

# X11 LINEAR ALGEBRA

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	ECONOMIC SCIENCES		
<b>DEPARTMENT</b>	ECONOMICS AND SUSTAINABLE DEVELOPMENT		
<b>LEVEL OF STUDY</b>	<i>Undergraduate</i>		
<b>COURSE UNIT CODE</b>	X11	<b>SEMESTER OF STUDY</b>	1st
<b>COURSE TITLE</b>	LINEAR ALGEBRA		
<b>COURSEWORK BREAKDOWN</b>		<b>TEACHING WEEKLY HOURS</b>	<b>ECTS Credits</b>
Lectures		4	7,5
<b>COURSE UNIT TYPE</b>	Compulsory		
<b>PREREQUISITES :</b>	NO		
<b>LANGUAGE OF INSTRUCTION/EXAMS:</b>	English		
<b>COURSE DELIVERED TO ERASMUS STUDENTS</b>	YES in English		
<b>MODULE WEB PAGE (URL)</b>			

### 2. LEARNING OUTCOMES

<b>Learning Outcomes</b>
<p>This is an essential introductory subject that offers to the students the preliminary knowledge of mathematics for economics science students. The aim is to introduce and familiarize students to the basic aspects of linear algebra. On successful completion of this module the learner will be able to:</p> <ul style="list-style-type: none"><li>• Handle matrices (addition, multiplication, inversion, factorization).</li><li>• Solve linear systems, and linear systems of special forms (symmetric, positive definite, diagonal, banded)</li><li>• Compute eigenvalues and eigenvectors of a given matrix</li><li>• Solve all the above problems using MATLAB.</li></ul>
<b>General Skills</b>
<ul style="list-style-type: none"><li>• Retrieve, analyze and synthesize data and information, with the use of necessary technologies.</li><li>• Make decisions.</li><li>• Advance free, creative and causative thinking.</li></ul>

### 3. COURSE CONTENTS

Matrices, special matrices, matrix operations. Systems of linear equations, Gaussian elimination, LU factorization, Inverse matrix. Vector spaces and subspaces, Linear combination, dependence, basis and dimension.
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The Nullspace of A, the complete solution of  $Ax=b$ .  
 Determinants, properties and applications.  
 Linear transformations.  
 Eigenvalues and eigenvectors, matrix diagonalization.  
 Introduction to MATLAB and applications to all above topics.

#### 4. TEACHING METHODS - ASSESSMENT

<b>MODE OF DELIVERY</b>	Lectures in the classroom	
<b>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</b>	Electronic Presentations MATLAB Moodle e-learning platform	
<b>TEACHING METHODS</b>	<b><i>Method description</i></b>	<b><i>Semester Workload</i></b>
	Lectures	39
	Practice in the lab - Programming Assignments	13
	Personal Study	128
	<b><i>Total</i></b>	<b><i>180</i></b>
<b>ASSESSMENT METHODS</b>	Final written examination (100%)	

#### 5. RESOURCES

*Recommended Book Resources:*

1. Gilbert Strang, Linear Algebra for Everyone, Wellesley-Cambridge Press.
2. Gilbert Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press.
3. Seymour Lipschutz, Schaum's Outlines of Linear Algebra, McGraw Hill.