful completion of this course, the student will be able to… *(Use action verbs – see Bloom's Taxonomy below for "action verbs requiring cognitive outcomes.")*
1. Linear equations a. Row reduction and echelon forms b. Vector equations c. Matrix equations 2. Matrix algebra a. Sums, products, transposes b. Inverses c. Partitioned matrices 3. Determinants a. Properties b. Cramer's Rule 4. Vector spaces a. Space and subspace b. Linear independence, span, and bases c. Null, column, row spaces d. Dimension e. Rank f. Change of basis 5. Linear transformations a. Definition b. Matrix representation 6. Eigenvectors and eigenvalues a. Definition b. Characteristic equation c. Diagonalization d. Linear transformation 7. Orthogonality a. Inner product, length b. Orthogonal sets c. Orthogonal projections d. Gram-Schmidt 8. Symmetric matrices a. Diagonalization b. Quadratic forms 9. Applications This course may also include: 1. Least-squares problems 2. Applications to image processing 3. Singular Value Decomposition 4. Circuit design 5. Other vector spaces	6 6 3 13 4 7 8 4 3	Upon completion of this course, the student will be able to: 1. Solve systems of equations with row reductions and echelon forms or with matrix factorizations 2. Reformulate statements about linear systems of equations into statements about vector equations, matrix equations, and/or linear transformations 3. Construct a basis of a given subspace 4. Compute an orthonormal basis using Gram-Schmidt 5. Formulate the matrix representation of a linear transformation in terms of specified bases 6. Compute the eigenvalues and eigenvectors of a given matrix 7. Demonstrate the invertibility of a matrix using conditions on the corresponding linear transformation, row space, column space, determinant, eigenvalues, rank, consistency and/or uniqueness of solutions to associated linear systems 8. Contruct proofs based on definitions and previously established theorems 9. Find a matrix representation of a quadratic form

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Total **lecture** hours*	54	

*Total lecture and laboratory hours (which includes the final examination) must equal totals on page 1.

2. REQUIRED TEXTS:

Provide a representative list of textbooks and other required reading; include author, title and date of publication:

Linear Algebra and Its Applications, David C. Lay

3. SUPPLEMENTARY READINGS:

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

4. WRITING ASSIGNMENTS:

Title 5, section 55002 requires grades to be "based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students." Writing assignments in this course may include, but are not limited to the following:

Writing assignments in this course include, but are not limited to, problem solving exercises.

5. REPRESENTATIVE OUTSIDE ASSIGNMENTS:

Out of class assignments may include, but are not limited to the following:

6. REPRESENTATIVE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING:

Title 5, section 55002(a) requires that a degree applicable course have a level of rigor that includes "critical thinking and the understanding and application of concepts determined by the curriculum committee to be at college level". Critical thinking may include, but is not limited to analysis, synthesis, and evaluation. Provide examples of assignments that demonstrate critical thinking.

Writing assignments involve problem solving and analysis. For example: "Prove that two similar matrices have the same rank."

7. METHODS OF EVALUATION:

Title 5, section 55002 requires grades to be "based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays, or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students." Methods of evaluation may include, but are not limited to the following (please note that evaluation should measure the outcomes detailed "Course Objectives" at the beginning of Section II):

Methods of evaluation may include, but are not limited to, quizzes and exams, including a final exam; homework; computer projects; portfolios or journals

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