

Classes meet: MWF 12–12:50, online (for now). You should also **watch the relevant recorded lecture/presentation** before each class meeting. Links to the videos will be available from my homepage and/or Moodle. If exams are online, they will include **written and oral** components.

Professor: Kamal Khuri-Makdisi, kmakdisi@aub.edu.lb. Contact me by e-mail or through the discussion forum in Moodle if you have any questions.

Required textbook: Corwin and Szczarba, *Calculus on Vector Spaces*, 2nd edition, available at the AUB Bookstore.

Optional, but useful, supplementary textbooks:

- 1) Friedberg, Insel, and Spence, *Linear Algebra*
- 2) Lang, *Linear Algebra* — note the book is also available electronically from an AUB computer at <https://link.springer.com/book/10.1007/978-1-4757-1949-9>
- 3) Curtis, *Linear Algebra: an Introductory approach* — again, electronically available from AUB at <https://link.springer.com/book/10.1007/978-1-4612-1136-5>
- 4) Axler, *Linear Algebra Done Right* — yet another book available electronically from an AUB computer at <https://link.springer.com/book/10.1007/978-3-319-11080-6>
- 5) Treil, *Linear Algebra Done Wrong*, available electronically at <https://www.math.brown.edu/~treil/papers/LADW/LADW.html>

Course requirements: The BETTER of **Option I:** 1) homework, 10%; 2) two quizzes, 25% each; 3) comprehensive final exam, 40%, and **Option II:** 1) homework, 10%; 2) quiz 1, 10%, and quiz 2, 20%; 3) comprehensive final exam, 60%. It is **very important** to keep up with the homework in this course, otherwise you will do badly on the quizzes and the final exam. You may collaborate with your classmates in finding out how to solve the homework problems, but **you MUST write your problem set in your own words, based on your own understanding of the solution. Also, you MUST include in EACH problem set the names of any people you consulted with, and full references to any books or websites you used in solving the problems.**

Prerequisites for this course: Mathematical maturity at a level equivalent to having taken the first few weeks of Math 211 or Chapter 1 of Corwin–Szczarba; in particular, facility with sets, logic, and mathematical induction, and some background in mathematical proof. Students from all majors are welcome, including from the Faculty of Engineering.

Topics to be covered: this list is subject to change.

1. Vector operations in \mathbf{R}^n , abstract vector spaces, subspaces, some Gaussian elimination. (Sections 2.1–2.4.)
2. Introduction to linear transformations, matrix representation on \mathbf{R}^n , some basic matrix algebra. (Sections 2.5–2.6, supplemented by lectures.)
3. Spans, linear independence, bases, and dimension of a vector space, Rank-Nullity theorem, general matrix representation of linear transformations. (Sections 4.1–4.4, 7.1.)

QUIZ I

4. Inner products and orthogonality, orthogonal projection, orthonormal bases, Gram-Schmidt method. (Sections 4.5–4.7.)
5. Isomorphisms and invertibility, change of basis, equivalent and similar matrices, rank of a matrix, linear equations. (Sections 7.2–7.7.)

QUIZ II

6. Determinants. (Most of sections 10.5–10.7, supplemented by lectures.)
7. Eigenvalues and eigenvectors, characteristic polynomial, and diagonalization of linear transformations (Sections 10.1–10.3).
8. Spectral Theorem: adjoints, transpose, self-adjoint linear transformations, the spectral theorem (Sections 7.5, 10.4, 10.8.).

Statement from the Accessible Education Office: AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform me immediately so that we can privately discuss options. In order to help establish reasonable accommodations and facilitate a smooth accommodations process, you must also register with the Accessible Education Office, West Hall 314, Extension 3246, accessibility@aub.edu.lb

Other AUB Policies: By signing up for this course, you confirm that you have read and accepted the terms and provisions of AUB's **Privacy Statement** and policies on **Academic Integrity** and **Non-Discrimination**.