Name: Dr. Jonathan Mitchell  
Email: mitchelljonat@sfasu.edu  
YouTube Channel: www.YouTube.com/MathDoctorMitchell  
Phone: 936-468-1606  
Class meeting time and place: MW 1:00-2:15 PM, Rm 205  
Office: Bush Math building Rm 352  
Office Hours: M: 9-10am, W: 8-10am, T/Th: 10-11am, F: (by appt)  
You may knock anytime. I have an “open door” policy. When you come to visit, my office door stays open.

Course Description: The core of this course is finite dimensional vector spaces, linear transformations and matrices with numerical aspects. The course will also cover the correspondence between linear transformations and matrices, determinants, eigenvalues and eigenvectors.

Text and Materials
- **Book:** The required textbook is Matrix Mathematics, A Second Course in Linear Algebra. 2nd edition, Garcia and Horn. Cambridge U. Press ISBN 9781108837101  
- **MATLAB:** While you do not have to purchase a student license (~$50), you must have access to the licensed software for you to fulfill the course objectives, assignments, etc. SFA CoSM provides a limited number of licences for you utilize for free using SFA virtual machines.

Course Requirements
- **When you arrive to class,** put your cell phone and other devices on silent (or turn off) and away from you unless told otherwise. Before any quiz or exam put away all smart watches.  
- **Two exams** — Each exam will be taken outside of the regularly scheduled class time. These times will be coordinated with student input by your instructor.  
- **Homework** — Students will be assigned homework exercises from the textbook and from other (provided) supplemental materials for each major topic in the course.  
- **Quizzes** —Students will be assigned periodic in-class and take-home quizzes, which will be designed to have students writing proofs, and testing algorithms that solve specific problems.  
- **A cumulative final exam** —The final exam is Tuesday, May 7, 10:30 – 12:30AM

Grading Policy
That is, your grade is the average with the following weights:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Quiz &amp; Presentations</td>
<td>20%</td>
<td>90 – 100</td>
</tr>
<tr>
<td>Exam 1</td>
<td>20%</td>
<td>80 – 89</td>
</tr>
<tr>
<td>Exam 2</td>
<td>20%</td>
<td>70 – 79</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
<td>60 – 69</td>
</tr>
<tr>
<td>below 60</td>
<td></td>
<td>F</td>
</tr>
</tbody>
</table>

Attendance Policy: Students are expected to attend all class meetings, arriving on time. If you are absent, you are responsible for determining what you missed and for being prepared for class when you return. Leaving class early will result in your being counted absent for the class session. Students that sleep in class, send or receive text messages, or conduct other activities on their phone during class will be counted absent.
Tips for Success:
1. Print the slides. Attend every class. Take notes. Ask questions.
2. Be prompt and professional. Remove your head phones. Put your phone away without being asked.
3. Check your SFA email at least once per day. I will do the same.
4. Do all assigned HW exercises independently and promptly. Cancel Chegg (slater, wolfram alpha, symbolab) subscription, self-evaluate, use a timer, etc.
5. Do not ask for extra credit. Do not ask, “Is THAT going to be on the exam?” or it might be 😊

Student Learning Outcomes (SLO): at the end of MATH 5325, a student who has studied and learned the material should be able to:
- Work basic problems that make use of ideas covered in the course.
- Define all of the basic terms introduced in the course.
- Provide proofs of important theorems that were discussed in class.
- Write up their solutions to linear algebra problems making use of good language skills.
- Present their solutions to problems they have solved to their classmates.
- Explain and implement the algorithms covered in the course.

Program Learning Outcomes (PLO):
Students graduating from SFASU with a M.S. degree and a major in mathematics will:
1. [Critical Reasoning] Independently apply the principles of logic in mathematics to develop and analyze conjectures and proofs. (understanding of abstract structures, development of definitions, development and proof of conjectures)
2. [Skills] Execute advanced mathematical procedures and build upon these standard procedures. (learning of new skills, applying or extending skills in new situations)
3. [Concepts] Demonstrate knowledge of core mathematical concepts. (definitions and theorems in analysis, definitions and theorems in linear or abstract algebra, definitions and theorems in theoretical statistics)
4. [Problem Solving] Demonstrate initiative in using various mathematical tools, including technology, to formulate, represent, and solve problems. (implement algorithms or definitions, discuss algorithmic proficiency, find numerical approximations)
5. [Communication] Demonstrate proficiency in communicating mathematics in a format appropriate to expected audiences. (written, visual, oral)

Academic Dishonesty:
I may opt to ask for an in-person oral examination if I have any reason to suspect that work you submit is not your own. Possession of materials that can be used to cheat, whether or not they are used, is considered academic dishonesty. Students are to remain above reproach. Make sure your (1) cell phone is off and put away, (2) hat is turned backward (or removed), (3) hands remain above the desk, (4) eyes do not wander around during assessments. Consequences for academic dishonesty will be determined in accordance with university policy at the time of the violation. “Food gained by deceit is sweet to a man, but afterward his mouth will be full of gravel.” Proverbs 20:17

Other Policies: Academic Integrity (A-9.1) and Withheld Grades Semester Grades Policy (A-54)
The following is an excerpt from SFA Policy 5.4:
The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:
1. Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of
credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;

2. At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

See https://math.sfasu.edu/docs/syllabi/MATH5325Syllabus.pdf for some elements common to all sections.
Math 5325 – Linear Algebra
Course Syllabus

Course description: Finite dimensional vector spaces, linear transformations and matrices with emphasis on numerical aspects.

Credit hours: 3

The following is an excerpt from SFA Policy 5.4:
The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:

1. Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;

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To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

Course Prerequisites and Corequisites: Undergraduate major in mathematics, including MTH 3365

Course outline: Approximate time spent

- Finite Dimensional Vector Spaces 20%
  - Vector Spaces
  - Subspaces of Vector Spaces
  - Linear Combinations and Systems of Linear Equations
  - Linear Dependence and Linear Independence
  - Bases and Dimension
  - Maximal Linearly Independent Subsets

- Linear Transformations and Matrices 20%
  - Linear Transformations, Null Spaces, and Ranges
  - The Matrix Representation of a Linear Transformation
  - Composition of Linear Transformations and Matrix Multiplication
  - Invertibility and Isomorphisms
  - The Change of Coordinate Matrix
  - Dual Spaces

- Diagonalization of Matrices 20%
  - Eigenvalues and Eigenvectors
  - Diagonalizability
  - Matrix Limits and Markov Chains (Optional)
  - Invariant Subspaces and the Cayley-Hamilton Theorem

- Inner Product Spaces 20%
  - Inner Products and Norms
  - The Gram-Schmidt Orthogonalization Process and Orthogonal Complements
  - The Adjoint of a Linear Operator
Normal and Self-Adjoint Operators  
Unitary and Orthogonal Operators and Their Matrices  
Orthogonal Projections and the Spectral Theorem  
Bilinear and Quadratic Forms (Optional)  
Einstein’s Special Theory of Relativity (Optional)  
Conditioning and the Rayleigh Quotient (Optional)  
The Geometry of Orthogonal Operators (Optional)

**Canonical Forms (Optional)**  
- Jordan Canonical Form I  
- Jordan Canonical Form II  
- The Minimal Polynomial  
- Rational Canonical Form

**Student Learning Outcomes (SLO):** At the end of MATH 5325, a student who has studied and learned the material should be able to:

- Work basic problems that make use of ideas covered in the course. [PLO:1,2,3]
- Define all of the basic terms introduced in the course. [PLO:1,2,3]
- Provide proofs of important theorems that were discussed in class. [PLO:1,2,3]
- Write up their solutions to linear algebra problems making use of good language skills. [PLO:1,2,3]
- Present their solutions to problems they have solved to their classmates. [PLO:1,2,3]

**Program Learning Outcomes (PLO):** Students graduating from SFA with a M.S. Mathematical Sciences Degree will:

1. **Written Communication** - SFA Mathematics majors communicate mathematical ideas effectively in written form, integrating mathematical notation correctly and consistently.

2. **Verbal Communication** - SFA Mathematics majors communicate mathematics effectively to diverse audiences.

3. **Mathematical Maturation** - SFA Mathematics majors grow from a computational understanding of mathematics to an integrated approach which includes critical thinking proficiency, computational facility, conceptual understanding, and problem-solving persistence.

**Academic Integrity**

The Code of Student Conduct and Academic Integrity outlines the prohibited conduct by any student enrolled in a course at SFA. It is the responsibility of all members of all faculty, staff, and students to adhere to and uphold this policy.

Articles IV, VI, and VII of the new Code of Student Conduct and Academic Integrity outline the violations and procedures concerning academic conduct, including cheating, plagiarism, collusion, and misrepresentation. Cheating includes, but is not limited to: (1) Copying from the test paper (or other assignment) of another student, (2) Possession and/or use during a test of materials that are not authorized by the person giving the test, (3) Using, obtaining, or attempting to obtain by any means the whole or any part of a non-administered test, test key, homework solution, or computer program, or using a test that has been administered in prior classes or semesters without permission of the Faculty member, (4) Substituting for another person, or permitting another person to substitute for one’s self, to take a test, (5) Falsifying research data, laboratory reports, and/or other records or academic work offered for credit, (6) Using any sort of unauthorized resources or technology in completion of educational activities.

Plagiarism is the appropriation of material that is attributable in whole or in part to another source or the use of one’s own previous work in another context without citing that it was used previously, without any indication of the original source, including words, ideas, illustrations, structure, computer code, and other expression or media, and presenting that material as one’s own academic work being offered for credit or in conjunction with a program course or degree requirements.

Collusion is the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on academic dishonesty, including disclosing and/or distributing the contents of an exam.
Misrepresentation is providing false grades or résumés; providing false or misleading information in an effort to receive a postponement or an extension on a test, quiz, or other assignment for the purpose of obtaining an academic or financial benefit for oneself or another individual or to injure another student academically or financially.

**Withheld Grades**

**Semester Grades (SFA Policy 5.5)**

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average. The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C. For additional information, go to [https://www.sfasu.edu/policies/course-grades-5.5.pdf](https://www.sfasu.edu/policies/course-grades-5.5.pdf).

**Students with Disabilities**

To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to [http://www.sfasu.edu/disabilityservices](http://www.sfasu.edu/disabilityservices).

**Student Wellness and Well-Being**

SFA values students’ overall well-being, mental health and the role it plays in academic and overall student success. Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, emotional well-being, alcohol and other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help, SFA provides a variety of resources to support students’ mental health and wellness. Many of these resources are free, and all of them are confidential.

**On-campus Resources:**

**The Dean of Students Office** (Rusk Building, 3rd floor lobby)

[www.sfasu.edu/deanofstudents](http://www.sfasu.edu/deanofstudents)

936.468.7249

dos@sfasu.edu

**SFA Human Services Counseling Clinic** Human Services, Room 202

[www.sfasu.edu/humanservices/139.asp](http://www.sfasu.edu/humanservices/139.asp)

936.468.1041

**The Health and Wellness Hub** “The Hub”

Location: corner of E. College and Raguet St.

To support the health and well-being of every Lumberjack, the Health and Wellness Hub offers comprehensive services that treat the whole person – mind, body and spirit. Services include:

- Health Services
- Counseling Services
- Student Outreach and Support
- Food Pantry
- Wellness Coaching
- Alcohol and Other Drug Education

[www.sfasu.edu/thehub](http://www.sfasu.edu/thehub)

936.468.4008

tethehub@sfasu.edu

**Crisis Resources:**

[www.sfasu.edu](http://www.sfasu.edu)
Acceptable Student Behavior
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy 10.4). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom.

Date of document: 08/23/2023