UNIVERSITY OF GUAM
UNIBETSEDÅT GUAHAN

College of Natural & Applied Sciences
Division of Mathematics & Computer Science

MA 341 Linear Algebra Fanuchanan (Fall) 2024

Class Meeting:	TTh 9:30 – 10:50 a.m.	SC 121
Instructor:	Zoltan Szekely, Ph.D.	Associate Professor of Mathematics
Office:	SC 106	**Phone:** 735-2830
Email:	zszekely@triton.uog.edu	
Office Hours:	MTW 3:00 – 5:00 p.m.	

Catalogue Course Description:

Topics covered include linear equations, matrices, determinants, vectors, vector spaces, subspaces, linear dependence, Euclidean spaces. Prerequisite: Grade of C or better in MA 204.

Course Content:

The following are the major topics to be treated: Linear Equations (Gaussian Elimination), Determinants, Vector Spaces, Subspaces of R^n and Their Dimensions, Linear Transformations, Orthogonality, Eigenvalues and Eigenvectors

Rationale for Offering the Course:

This course is a major requirement of *both the mathematics* and *the computer science programs*. The basic techniques and ideas of linear algebra are applied in almost *every discipline of both pure and applied mathematics*. Important applications of linear algebra range from techniques for *solving differential equations* used in physics and engineering, to the *simplex method* used in business mathematics. Many computing applications are designed using linear algebra. MA 341 is a useful *preparatory course for most upper-level mathematics class*es. It is especially useful for students planning to take MA 375, Numerical Methods and Software, or MA 411, Abstract Algebra.

Linear algebra provides a natural *bridge to upper-level mathematics*. There are many opportunities to illustrate how basic mathematical ideas can be adapted to many different purposes if the student's conceptual grounding is firm. The student should get a sense of how upper-level mathematics concentrates much less on developing skills and techniques, and more on *instilling conceptual understanding* which has proven useful, and which can be expected to be adapted to *any area of mathematics.*

Intended Student Learning Outcomes (SLOs):

After completing the course, successful students will be able to

1. *use* basic algorithms employed in linear algebra (e.g. Gauss-Jordan elimination),
2. *demonstrate knowledge* of the theory and application of vectors, matrices, vector spaces and linear transformations,
3. *apply* linear algebra for problem solving by *demonstrating* the ability to adapt the conceptual tools they are given to different kinds of problems,
4. *make use* of appropriate computer software now available as an aid in calculations.

Textbook: Linear Algebra, a Modern Introduction by David Poole, 4th edition. We will cover most of *Chapters 1-7* as time permits. Chapter 8 is available *online.*

Weeks 0-2	*Chapter 1: Vectors (*review) *Chapter 2: SoLEs* 2.1 Introduction to SoLEs 2.2 Direct Methods for solving SoLEs 2.3 Spanning Sets and Independence Review Quiz *Chapter 3: Matrices* 3.1 Matrix Operations	Weeks 9-10	*Chapter 5: Orthogonality* 5.1 Orthogonality in R^n 5.2 Orth. Complements and Projections 5.3 The Gram-Schmidt Process and the QR factorization 5.4 Orthogonal Diagonalization of Symmetric Matrices 5.5 Applications Review
Weeks 3-4	3.2 Matrix Algebra 3.3 The Inverse of a Matrix Review Quiz 3.4 The *LU* Factorization 3.5 Subspaces, Basis, Dimension and Rank	Weeks 11-12	Quiz *Chapter 6: Vector Spaces* 6.1 Vector Spaces and Subspaces 6.2 Linear Independence, Basis and Dimension 6.3 Change of Basis Review
Weeks 5-6	3.6 Intro to Linear Transformations Review Quiz *Chapter 4:* *Eigenvalues and Eigenvectors* 4.1 Introduction 4.2 Determinants	Weeks 13-14	Quiz 6.4 Linear Transformations 6.5 Kernel and Range of Lin. Transf. 6.6 Matrix of a Lin. Transformation Review Quiz *Chapter 7: Distance and Approximation* 7.1 Inner Product Spaces
Weeks 7-8	4.3 Eigenvalues of *n x n* Matrices 4.4 Similarity and Diagonalization Review Midterm	Weeks 15-16	7.2 Norms and Distance Functions 7.3 Least Squares Approximation Review for the Final Final Test

Format/Activities in the Class:

It is a face-to-face course. Participate in *each class session on time*. Learning mathematics requires that you work and *practice mathematics every day*. Dialogue and cooperative learning are encouraged. You will learn *clear communication* of your ideas. Your instructor is hard of hearing. You may email me any time.

You are expected to attend *each class session on time*. Learning mathematics requires that you work and *practice mathematics every day*. *Good communication* is essential. Dialogue and cooperative learning are encouraged. You will learn *clear communication* of your ideas. Your instructor is hard of hearing. If you have a question, raise your hand and, please, talk loudly. Follow the *communication guidelines* distributed. We'll have *amplifying technology* installed in our classroom. Please, use it properly. In case of any problem with the technology, please, immediately notify your instructor. Please, return the microphones to your instructor after class. No technology can be taken out of the classroom. An assessment will be performed via embedded questions in one of your assignments.

Format of Quiz and Test Submissions:

Quizzes will have time limitations. Please, complete your Quizzes in the given time limit. Each Quiz can be attempted only once, at the assigned time in class. Exams will have two parts. Part 1 is a multiple-choice Quiz, longer than a regular Quiz. Part 2 consists of open-ended problems to work out paper-and-pencil. The *due time* for finishing an Exam will be set. Manage your time properly during an Exam.

Assignments, Quizzes, Tests:

You will have to *read the textbook* for each class in advance and review the section covered after class. You need to do *all your homework assignments.* You are encouraged to learn together with fellow classmate(s) as *study partners*. Please note that all the work you handed me in must reflect *your own individual efforts*. You should be ready for *pop Quizzes* with questions like your homework assignments (hint: see even exercises in your book).

There will be up to 10 Quizzes, in both Multiple-choice Moodle and paper-and-pencil format. The *Midterm Exam* has 2 parts, combining these 2 formats. Timing may be modified depending on the progress we make with the class material. Keep in mind that the scores you earn in this class *will be in direct correlation with the individual effort you invest in studying your subject!* The *Final Test* is cumulative.

Preliminary Test dates (any change will be announced in class):

- Midterm: Thursday, October 3rd
- The *Final* is on Tuesday, December 10th at 10:00 – 11:50 a.m.

Evaluation and Grades:

We'll have a *"no work – no credit"* policy in this class. This means you must *show all the work* for any problem in a quiz or test, to get credit. In mathematics, you always must explain your answers. If any assignment is being copied, *both students involved in copying will lose their credit* for the assignment.

Quizzes earn up to *10 points* each, while Tests earn up to *100 points*. Make every effort to earn as much points as you can. Up to 8 Quizzes with the highest scores will be kept and two with the *lowest scores* will be dropped. At the end of the semester an overall *Semester Score* you earned will be calculated as follows:

- Quizzes 40 %
- Midterm Exam: 20 %
- Attendance, participation, and online course evaluation:
- 5 %
- Assessment: 5 %
- Final Test: 30 %
- Total: 100 %

Grading Scale:

- A+: 100 – 95% - A: 94.9 – 90% - B+: 89.9 – 85% - B: 84.9 – 80%
- C+: 79.9 – 75% - C: 74.9 – 70% - D: 69.9 – 60% - F: 59.9 – 0%

A Pre-Final Score (including all but the Final Score) that you will have earned by your class work during the session including your Quiz Scores, Midterm Score, attendance, and participation scaled up to 100% will be calculated and provided to you before you take the Final Test. Grade information can be obtained via email for a limited time after taking the Final. To receive it, you will have to send an email to your instructor after 2 days of the Final. This email will be replied with the following information: Final Test Score, Overall Semester Score, and the Semester Grade you earned.

Course Policies:

Attend each class on time, participate and do the coursework. Both attendance and participation will be recorded. If you cut a class, it is *your responsibility* to make up any missed class material! Pagers, cell phones or any distractive devices must be *turned off* in the classroom. Be courteous in class, don't chat, respect, and pay attention to your instructor/classmate who works on the board. *Focus on learning* so that you benefit the most from participating in the class activities.

Make-up policy: No make-up for missed Quizzes or homework. Missed scores are counted as zero. If you must miss a Test, let your instructor know it in advance. If your excuse is approved, you may make up one Test *on the last week of classes*. You will have to make a written request for any make-up Test at least one week before you take it.

Best practices to follow:

Study *at least 2 hours* for this course every day. Start with a short *review* of the previous section, making sure that you understand and correct if needed the solutions for the assigned exercises. Also review the last Quiz you received back. *Then read through the current section* from your textbook paying special attention to the worked-out examples. When completed, *compare what you read with your class notes* and go through the examples we had in class again. Try to *solve the* homework exercises*. Give your best effort*. After finish, check the solution key in the book. Please note, that the book may have, occasionally, typos in the solution key.

Write down the homework assignments in a separate booklet indicating your name, the date, the section, and the exercise number for each exercise. If there is a *work sheet* handed out, work out the answers for those questions, as well. If you get stuck, *seek help* from your instructor. Office hours, phone or email are all suitable ways to contact him. *Do not give up on trying until you succeed*. We'll have time to discuss solutions for the most challenging exercises in class. *Bottom line:* It is a challenging course. You'll have help available to succeed. You'll also need determination.

Be ready to *present your solutions* on board next class. Make special preparation for *review classes, Quizzes,* and the *Midterm*. If you have a question, *don't hesitate to ask* in the class or visit me during my office hours. There is no guarantee that you would obtain a passing grade easily in this

course, but if you follow these best practices, *you will have the best chances to earn a good grade.*

Policy on Academic Integrity:

Academic honesty is fundamental to our learning community. The University maintains a Code of Academic Integrity. A confirmed violation of that Code on this course will result in *failure* of the course. Cheating is strictly prohibited because it *devalues the degree* you are working hard to get. As a member of the University community, it is your responsibility to protect your educational investment by knowing and following the rules. *Academic dishonesty* and *plagiarism* are serious violations of university policy, punished by failing grade and/or suspension. *Never cheat* and *never be dishonest*! Please, also see the attached *Statement on Academic Integrity* by the Division of Mathematics and Computer Science!

Special Needs: **Americans with Disabilities Act Amendments Act**

DSS Accommodation Services: If you are a student with a disability who will require an accommodation(s) to participate in this course, please contact the Student Counseling and Advising Service Disability Support Services office to discuss your specific accommodation needs confidentially. A Faculty Notification letter will be emailed to me specifying your approved accommodation. If you are not registered, you should do so immediately at the Student Center, Rotunda office #5, sssablan@triton.uog.edu or ph./TTY: 735-2460, to coordinate your accommodation request.

Family Education Rights and Privacy Act (FERPA):

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights for students, parents and school officials can be viewed at: http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html

Tobacco Policy:

The University of Guam is a tobacco-free campus and has a total ban on sales, smoking and distribution and use of tobacco and tobacco-based products on campus. UOG is committed to promoting the health, wellness

and social well-being of the University Community, the people of Guam and the Western Pacific.

Drop Date:

Except extenuating circumstances, no withdrawal petition will be signed by your instructor on the last week of classes.

Contact for Classmates:

You are encouraged to exchange *contact information* with your classmates. Choose at least one *study partner*. Contact your classmate(s) if you miss a class and make up the missed material. You are also encouraged to form *study groups.* List here some contact information from your classmates:

Name	Phone Number	Email address	Study partner?(y/n)

MA 341 Linear Algebra

Intended Student Learning Outcomes (SLOs):

- *MA 341 SLO1 – use* basic algorithms employed in linear algebra (e.g. Gauss-Jordan elimination),
- *MA 341 SLO2 – demonstrate knowledge* of the theory and application of vectors, matrices, vector spaces and linear transformations,
- *MA 341 SLO3 – apply* linear algebra for problem solving by *demonstrating* the ability to adapt the conceptual tools they are given to different kinds of problems,
- *MA 341 SLO4 – make use* of appropriate calculator or computer software now available as an aid in calculations.

Mathematics Program Learning Outcomes (PLOs):

Students completing the mathematics program at the UOG will:

- *MA PR PLO1 – demonstrate* critical thinking, problem solving skills and ability to *use* mathematical methods by identifying, evaluating, classifying, analyzing, synthesizing data and abstract ideas in various contexts and situations,
- *MA PR PLO2 – exhibit* a sound conceptual understanding of the nature of mathematics, and *demonstrate* advanced mathematical skills in mathematical analysis, modern algebra and other mathematical discipline(s),
- *MA PR PLO3 – argue* and *reason* using mathematics, read, *create* and *write* down logically correct mathematical proofs, *use* exact mathematical language and *communicate* mathematics efficiently orally, in writing and using information technology tools,
- *MA PR PLO4 – apply* abstract thinking, mathematical methods, models, and current practices in the sciences, including state-of-the-art mathematical software, to solve problems in theoretical mathematics or in a diverse area of mathematical applications,
- *MA PR PLO5 – show maturity* in mathematical knowledge and thinking that prepares and encourages students to pursue graduate studies in mathematics or in related fields,
- *MA PR PLO6 – demonstrate* an appreciation of and enthusiasm for inquiry, learning and creativity in mathematical sciences, a sense of exploration that enables them to pursue lifelong learning and up-to-date professional expertise in their careers through various areas of jobs, including governmental, business, or industrial jobs in mathematics, related sciences, education, or technology.

Institutional Learning Outcomes (ILOs):

After graduating at the UoG, successful students will *demonstrate* and *apply:*

- *UoG ILO 1* – mastery of *critical thinking* and *problem solving,*
- *UoG ILO 2* – mastery of *quantitative analysis,*
- *UoG ILO 3* – effective oral and written communication*,*
- *UoG ILO 4* – understanding and appreciation of culturally *diverse* people, ideas, and values in a democratic context,
- *UoG ILO 5 – responsible* use of knowledge, natural resources, and technology,
- *UoG ILO 6* – an appreciation of the *arts* and *sciences*,
- *UoG ILO 7* – an interest in *personal development* and *lifelong learning*.

Curriculum Mappings:

	MA PR PLO1	*MA PR PLO2*	*MA PR PLO3*	*MA PR PLO4*	*MA PR PLO5*	*MA PR PLO6*
MA 341 SLO1	x			x		
MA 341 SLO2	x	x				
MA 341 SLO3	x	x	x			
MA 341 SLO4				x		x

	UoG ILO1	*UoG ILO2*	*UoG ILO3*	*UoG ILO4*	*UoG ILO5*	*UoG ILO6*	*UoG ILO7*
MA PR PLO1	x	x					
MA PR PLO2	x	x					
MA PR PLO3	x	x	x				
MA PR PLO4	x	x	x			x	
MA PR PLO5					x	x	
MA PR PLO6					x	x	x