CoSM Class Syllabus/Policy
MATH 5325: Linear Algebra, Fall 2020

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Office: Bush Mathematical Sciences Building, room 306  
Office Hours: MWF 10–10:50 am, MTW 2:30–3:30 pm, or by arrangement.  
Department: Mathematics and Statistics  
Class meeting time/place: TR 3:30–4:45 pm in Bush Math 214 (subject to change)

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;

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.

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


To prepare for the possibility that conditions may require this class to go fully remote, students will be submitting PDF scans of their work on assessments to D2L/Brightspace. For this purpose, several applications are available for smartphones; I would suggest Microsoft Office Lens, a free download from either the iOS or Android store which can scan images into PDF format and save to OneDrive or a local copy on your device.

In the event that we are forced to go fully remote, it will be necessary to have access to a dependable internet connection and some way to livestream yourself working on major assessments.
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)

Program Learning Outcomes (PLO): Students graduating from SFASU with an M.S. degree and a major in statistics will demonstrate:

1. A command of core probability and statistical concepts through major definitions and theorems. [Concepts] (Probability and Statistical Inference)

2. Strategic competence in formulating a standard probabilistic/statistical model for a given problem. [Modeling] (Model Choice and Model Interpretation)

3. Skill in using statistical software in order to process and interpret data. [Data Processing] (Computational Skills and Model Validation)

4. The ability to independently apply principles of probability and statistics to model and solve new or non-standard problems. [Independent Thinking and Application] (Existing Literature Comprehension, Independent Progression, Resourcefulness)

5. Proficiency in communicating probability and statistics in a format appropriate to expected audiences. [Communication] (Written Communication, Oral Communication)

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

1. Work basic problems that make use of ideas covered in the course. [Math PLO: 2,4], [Stat PLO: 1,4]

2. Define all of the basic terms introduced in the course. [Math PLO: 3], [Stat PLO: 1]

3. Provide proofs of important theorems that were discussed in class. [Math PLO: 1,2,4]; [Stat PLO: 1]
4. Write up their solutions to linear algebra problems making use of good language skills. [Math PLO: 1.5], [Stat PLO: 1.5]

5. Present their solutions to problems they have solved to their classmates. [Math PLO: 1.5], [Stat PLO: 1.5]

**Course Requirements:** Students will be expected to come to class prepared—most notably, to have read the section(s) under discussion and attempted any assigned homework. Assessments will likely consist of homework and exams, though other types of assessments (quizzes, take-home assignments, etc.) may be added at the instructor’s discretion. The final exam will be comprehensive and is scheduled for Tu, 8 Dec, 1:30–4:00 pm (subject to change)

*Class meetings:* For as long as is reasonable, this course will be conducted in a hybrid fashion, with optional face-to-face meetings that will be livestreamed via Zoom. **Due to the unpredictability of the ongoing pandemic, policies in this sheet are subject to change as conditions warrant.**

*Face-to-face meetings:* Students choosing to attend face-to-face meetings are subject to the following conditions:

- Masks (appropriate face coverings) must be worn over the nose and mouth at all times while in class and appropriate physical distancing must be observed; any student violating any part of the above will be asked to leave the class.

- Noncompliance will be reported to the Office of Student Rights and Responsibilities; students reported for multiple infractions may be subject to disciplinary actions.


*Livestream via Zoom:* As often as possible, class meetings will be streamed via Zoom; the current links to the stream and other connection details can be found in D2L/Brightspace. Students attending the livestream are encouraged to participate as normal. **In the event that face-to-face meetings are no longer feasible, instruction will continue at the scheduled times via livestream.** Streaming sessions will be recorded with links posted to D2L/Brightspace.

**Course calendar/outline:** (Topics may be presented in a different order than given here)

- Finite Dimensional Vector Spaces
  - 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
  - Approximate time spent
- Linear Transformations and Matrices
  - 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 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 Quadric Forms (Optional)
  - Einstein’s Special Theory of Relativity (Optional)
  - Conditioning and the Rayleigh Quotient (Optional)
  - The Geometry of Orthogonal Operators (Optional)
- Canonical Forms (Optional) 20%
  - Jordan Canonical Form I
  - Jordan Canonical Form II
  - The Minimal Polynomial
  - Rational Canonical Form

Grading Policy: Grades will be based on the total points accumulated on assessments.

Attendance Policy: Under the current conditions, an attendance policy is impractical; should conditions arise that interfere with your progress in the course, please inform me as soon as is practical via e-mail.

Academic Integrity (A-9.1): Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one’s own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one’s paper without giving the author due credit.
Withheld Grades (Semester Grades Policy A-54): 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.

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/

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 D-34.1). 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. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

Please be respectful of your fellow students and your instructor. Cell phone use and texting are not allowed in class. Remember to turn your cell phone off or place it in quiet mode before entering the classroom.