MAS 3105 Linear Algebra

CRN 12465 (3 credits), Spring 2018
College of Arts and Sciences
Department of Mathematics

Instructor/E-mail:	Cara D. Brooks, Ph.D. (Assistant Professor) `cbrooks@fgcu.edu`
Class Meetings:	MWF 1:30pm - 2:20pm, Merwin Hall 115
Classpage:	See class page in Canvas, `http://canvas.fgcu.edu`
Office/Phone:	206 Whitaker Hall, (239) 590-7073
Office Hours:	Mondays, Wednesdays, and Fridays from 11:00am-12:20pm and other times by appointment.

When seeking help during office hours, it is important that you organize your questions in advance, bring your class notes with you, and be prepared to show your own homework attempts. Missed lectures will NOT be repeated during office hours.

Course Introduction:

Welcome to Linear Algebra!

My name is Dr. Brooks and over the next 16 weeks, you will be working to acquire knowledge of the theory and computational techniques of linear algebra.

You may be wondering,

"What is Linear Algebra?"

In a nutshell, linear algebra refers to the study of linear transformations (represented primarily for us as matrices) and the finite dimensional vector spaces on which they are defined.

The topics in this course include matrices and determinants, matrix operations, and canonical factorizations, Gauss-Jordan elimination, vector spaces, linear transformations, basis, linear independence, orthogonality, eigenvalues and eigenvectors, similarity, and diagonalization.

Now you may also be wondering,

"Will I have to write proofs?",

and the answer is,

"Yes, but not big scary formal ones!"

You will be required to exercise your critical thinking skills, assess whether or not a claim holds, apply content knowledge, and explain your reasoning while transitioning between (correct) mathematical symbols and notation and written English. In the end, you will establish basic results about matrices, linear systems of equations, and vector spaces.

You will also be asked to think about how you learn. You will be expected to attend class, participate, thoughtfully engage with the material outside of class on a near daily basis, self-assess, and seek help if you are having difficulty.

It's not all on you though. I commit to provide you clear, organized, collaborative lectures equipped with illustrative examples. In these lectures, I will present and explain the material, and demonstrate how to think and approach problems, and apply computational techniques. I will provide you with multiple opportunities to engage with the material, to practice working problems, to ask questions, to assess how well you are learning, and to collaborate with your peers. These

opportunities will take the form of in-class worksheets, take-home quizzes, take-home exams, and suggested exercises.

I also promise to provide you with individual, detailed feedback to your responses on every quiz and exam. I will to be available during office hours to clarify misunderstandings and aid in your successful completion of class work, quizzes, and suggested exercises.

Indeed, this course will require your active participation and hard work, and perhaps bring about new perspectives in how you think and learn mathematics. This class will be designed to help you to become better equipped to apply linear algebra concepts and computational techniques to solving "real" problems, examples of which appear throughout the text. More importantly, as a student of mathematics (or any other discipline), the critical thinking and writing skills honed this term will positively impact your ability to reason and communicate your thinking in other contexts.

Course content:

- **Required Text:** *Linear Algebra with Applications, 8th Edition*, by Steven J. Leon.
- **Topics:** Material for the course will be drawn from chapters 1-6 with selected omissions and additions (see tentative schedule). Changes will be announced in class and posted in Canvas.
- **Course Technology:** Calculators with matrix capabilities may be used on occasion during class and can be checked out from the library with your student ID. However, assessments prohibit the use of calculators.
- **Prerequisite:** MAC 2313 (Calculus III) for level Undergraduate with minimum grade of C.
- **Format**: Each class will consist primarily of a collaborative lecture with examples, and occasional group work or discussion of solutions to homework exercises. We will attempt to cover one section per class period. You should plan on spending *at least* 9-12 hours outside of class each week rewriting and working through your notes, studying definitions and theory, working on suggested exercises, and completing assessments.

Grading:

- **Evaluation:** Grades will be determined by the total number of points earned out of 575 based on the following assessments:

In-class Exams	300 points
Quizzes	120 points
Final Exam	140 points
Critical Reflections	15 points

There is NO curve. The following scale will be used:

90-100%	85-89%	78-84%	73-77%	65-72%	60-64%	54-59%	$< 54\%$
A	B+	B	C+	C	D+	D	F

In borderline cases, a minus grade (e.g. B-) may be considered.

- **Exams:** There will be three regular exams (see tentative schedule below) each worth 100 points and a comprehensive final exam worth 140 points on Wednesday, May 2nd from 12:30pm - 2:45pm in Merwin Hall 115.

- **Quizzes:** There will be at least eight (8) quizzes (see tentative schedule below), each of which is worth 20 points. **Only the highest 6 quiz scores will be counted**.
- **Homework:** As each section is covered, a list of suggested exercises from that section will be posted on the class page in Canvas. *It is your responsibility to do these problems and seek help if you are having difficulty.* You are strongly urged to come to office hours to ask questions. To succeed in this course, *you should work through all of the suggested problems* (sometimes more than once) and check to see that you are doing the problems correctly! It may be necessary to do other problems from the sections covered not included on the list. Each week, a small amount of class time may be devoted to answering questions from the homework whenever time allows.
- **Critical reflections:** Following each in-class exam, you will be asked to self-assess the degree to which you think you met the learning objectives assessed on that exam. You will be asked to estimate the amount of time and personal effort you put in and to reflect on any changes you might make in preparation for future assessments.

Course Learning Objectives: The primary goal of this course is to provide students a strong foundation in the theory and techniques of linear algebra. Students will demonstrate critical thinking and some basic proof writing will be required. Students will

1. Acquire and apply content knowledge and computational techniques to solve problems in the context of linear algebra.
2. Think critically and demonstrate the use critical thinking skills to solve problems;
    - apply logic and deductive reasoning to establish basic mathematical results using only definitions and theorems applicable in the given context;
    - State, express, apply, sketch, identify, prove (argue/justify), and construct in the given context.
3. Craft detailed and organized mathematical arguments (proofs); use correct mathematical notation, define variables, use phrases to explain thought and smooth flow (between symbols), and reference given hypotheses.
4. Learn how to learn. Discover ways to self-assess independently whether learning has occurred. Estimate the amount of time and personal effort required to learn mathematical procedures and concepts in a deep and meaningful way.

Additional policies:

- **Quiz and Exam Policies:** Notes are NOT allowed during exams or quizzes (unless written directions permit you to do so). Some quizzes and exams may allow the use of a course-approved calculator while others may be solely "by hand." There are NO make-up quizzes. If you are excused for an absence (valid documentation must be provided) resulting in your missing a quiz, your final exam grade will be used to replace the missed quiz score. On exam days, arrive to class five minutes early and plan to stay five minutes after class. If you miss an exam due to an *extreme* circumstance, you must provide valid documentation of the incident, otherwise a missed exam will receive the score 0. An excused exam score may be replaced with your final exam score or your course grade may be taken out of 100 fewer points. *Traveling schedules, a desire for a cheaper air fare, etc. are NOT acceptable excuses.* Students are expected to read this syllabus carefully and **plan well ahead**.

- **Attendance and Participation:** Students enrolled in the course are expected to attend all class meetings and participate during class. Any student engaged in disruptive conduct may be asked to leave the classroom for the day. If you are absent from class, *you are responsible* for getting notes for that day *from a classmate*. Office hours will not be used as a substitute for missed lectures.

- **Announcements:** Be advised that the Tentative Schedule below is *tentative*. Any changes to this syllabus (e.g. scheduling of exams, quizzes, etc.) will be announced in class and posted on the weekly class page in Canvas. Other communications will be sent to your Eagle email account.

- **Video and/or Audio Recording** Video and audio recording of class lectures is expressly prohibited unless the FGCU Office of Adaptive Services has documented your disability and determined the best reasonable accommodation for you is to allow recording and you have executed a written agreement regarding the limitations on use of such recordings and their disposition at the end of the semester.

- **Technology Policy:** All cell phones (and similar devices) must be set to *vibrate or turned off* during all class meetings, quizzes and exams. *Texting, phone calls, listening to headphones, and using laptops (if not an approved accommodation)* ***are not*** *permitted during class*. Unauthorized use of any of the above devices may be considered as disruptive conduct.

  As of fall 2015, all faculty members are required to use Canvas to confirm a student's attendance for each course by the end of the first week of classes. Failure to do so will result in a delay in the disbursement of your financial aid. The confirmation of attendance is required for all students, not only those receiving financial aid.

- **Academic Behavior Standards and Academic Dishonesty:** Academic dishonesty will not be tolerated. *Cheating, aiding and abetting cheating, plagiarism and other forms of academic dishonesty will be dealt with accordingly. Penalties range from a zero on an assessment to failure of the course.* ***All occurrences of academic dishonesty will be reported to the Dean of Students.*** *Serious cases will be referred to a judicial committee and may result in more severe penalties.*

  All students are expected to demonstrate honesty in their academic pursuits. The university policies regarding issues of honesty can be found in the FGCU Student Guidebook under the Student Code of Conduct and Policies and Procedures sections. All students are expected to study this document, which outlines their responsibilities and consequences for violations of the policy. The FGCU Student Guidebook is available online at `http://studentservices.fgcu.edu/judicialaffairs/new.html`

- **University Nondiscrimination Statement:** Florida Gulf Coast University is committed to ensuring equity and fairness for all University employees, students, visitors, vendors, contractors and other third parties. As such, the University prohibits discrimination on the bases of race, color, national origin, ethnicity, religion, age, disability, sex (including sexual harassment/assault), gender identity/expression, marital status, sexual orientation, veteran status or genetic predisposition with regard to admissions, employment, programs or other activities operated by the University. This prohibition extends to enforcement of Title IX of the Education Amendments of 1972. Questions or complaints should be directed to the Office of Institutional Equity and Compliance (OIEC). The OIECs phone number is (239)745-4366; the OIEC email address is OIEC@fgcu.edu.

- **Disabilities Accommodations Services:** Florida Gulf Coast University, in accordance with the Americans with Disabilities Act and the university's guiding principles, will provide

classroom and academic accommodations to students with documented disabilities. If you need to request an accommodation in this class due to a disability, or you suspect that your academic performance is affected by a disability, please see me or contact the Office of Adaptive Services. The Office of Adaptive Services is located in the Wellness Building. The phone number is 239-590-7956 or Video Phone (VP) 239-243-9453. In addition to classroom and campus accommodations, individuals with disabilities are encouraged to create their personal emergency evacuation plan and FGCU is committed to providing information on emergency notification procedures. You can find information on the emergency exits and Areas of Rescue Assistance for each building, as well as other emergency preparedness materials on the Environmental Health and Safety and University Police Department websites. If you will need assistance in the event of an emergency due to a disability, please contact Adaptive Services for available services and information.

- **Student Observance of Religious Holidays:** All students at Florida Gulf Coast University have a right to expect that the University will reasonably accommodate their religious observances, practices, and beliefs. Students, upon prior notification to their instructors, shall be excused from class or other scheduled academic activity to observe a religious holy day of their faith. Students shall be permitted a reasonable amount of time to make up the material or activities covered in their absence. Students shall not be penalized due to absence from class or other scheduled academic activity because of religious observances. Where practicable, major examinations, major assignments, and University ceremonies will not be scheduled on a major religious holy day. A student who is to be excused from class for a religious observance is not required to provide a second party certification of the reason for the absence.

- **Some important dates:**

  1. Monday, January 8 - Classes Begin
  2. Friday, January 12 - Last Day to Drop/Withdraw via Gulfline (100% Refund)
  3. Monday, January 15 - MLK Holiday Observed (no classes)
  4. Monday, March 5 to Saturday, March 10 - Spring Break (no classes)
  5. Friday, March 23 - Last Day to Drop/Withdraw without Academic Penalty
  6. Friday, April 27 - Study day (no classes)
  7. Saturday, April 28 - Last Day of Classes

  The full FGCU Academic Calendar Spring 2018 is available online at
  `http://www.fgcu.edu/Registrar/academiccalendar.asp`

****Tentative Schedule** :**

Week(s)	Dates	Topics
1	1/8, 1/10, 1/12	Linear Systems and Echelon Forms, Matrix Arithmetic, 1.1, 1.2, 1.3
2	1/17, 1/19 (no class 1/15)	Matrix Algebra 1.4, **Quiz 1 (F)**
3	1/22, 1/24, 1/26	Elementary Matrices 1.5
4	1/29, 1/31, 2/2	Determinants 2.1, 2.2, **Quiz 2 (F)**,
5	2/5, 2/7, 2/9	Vector Spaces, Subspaces 3.1, 3.2
6	2/12, 2/14, 2/16	Nullspace, **Exam I (F)** (1.1-1.5, 2.1, 2.2)
8	2/19, 2/21, 2/23	Span, Lin. Indep. 3.2, 3.3 **Quiz 3 (F**
9	2/26, 2/28, 3/2	Basis and Dimension, Fund. Subspaces 3.4, 3.6, **Quiz 4 (F)**
	3/5–3/9 (no classes)	Spring break
10	3/12, 3/14, 3/16	Fundamental subspaces, Lin. Transformations 3.6, 4.1, **Quiz 5 (F)**,
11	3/19, 3/21, 3/23*	Matrix Representation, **Exam II (F)** (3.1-3.4, 3.6)
12	3/26, 3/28, 3/30	Scalar Prod. in $\mathbb{R}^n$, Orthog. Subspaces 5.1, 5.2, **Quiz 6 (F)**
13	4/2, 4/4, 4/6	Least Squares, Inner Product Spaces 5.3, 5.4
14	4/9, 4/11, 4/13	Orthonormal Sets, Review 5.5, 6.1, **Quiz 7 (F))**
15	4/16, 4/18, 4/20	Eigenvalues and eigenvectors, **Exam III (F)** 6.1
16	4/23, 4/25 (no class 4/27)	Diagonalization 6.3, **Quiz 8 (W)**
17	5/2	**Final Exam (W)**