MA1B PRACTICAL TRACK (WINTER 2015), COURSE SYLLABUS

GENERAL INFORMATION

Instructor: Xinwen Zhu
Office: 176 Sloan
Phone number: 626 395 4360
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Office hours: Friday 3pm or by appointment

TEXT BOOK

Sergei Treil, Linear Algebra Done Wrong, available online.

HOMWORKS

Homework will be assigned every Monday and will be due on the following Monday 10am in your section homework box outside room 253 Sloan. Collaboration while doing homework is encouraged. But solutions must be written down independently.

EXAMS AND GRADES

There will be a take home midterm and a take home final exam. The pass-fail line is 60%. The final score will be calculated as

Homework 40% + Midterm exam 30% + Final exam 30%

MIDTERM Exams will be handed out on Friday, February 06, and will be due 10am on Monday, February 09, 2015.

EXCUSED Students excused from the final exam will be informed on March 12, 2015.

FINAL Exams will be handed out on Friday March 13, 2015, and will be due 4pm on Monday, March 16, 2015.

SCHEDULE

This is a tentative schedule. It will be updated as the class proceeds.

WEEK ONE: Basic notions: vectors and matrices. Ch. 1, Sec. 1-4, 7.
(1) Jan 05. Solutions to systems of linear equations; Definition of vector spaces; Examples of vector spaces. Subspaces.
(2) Jan 07. Bases of vector spaces.
(3) Jan 09. Linear transformations. The matrix associated to a linear transformation. Matrix addition and multiplication.

WEEK TWO: Systems of linear equations. Ch. 1, Sec. 5-6. Ch. 2, Sec. 1-2, 4, 6.

WEEK THREE: Systems of linear equations. Ch. 1, Sec. 6. Ch. 2, Sec. 3, 5.
(7) Jan 19. MLK Holiday.

WEEK FOUR: Linear system. Ch. 2, Sec. 6-8.
(10) Jan 26. Extract a basis from a generating set. Expand a linearly independent set to a basis.

WEEK FIVE: Determinants. Ch. 3, Sec. 1-5.
(13) Feb 02. Definition of determinants and their properties.
(14) Feb 04. Invertible matrices via determinants.
(15) Feb 06. Review.

WEEK SIX: Determinants, minors and rank. Ch. 3, Sec. 4-6. Spectral theory: E-values and e-vectors. Ch. 4, Sec. 1, Ch. 9, Sec. 1.

WEEK SEVEN: Spectral theory: diagonalization. Ch. 4, Sec. 2. Some applications.
(19) Feb 16. President Day Holiday.
(21) Feb 20. Examples and an application to stochastic matrices.

WEEK EIGHT: Inner product spaces. Ch. 5, Sec. 1-4.
(22) Feb 23. Definitions. Basic properties of inner products. Cauchy-
Schwarz inequality. Triangle inequality.
(23) Feb 25. Orthonormal basis. Generalized Pythagorean identity. Gram-
Schmidt orthogonalization.
(24) Feb 27. Orthogonal projection. Formula for the orthogonal projec-
tion. Least square solution.

WEEK NINE: Inner product spaces. Ch. 5, Sec. 5-7. Operators in inner product
space. Ch. 6, Sec. 1-2.
(25) Mar 02. Least square solution continued. Adjoint matrices and
operators.
Isometry and unitary operators.
(27) Mar 06. Spectral theorem for self-adjoint and normal operators.

WEEK TEN: Advanced Spectral theory. Ch. 9.