Math 219, Linear Algebra — Spring 2015
Course website: `http://people.aub.edu.lb/~kmakdisi/`

Classes meet: TTh 9:30–10:45 in Nicely 214.

Professor: Kamal Khuri-Makdisi, Bliss 311, phone 4234. The best way to contact me is to send e-mail to **kmakdisi@aub.edu.lb** . My office hours will be announced soon. Also, you should always feel free to contact me by e-mail at other times, 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: The first four will be placed on reserve at Jafet Library; the fifth is available online.

1) Friedberg, Insel, and Spence, *Linear Algebra*

2) Lang, *Linear Algebra* — note the book is also available electronically from an AUB computer at `http://link.springer.com/book/10.1007/978-1-4757-1949-9`

3) Curtis, *Linear Algebra: an Introductory approach* — again, electronically available from AUB at `http://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 `http://link.springer.com/book/10.1007/978-3-319-11080-6`

5) Treil, *Linear Algebra Done Wrong*, available electronically at
`http://www.math.brown.edu/~treil/papers/LADW/LADW.html`

Course requirements: 1) homework, 10%; 2) two quizzes, 25% each; 3) comprehensive final exam, 40%. 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.**

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

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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

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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.).