SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
MAT	**621**	**Advanced Linear Algebra**	**4**	**3**	**0**	**1**	**8**		**1**	**English**

A. Course Description

This course describes the most important ideas and theoretical results regarding the fundamentals of linear algebra. A particular attention will be given to applications in Matrix Theory and canonical transformations.

The course includes the essential fundamentals of inner product spaces and their matrices with spectral properties. Quadratic forms are investigated too.

B. Course Outcomes

At the end of this course the student will be able to:

- Learn basic methods of the theory of linear transformations of vector spaces over complex numbers and their matrices.
- Write algorithms of finding canonical bases consisting of their eigenvectors and applications in various branches of mathematics.

C. References

Required Textbook

Linear algebra, S. Friedberg, A. Insel, and L. Spence, 4th Ed., Pearson, 2002**.**

Other References

1. *Linear algebra*, K. Hoffman, R. Kunze, 2nd Ed., Pearson, 1971.

2. *Linear Algebra*, J. Kwak, S. Hong, 2nd Ed., Birkhäuser Boston; 2004.

Course Website: Google Classroom Webpage: http://www.imamm.org/

D. Topics Outline

1. **Vector Spaces:** Review of Bases and Dimensions, Linear Transformations and their Matrices, Nullity and Image, The Solution Space of a Homogeneous Linear System, The General Solution of a Non-Homogeneous Linear System, Direct Sum and Quotient Spaces, The Rank Nullity Theorem and Complements, Dual and Double Dual Spaces.
2. **Eigenvalues and Linear Operators:** Eigenvalues and Eigenvectors, Characteristic Polynomial and Cayley-Hamilton Theorem, Similarity and Diagonalizations of Matrices, Invariant Subspaces, Primary Decompositions, Rational and Jordan Canonical Forms.
3. **Inner Product Spaces:** Inner Products and Norms, Orthonormality and Gram-Schmidt Processes, The Adjoint of a Linear Operator, Normal and Self-Adjoint Operators, Unitary and Orthogonal Operators and Their Matrices, Orthogonal Projections and The Spectral Theorem.
4. **Quadratic Forms:** Bilinear and Quadratic Forms, Rank of a Quadratic Form, Equivalent Quadratic Forms, Diagonal Form of a Quadratic Form and Law of Inertia.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm:** 8^{th} or 9^{th} week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16^{th} week.

Your course grade will be based on your semester work as follows:

Midterm : 30 %	**Final Exam:** 40 %
4 Quizzes + 4 Homeworks, Attendance & Participation: 30 %	

The grading distribution:

A^+	A	B^+	B	C^+	C	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[0, 70)

G. Student Workload:

#	Teaching/learning activities	Contact Hours	Frequency	Total Contact hours	Self-study hours	Total self-study hours	Student Learning Time
1	Lecture	3	15	45	1.5	22.5	67.5
2	Tutorial	1	15	15	3	45	60
3	Lab\Practical	0	0	0	0	0	0
4	Homework	0	4	0	1.5	22.5	22.5
5	Quiz	0.25	4	1	1	4	5
6	Test (Midterm)	2	1	2	12	12	14
7	Final Exam	2	1	2	12	12	14
Total				**65**		**118**	**183**

Independent self-study = 118/15 ≅ 8 hrs per week

H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Examsgoo.gl/ykm7t3