MA1B PRACTICAL TRACK (WINTER 2017), COURSE SYLLABUS

GENERAL INFORMATION

Instructor: Xinwen Zhu
Office: 176 Sloan
Phone number: 626 395 4360
Email: xzhu@caltech.edu
Office hours: Friday 3pm or by appointment

TEXT BOOK

Sergei Treil, Linear Algebra Done Wrong, available online.

HOMWORKS

Homework will be assigned every Monday (except the first one, which will be assigned on January 4 Wednesday) and will be due on the following Monday 10am (if Monday is a holiday, it will be due on Tuesday 10am) in your section homework box outside Room 253 Sloan.

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 available in Room 253 Sloan at 11am on Friday, February 03, and will be due at 10am on Monday, February 06, 2017.

EXCUSED Students excused from the final exam will be informed on March 10, 2017.

FINAL Exams will be available in Room 253 Sloan on Monday March 13, 2017, and will be due on Friday noon, March 17, 2017. No extension will be allowed.

SCHEDULE

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

WEEK ONE: Vector spaces. Ch. 1, Sec. 1-2, 7.
(1) Jan 04. Solutions to systems of linear equations; Definition of vector spaces; Examples of vector spaces. Subspaces.
(2) Jan 06. Bases of vector spaces.

WEEK TWO: Linear transformations. Ch. 1, Sec. 3-6. Ch. 2, Sec. 1.
(3) Jan 09. Linear transformations. The matrix associated to a linear transformation.
(4) Jan 11. Matrix addition and multiplication.

WEEK THREE: Systems of linear equations. Ch. 2, Sec. 2-4, 6.
(6) Jan 16. MLK Holiday.

WEEK FOUR: Bases and dimension. Ch. 2, Sec. 5, 7-8.
(9) Jan 23. Dimension. Extract a basis from a generating set. Expand a linearly independent set to a basis.
(10) Jan 25. Kernel (null space) and range. Bases of null, column, row spaces.

WEEK FIVE: Determinants. Ch. 3, Sec. 1-4.
(12) Jan 30. Definition of determinants and their properties.
(13) Feb 01. Invertible matrices via determinants.
(14) Feb 03. Review.

WEEK SIX: Determinants, minors and rank. Ch. 3, Sec. 5-6. Spectral theory: E-values and e-vectors. Ch. 4, Sec. 1-2.
(16) Feb 08. Eigenvalues, eigenvectors, characteristic polynomials.

WEEK SEVEN: Spectral theory: diagonalization. Ch. 4, Sec. 2. Some applications. Ch. 5, Sec. 1.
(19) Feb 15. Examples and an application to stochastic matrices.
WEEK EIGHT: *Inner product spaces*. Ch. 5, Sec. 2-4.
   (21) Feb 20. President Day Holiday.

WEEK NINE: *Operators in Inner product spaces*. Ch. 5, Sec. 5-6. Ch. 6, Sec. 1-2.
   (24) Feb 27. Least square solution. Adjoint matrices and operators.
   (26) Mar 03. Spectral theorem for self-adjoint and normal operators.

WEEK TEN: *Advanced Spectral theory*. Ch. 9.