MATH 6266 SYLLABUS
Fall 2014

Course Number:    Math 6266
Course Name:      Linear statistical model
Lecture Time:     MW 4:35-5:55 pm
Lecture Room:     Skyles 169
Instructor:       Pr. Karim Lounici
                   Office: Skiles 214B
                   Email Address: klounici AT math.gatech.edu
Course Web Page:  http://www.math.gatech.edu/~klounici6/classes/6266.html
                   Consult t-square for details and updated schedule.
Office Hours:     MF 12:30-1:30pm and by appointment.
Contacting me:    You can contact me by email.
Prerequisites:    Math 4261, Math 4262 or equivalent and Math 6241
Textbook:        At the level of Graybill, Theory and Application of the Linear Model

Course Outline: A thorough theoretical study of the statistical linear model and some dimension reduction techniques. The theory will be completed by an introduction to R software with applications to real/simulated data.
Below is a tentative outline of the topics we will treat in this class:

1. **Reminder linear algebra**: Orthogonal projections, Cochran’s theorem, Representations theorems.
2. **Gaussian vectors**: Random vectors, expectation and covariance, Characterization of Gaussian vectors, marginal and conditional distributions, Cochran’s theorem (probabilistic version).
3. **Statistical estimation and testing theory**: Least squares estimation, geometric interpretation, Gauss-Markov optimality theorem, maximum likelihood estimator, minimax properties, James-Stein estimator.
4. **Shrinkage estimation procedures, reduction of dimension**: Thresholding, penalized empirical risk minimization, oracle inequalities, prediction, variables selection.
5. **Introduction to R**: Linear regression, model and variable selection with R.

Grading Policies: There will be two midterms and one final exam. The (tentative) final grade will be based on the following rules:
   - Midterm 1: 30%, Midterm 2: 30% Final : 40%
Letter grades will be based on the accumulated points according to the standard cutoffs: A:90-100, B:80-89, C:70-79, D:60-69, F:0-59. There will be make up tests ONLY for institutionally approved activities and illness. Official document is required as proof.

Honor Code: All students are expected to comply with the Georgia Tech Honor Code. Any violations of the Georgia Tech Honor Code will be submitted directly to the Dean of Students. The Georgia Tech Honor Code is available at http://www.honor.gatech.edu/.