DE LA SALLE UNIVERSITY
College of Science
Department of Mathematics

MTRXTHE – *Matrix Theory*
Prerequisite: MATH114 *Prerequisite to: LINMODE*

Instructor: **Contact details:**
Consultation Hours: **Class Schedule and Room:**

Course Description

This is an introductory course in matrix theory. Topics discussed include matrices, vector spaces, linear transformation and their matrix representation, eigenvalues and eigenvectors and diagonalization. Emphasis is given on concepts used in statistics.

Learning Outcomes

On completion of this course, the student is expected to present the following learning outcomes in line with the Expected Lasallian Graduate Attributes (ELGA)

ELGA	Learning Outcome
Critical and Creative Thinker Effective Communicator Lifelong Learner Service-Driven Citizen	At the end of the course, the student will perform the fundamental operations on matrices as well as illustrate the following concepts: vector spaces, subspaces, linearly independent sets, basis, rank of matrix, dimension of vector space, linear transformation, matrix of linear transformation with respect to different pairs of bases, eigenvalues and eigenvectors.

Final Course Output

As evidence of attaining the above learning outcomes, the student is required to submit the following during the indicated date of the term.

Learning Outcome	Required Output	Due Date
At the end of the course, the student will apply appropriate linear algebraic concepts, thinking processes, tools, and technologies in the solution to various conceptual or real-world problems.	Carefully crafted compilation of solved problems (theoretical exercises) that will manifest the application of the concepts learned	Week 13

Rubric for assessment

As evidence of attaining the above learning outcomes, the student is required to submit the following during the indicated dates of the term.

CRITERIA	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Understanding of mathematical concepts	Shows complete understanding of the underlying mathematical concepts and principles needed to solve the problem.	Shows nearly complete understanding of the problem's mathematical concepts and principles.	Shows some understanding of the mathematical concepts and principles needed to solve the problem.	Shows very limited understanding of the problem's mathematical concepts and principles.
Clarity of Explanation	Explanation is well-written, complete and unambiguous. Terminologies and symbols are used correctly.	Explanation is clear but few simple details are missed. Terminologies and symbols are used appropriately.	Explanation is little difficult to understand. Some symbols and notations are used inappropriately.	Explanation is difficult to understand.

Understanding of methods of proof	Shows correct understanding of the method of proof. Statements are logical and the desired conclusion is arrived at.	Shows correct understanding of the method of proof. The proof proceeded logically except for a few minor errors.	Shows correct understanding of the method of proof but there are major errors in reasoning.	Lacks understanding of the method of proof but an attempt to solve the problem is evident.

Grading System

	FOR EXEMPTED STUDENTS (w/out Final Exam)	**FOR STUDENTS with FINAL EXAM**	
		with no missed quizzes	*with one missed quiz*
Average of quizzes	90%	60%	50%
Other requirements	10%	10%	10%
Final exam	-	30 %	40%

Scale:

95-100%	4.0
89-94%	3.5
83-88%	3.0
78-82%	2.5
72-77%	2.0
66-71%	1.5
60-65%	1.0
<60%	0.0

Learning Plan

LEARNING OUTCOME	TOPIC	WEEK NO.	LEARNING ACTIVITIES
At the end of the course, the student will perform regression analysis, apply appropriate statistical concepts, processes, tools, and technologies in solving various conceptual and real-world problems.	I. **LINEAR EQUATIONS AND MATRICES** 1.1 Matrices and Special Forms (Square, Diagonal, Identity, Triangular, Null, Vectors, Scalars) 1.2 Matrix Operations (including Transpose, Partition, Trace) 1.3 Special Types of Matrices 1.4 Echelon Form of a Matrix 1.5 Equivalent Matrices (incorporate discussion above) 1.6 Inverse of a Matrix 1.7 Statistical Concepts: Mean Vectors, Variance – Covariance Matrices	7.5 hrs.	
	QUIZ1	1.5 hrs.	
	II. **DETERMINANTS** 2.1 Definition 2.2 Properties of Determinants 2.3 Cofactor Expansion 2.4 Cramer's Rule	6.0 hrs.	
	III. **LINEARLY (IN)DEPENDENT VECTORS** 3.1 Vector Spaces 3.2 Subspaces 3.3 Linear Dependence 3.4 Rank of a Matrix 3.5 Matrix Factorization	6.0 hrs.	

	QUIZ 2	1.5 hrs.	
	IV. **LINEAR TRANSFORMATIONS** 4.1 Definition and Examples 4.2 Kernel and Range of a Linear Transformation 4.3 Matrix of a Linear Transformation	6.0 hrs.	
	V. **EIGENVALUES AND EIGENVECTORS** 5.1 Definition of Eigenvalues and Eigenvectors 5.2 Diagonalization 5.3 Inner Product Spaces (Orthogonal and Orthonormal Vectors)	4.5 hrs.	
	QUIZ 3	1.5 hrs.	
	VI. **SPECIAL MATRICES AND CANONICAL FORMS** 6.1 Symmetric Matrices (AA' and A'A) 6.2 Skew-symmetric Matrices 6.3 Idempotent Matrices 6.4 Orthogonal Matrices 6.5 Canonical Forms 6.6 Quadratic Forms 6.7 Non-negative Definite Matrices	4.5 hrs.	
	Final Examination		

References

Kolman, Bernard. (2005). Elementary Linear Algebra, (7th edition). Upper Saddle River N.J.: Pearson Education

Searle, Shayle and Willet, Lois.(2000). Matrix Algebra for Applied Economics. New York: Wiley

Perry, Williams.(1988).Elementary Linear Algebra. (4th edition). New York: McGraw Hill

Anton, Howard.(1981). Elementary Linear Algebra, (3rd edition). New York: Wiley

Lee, Riess and Arnold. Introduction to Linear Algebra. (3rd edition)

Fraleigh and Beauregard. Linear Algebra(3rd Edition). Reading Mass: Addison Wesley

Online Resources

A First Course in Linear Algebra Accessed October 24, 2012 from: http://linear.ups.edu/

Dawkins, P. (2012) Paul's Online Notes: Linear Algebra. Accessed October 24, 2012 from: http://tutorial.math.lamar.edu/classes/Linalg/linalg.aspx

Class Policies

1. The required minimum number of quizzes for a 3-unit course is 3, and 4 for 4-unit course. No part of the final exam may be considered as one quiz.
2. Cancellation of the lowest quiz is not allowed even if the number of quizzes exceeds the required minimum number of quizzes.
3. As a general policy, no special or make-up tests for missed exams other than the final examination will be given. However, a faculty member may give special exams for
   A. approved absences (where the student concerned officially represented the University at some function or activity).
   B. absences due to serious illness which require hospitalization, death in the family and other reasons which the faculty member deems meritorious.
4. If a student missed two (2) examinations, then he/she will be required to take a make up for the second missed examination.
5. If the student has no valid reason for missing an exam (for example, the student was not prepared to take the exam) then the student receives 0% for the missed quiz.
6. Students who get at least 89% in every quiz are exempted from taking the final examination. Their final grade will be based on the average of their quizzes and other prefinal course requirements. The final grade of exempted students who opt to take the final examination will be based on the prescribed computation of final grades inclusive of a final examination. Students who missed and/or took any special/make-up quiz will not be eligible for exemption.
7. Learning outputs are required and not optional to pass the course.
8. Mobile phones and other forms of communication devices should be on silent mode or turned off during class.
9. Students are expected to be attentive and exhibit the behavior of a mature and responsible individual during class. They are also expected to come to class on time and prepared.
10. Sleeping, bringing in food and drinks, and wearing a cap and sunglasses in class are not allowed.
11. Students who wish to go to the washroom must politely ask permission and, if given such, they should be back in class within 5 minutes. Only one student at a time may be allowed to leave the classroom for this purpose.
12. Students who are absent from the class for more than 5 meetings will get a final grade of 0.0 in the course.
13. Only students who are officially enrolled in the course are allowed to attend the class meetings.

Approved by:

DR. ARTURO Y. PACIFICADOR, JR.
Chair, Department of Mathematics

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