MATH 3365, Linear Algebra  
Department of Mathematics and Statistics  
Class Policy Sheet and Syllabus—Spring 2024

Professor:  Dr. Sarah T. Stovall  
Office:  338 Mathematics building  
Email:  stovall@sfasu.edu  
Groupme Texting:  https://groupme.com/join_group/98638964/7MdSPKm4  
Office Hours:  I am available to meet at the times below in my office or by Zoom, but in-office visitors will be seen first.

Course description:  The course is an introduction to linear algebra.  This will include a study of systems of linear equations, matrices, determinants, vector spaces, linear transformations on vector spaces, eigenvalues and eigenvectors.

Text and Materials:  The required textbook is Elementary Linear Algebra, 4th ed, Andrilli and Hecker. (The 5th edition will do as well.)

Tentative Exam Schedule:  Please note that the dates for our in-class exams below are subject to change.  The final is university scheduled and cannot be taken at a different time without permission of the Chair of the Department of Mathematics and Statistics.

Exam 1  Thursday, February 8  
Exam 2  Thursday, March 7  
Exam 3  Tuesday, April 7  
Final  Tuesday, May 7, 8-10am

Grading Policy:  
- 60%  First Three Exams (top two 22% each, lowest 16%)  
- 10%  Homework quizzes  
- 30%  Comprehensive Final Exam  
Grading Scale:  
- 90% - 100%:  A  
- 80% - 90%:  B  
- 70% - 80%:  C  
- 60% - 70%:  D  
- Below 60%:  F

Course Requirements:  
- Three in-class exams—If a student must miss an exam due to an excused absence, special arrangements should be made in advance.
- Homework quizzes—  
  Completing homework and checking your answers to problems with solutions is your source for daily feedback. Completing homework is also how you identify which topics on which you need to spend more time.
- A comprehensive final exam—The final exam is Tuesday, May 7, 8-10am, in our regular classroom.
- Groupme app---Students can use the Groupme app for texting the instructor, in addition to communicating via your @jacks email.
- Class attendance—Students are expected to attend all class meetings, arriving on time. Bring your text (or some representation of it) daily. If you are absent, you are responsible for determining what you missed and for being prepared for class when you return. Any student missing 7 classes will receive a 10 point deduction on his or her final course grade. We will use the Groupme app for texting, in addition to communicating via your @jacks email.
- Preparing for class—Students should be prepared to invest several hours (at least 2 hours for each credit hour) outside of class reading the text, practicing examples, and working homework exercises.  
  Material to be discussed in class should be previewed before coming to class.
- There is no extra credit or alternative credit.  Do well enough on the graded items to earn the grade you seek.

MTH 3365 Syllabus:  
- Vector Spaces  20%  
- Linear Transformations and Matrices  15%  
- Elementary Matrix Operations and Systems of Equations  15%  
- Determinants  10%  
- Diagonalization  20%  
- Inner Product Spaces  15%

This complete course policy sheet and syllabus can be found online in your MTH 3365 course in d2l. You are responsible for reading the entire course policy sheet.
<table>
<thead>
<tr>
<th>Topics</th>
<th>Andrilli and Hecker, Elementary Linear Algebra 4th edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Fundamental Operations with Vectors</td>
<td>1 a, 2 c, 3 c, 4 a, 5 c, 6 c 7 e, 8 a, 23, 24</td>
</tr>
<tr>
<td>1.2 The Dot Product</td>
<td>1 c, 6, 9, 10, 15 a, 15 c, 18 c, 23</td>
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<tr>
<td>1.3 An Introduction to Proof Techniques</td>
<td>Read for proof technique review</td>
</tr>
<tr>
<td>1.4 Fundamental Operations with Matrices</td>
<td>1 i, 1 n, 2 A-D, 6 b, 7, 11, 13, 14 b i and iii</td>
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<tr>
<td>1.5 Matrix Multiplication</td>
<td>1 a b k m, 2 a, 5, 12 a, 15 (2), 24, 26 c</td>
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<tr>
<td>2.1 Solving Linear Systems Using Gaussian Elimination</td>
<td>1 a g, 2 a-d, 3, 4, 7</td>
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<tr>
<td>2.2 Gauss-Jordan Reduction and RREF</td>
<td>1, 2 a e, 4 a, 5 a, 11 a, 12</td>
</tr>
<tr>
<td>2.3 Equivalent Sytems, Rank, and Row Space</td>
<td>1 a c, 5 a e, 8 a c g, 9 a c, 20</td>
</tr>
<tr>
<td>2.4 Inverses of Matrices</td>
<td>1 a, 2 a, 3 a c, 4 e c, 6 a, 7 a, 13, 15 a, 22 c d</td>
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<tr>
<td>3.1 Introduction to Determinants</td>
<td>1 a g, 2 c, 3 d, 5 a, 7 a, 9 a</td>
</tr>
<tr>
<td>3.2 Determinants and Row Reduction</td>
<td>1 a c f, 2 c, 3 a c, 4 a, 6, 8, 11 a, 12 a, 13 a, 16</td>
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<tr>
<td>3.3 Further Properties of the Determinant</td>
<td>1 a c, 2 a c, 3 a, 4 a, 5 a, 9 c, 13</td>
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<tr>
<td>3.4 Eigenvalues and Diagonalization</td>
<td>1 a c, 2 a c, 3 c e, 4 a d, 5 a, 10 a, 12 a, 13 15, 17</td>
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<tr>
<td>4.1 Introduction to Vector Spaces</td>
<td>2, 4, 5, 6, 8, 14, 20</td>
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<td>4.2 Subspaces</td>
<td>1 a c j, 2 c e h, 3 b e g, 6 a, 18</td>
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<td>4.3 Span</td>
<td>1 a e, 2 a, 3 c, 7, 8, 16, 21</td>
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<tr>
<td>4.4 Linear Independence</td>
<td>1 b, 2 a b e, 3 a c, 6, 11 e, 16, 28</td>
</tr>
<tr>
<td>4.5 Basis and Dimension</td>
<td>3, 4 a c d, 7, 11, 18, 25 a-f</td>
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<tr>
<td>4.6 Constructing Special Bases</td>
<td>1 a, 2, 4 a c h, 5 c e, 6 c, 8 a, 9 a, 15 b</td>
</tr>
<tr>
<td>4.7 Coordinatization</td>
<td>1 a e h, 2 a c d, 4 a, 7a, 14</td>
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<tr>
<td>5.1 Introduction to Linear Transformations</td>
<td>1 a b g h l k, 5, 8, 13, 16, 23, 29</td>
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<tr>
<td>5.2 The Matrix of a Linear Transformation</td>
<td>2 a c, 3 a c e, 4 a b, 6 a, 7, 13 a c e, 21</td>
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<tr>
<td>5.3 The Dimension Theorem</td>
<td>1 a c, 2 a c, 3 a, 4 d g, 8, 13</td>
</tr>
<tr>
<td>5.4 One-to-one and Onto Linear Transformations</td>
<td>1 a e h, 2 a b, 3 a, 7</td>
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<tr>
<td>5.5 Isomorphism</td>
<td>2, 4, 5, 9, 12, 13</td>
</tr>
<tr>
<td>5.6 Diagonalization of Linear Operators</td>
<td>1 c d, 2 b h, 4 a, 10, 15</td>
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<tr>
<td>6.1 Orthogonal Bases and the Gram-Schmidt Process</td>
<td>1 a c, 3 a c, 4 c, 5 a, 9, 12, 17</td>
</tr>
<tr>
<td>6.2 Orthogonal Complements</td>
<td>1 a c e, 2 b, 6, 9 a, 10 a, 13, 18, 19</td>
</tr>
<tr>
<td>*6.3 Orthogonal Diagonalization</td>
<td>1 a d, 2 a, 3 a c, 11</td>
</tr>
</tbody>
</table>

*Time permitting

**SFASU 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 at least 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.
Student Learning Outcomes (SLO): At the end of MATH 3365, a student who has studied and learned the material should be able to:

1. Solve linear systems of equations either explicitly or numerically. [PLO: 1,2,4]
2. Demonstrate understanding of abstract vector spaces and inner product spaces. [PLO: 1,2,3,4]
3. Demonstrate understanding of linear transformations and their importance to pure and applied science. [PLO: 1,2,3,4]
4. Demonstrate understanding of the symbiotic relationship between linear operators and matrices. [PLO: 1,3,4]

Program Learning Outcomes: Students graduating from SFASU with a B.S. Degree and a major in mathematics will:

1. Demonstrate comprehension of core mathematical concepts. (Concepts) (notion of theorem, mathematical proof, logical argument)
2. Execute mathematical procedures accurately, appropriately, and efficiently. (Skills) (calculus, algebra, routine, nonroutine, applied)
3. Apply principles of logic to develop and analyze conjectures and proofs. (Logical Reasoning) (quantifiers, breaking down mathematical statements, counterexamples)
4. Demonstrate competence in using various mathematical tools, including technology, to formulate, represent, and solve problems. (Problem Solving)

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, collaboration, 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.

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.

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/deansofstudents
936.468.7249
dos@sfasu.edu

SFA Human Services Counseling Clinic: Human Services, Room 202
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
936.468.4008
thehub@sfasu.edu

Crisis Resources:

- Burke 24-hour crisis line: 1.800.392.8343
- National Suicide Crisis Prevention: 9-8-8
- Suicide Prevention Lifeline: 1.800.273.TALK (8255)
- Crisis Text Line: Text HELLO to 741-741

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.
Math 3365–Linear Algebra
Course Syllabus

Course description: Matrices, systems of linear equations, linear vector spaces, functions from $\mathbb{R}^n$ to $\mathbb{R}^m$, determinants, eigenvalues and eigenvectors.

Credit hours: 3

The following is an excerpt from SFA Policy 5.4:

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Course Prerequisites and Corequisites: MATH 3360 or MATH 2314 and consent of instructor.

Course outline:

<table>
<thead>
<tr>
<th>Approximate time spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vector Spaces</td>
</tr>
<tr>
<td>20%</td>
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<tr>
<td>- Vector spaces and subspaces</td>
</tr>
<tr>
<td>- Linear combinations and systems of linear equations</td>
</tr>
<tr>
<td>- Linear independence</td>
</tr>
<tr>
<td>- Basis and dimension</td>
</tr>
</tbody>
</table>

| Linear Transformations and Matrices |
| 15%                                 |
| - Linear transformations, null spaces, ranges |
| - Matrix representation of a linear transformation |
| - Composition of linear transformations and matrix multiplication |
| - Invertibility and isomorphisms |
| - Change of coordinate matrix |

| Elementary Matrix Operations and Systems of Equations |
| 15%                                                 |
| - Elementary matrix operations and elementary matrices |
| - Rank and inverse of a matrix |
| - Systems of linear equations |

| Determinants |
| 10%          |
| - Properties of determinants |

| Diagonalization |
| 20%             |
| - Eigenvalues and eigenvectors |
| - Diagonalizability |

| Inner Product Spaces |
| 15%                   |
| - Inner products and norms |
Gram-Schmidt Orthogonalization and orthogonal compliments
Adjoint of a linear operator
Normal and self-adjoint operators
Unitary and orthogonal operators and their matrices

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**Program Learning Outcomes (PLO):** Students graduating from SFA with a B.S. Degree and a major in mathematics 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.

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Date of document: 08/23/2023