Note: Homework assignments are due the following Wednesday (from the day of the assignment) at 11:45pm (dropbox link)

9/24: introduction, class mechanics, vector spaces, isomorphisms; slides
Reading: KK*: 1.1, 1.2 (except 1.2.4, 1.2.5), 1.3; L*: 2.2, 2.3, 2.5
HW#1: (KK) ex1.1.1, 1.1.2, 1.1.3, 1.2.2, 1.2.4, 1.3.4

9/29: linear independence, basis, dimension; slides

10/1: column/row spaces, null space, system of linear equations, RREF, matrix rank; slides
HW#2: (a) write a Matlab code that puts an arbitrary 3x3 matrix in RREF form; (all from KK) (b) 1.2.6, 1.2.7, 1.2.9, 1.3.6, 1.4.1, 1.4.3, 1.4.4, 1.4.9

10/6: cosets, quotient spaces, direct sums, subspace sums; slides

10/8: norms, linear operators, matrix representation of linear operators; slides
HW#3: 1.5.3(a), 2.1.1, 2.1.2, 2.1.3, 2.1.5, 2.2.1, 2.2.5, 2.3.1

10/13: linear operators, rank and nullity, matrix representations, conjugacy; slides

10/15: linear functionals and adjoints; slides
HW#4: 2.2.6, 2.3.3, 2.3.10, 2.3.15, 2.4.1, 2.4.4, 2.5.2, 2.5.5, 3.1.1, 3.2.3

(Reading: up to chapter KK chapter 4)

10/20: normed spaces, inner product spaces, Cauchy Schwarz inequality, gram-schmidt; slides

10/22: projections, eigenvalues, eigenvalues of self-adjoint linear operators; slides
HW#5 (due 10/31): 6.1.3, 6.1.8, 6.2.2, 6.3.1

10/27: spectral decomposition, isometry, unitary transformations; slides

10/29: midterm #1

HW#6: 2.5.13, 3.2.1, 6.1.5, 6.1.6, 6.1.11, 6.2.1, 6.3.8 + download the Matlab-based software CVX (watch S. Boyd CVX demo, try to solve some optimization problems with CVX)

11/3: positive semidefinite and positive definite matrices; slides
11/5: positive semi-definite ordering, convexity; slides

HW#7: 6.3.2, 6.3.5, 6.3.6, 6.3.11 (for part b you can use the fact that the determinant of matrix is the product of its eigenvalues); Luenberger chapter 2: 4, 5; Show that if $A \succeq B$ (PSD ordering), then the smallest eigenvalue of $A$ upper bounds the smallest eigenvalue of $B$.

11/10: convex optimization, Lyapunov inequality, LMIs, state feedback synthesis, SVD; slides; a nice paper on SVD;

11/12: closed/open sets, convergence, compactness, completeness, Hilbert Spaces; slides

HW#8: (KK) 1.5.1, 1.5.3, 1.5.4, 2.6.1; Use CVX to find a stabilizing state feedback for a random 4x4 "A" matrix and a random 4x1 "B" matrix; Luenberger/chapter 2: problems 6,19.

11/17: Completeness, Lp spaces, Banach Spaces, Least Squares; slides

11/19: minimum norm problems; applications in control; slides

11/19: project abstracts due; dropbox link

HW#9: Luenberger/chapter 3: problems 3, 6(a), 21, 22 + (read sections 3.8 and 3.9; run through some examples of solving least squares using different norms on CVX mentioned on CVX "A quick start"; you don't need to turn anything for the part in parenthesis!)

11/24: midterm #2

11/26: contraction mapping theorem, applications in iterative method; slides

HW#10: Luenberger chapter 10: problems 1, 2, 4 + write a Matlab code that implements Jacobi iterations for a 10x10 and a 100x100 random square matrices (comment on the respective rates of convergence both theoretically and computationally)

12/1:

12/3:

12/10: Project reports Due at 5:00 pm (dropbox link)

KK (Katznelson(s)): A (Terse) Introduction to Linear Algebra
*Luenberger: Optimization by Vector Space Methods