

**MATH 311, Section 503**  
**Topics in Applied Mathematics I**  
(Linear Algebra and Vector Analysis)

**Fall 2019**

**Instructor:** Yaroslav Vorobets

**Time:** MWF 10:20–11:10 a.m.

**Location:** BLOC 161

**Web page:** <http://www.math.tamu.edu/~yvorobet/MATH311/>

**Office:** BLOC 223b (e-mail: [yvorobets@tamu.edu](mailto:yvorobets@tamu.edu))

**Office hours:** Monday 1:00–3:00 p.m., Wednesday 1:00–2:00 p.m., and by appointment.

**Text:** S.J. Leon and S.J. Colley, *Math 311: Linear Algebra and Vector Calculus*, Pearson Education (custom edition for Texas A&M University, ISBN-13: 978-1256983699).

**Prerequisites:** MATH 221, 251, or 253 (multivariable calculus); MATH 308 (differential equations) or concurrent enrollment; junior or senior classification (or approval of instructor).

**Grading system:** There will be 3 in-class tests and the final comprehensive exam. The tests are worth 100 points (or 20% of the final grade) each, the final exam is worth 150 points (or 30% of the final grade). Extra credit can be earned by solving bonus problems (on tests and the final exam). Also, there will be homework assignments, which will account for another 50 points (or 10% of the final grade). The final grades will be assigned according to the 90–80–70–60% scale, that is, A for 450+ pts, B for 400–449 pts, C for 350–399 pts, D for 300–349 pts, and F for less than 300 pts.

The *tentative* dates for the three tests are September 27, October 30, and November 25. The final exam is scheduled for Tuesday, December 10, 8:00–10:00 a.m.

I will assign and collect homework about once per week. Late homework will be accepted only for legitimate reasons and may be penalized if circumstances warrant.

**Make-ups:** Make-ups for missed tests will only be allowed for a university approved excuse in writing. Wherever possible, inform the instructor before a test is missed. Consistent with University Student Rules, students are required to notify the instructor by the end of the next working day after missing a test. Otherwise, they forfeit their rights to a make-up.

**Academic integrity:** Although students are encouraged to discuss homework problems, each student is expected to write his/her own solutions. Copying another student's work is dishonest and academically worthless. Information about the Honor Council Rules and Procedures can be found at <http://aggiehonor.tamu.edu/>

**Copyright notice:** All course materials (both printed and web-based) are protected by U.S. Copyright Laws. No multiple copies can be made without written permission by the instructor.

**Students with disabilities:** The Americans with Disabilities Act (ADA) requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services (at the Student Services at White Creek complex on west campus) or call 845–1637. For additional information, visit <http://disability.tamu.edu/>

**Title IX and limits to confidentiality:** Class materials are generally considered confidential pursuant to student record policies and laws. As a University employee, I, however, must report allegations of sexual assault, sexual discrimination, or sexual harassment when they involve TAMU students, faculty, or staff, or third parties visiting campus if you share such information with me.

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**Course content:** The course consists of two parts. The first, larger part is an introductory course in linear algebra covering the abstract concepts of vector space and linear transformation as well as some models and applications of these concepts. The main topics to be covered are: systems of linear equations, matrices, determinants, vector spaces, linear transformations, orthogonality, eigenvalues and eigenvectors. In the second part of the course, the concepts of linear algebra are applied to the study of vector calculus. The topics to cover here include gradient, divergence, curl, line and surface integrals, Green's, Gauss' and Stokes' theorems.

The emphasis of the course is on applications and problem solving. However the course also contains a substantial amount of abstract theory. The student should be able to do simple proofs.

### Course outline

Part I ( $\approx 3$  weeks): *Elementary linear algebra*

- Systems of linear equations
- Gaussian elimination, Gauss-Jordan reduction
- Matrices, matrix algebra
- Determinants

Leon/Colley: Chapters 1–2

Part II ( $\approx 4$  weeks): *Abstract linear algebra*

- Vector spaces
- Linear independence
- Basis and dimension
- Coordinates, change of basis
- Linear transformations

Leon/Colley: Chapters 3–4

Part III ( $\approx 3$  weeks): *Advanced linear algebra*

- Eigenvalues and eigenvectors
- Diagonalization
- Orthogonality
- Inner products and norms
- The Gram-Schmidt orthogonalization process

Leon/Colley: Chapters 5–7

Part IV ( $\approx 4$  weeks): *Vector analysis*

- Main notions of vector analysis
- Review of multiple integrals
- Line and surface integrals
- Green's, Gauss' and Stokes' theorems

Leon/Colley: Chapters 8–11