MATH 8530: MATRIX ANALYSIS
FALL 2015

INSTRUCTOR: Felice Manganiello [manganm@clemson.edu]

OFFICE: Martin O-22
OFFICE HOURS: TBD

TIME: TTh 9:30am-10:45am
ROOM: Martin E005
EXAM: Wednesday Dec 9, 8am-10:30am

WEBSITE: http://www.math.clemson.edu/~manganm/teaching/math8530-f15/math8530-f15.html

TEXT BOOK: P.D. Lax, *Linear Algebra and Its Applications* (2nd edition), Wiley

PREREQUISITE FOR: *MATH 3110, 4530 or 4630* or equivalent courses.

DESCRIPTION OF THE COURSE: This course will be a comprehensive survey of linear algebra at the graduate level. The goals are two-fold: to prepare you for the linear algebra part of the prelim, and to build up a solid linear algebra foundation.

In the first 3 weeks of the course you will be required to refresh, on your own or in groups, the basics of linear algebra such as:

- Solving linear system of equations using Gaussian elimination.
- Determinants.
- Eigenvalues, Eigenvectors and Eigenspaces.
- Orthogonality and Gram-Schmidt process.
- Singular value decomposition.

The material will be tested with a midterm exam where you will be required to solve computational problems. Please, feel free to use your undergraduate linear algebra text book or any other resource.

Afterwards we will focus on the required text book and more specifically the material covered in Chapters 1-8.

LEARNING OUTCOMES: Upon successful completion of this course, successful students will be able to

- Prove when a set of vectors is independent, spanning set and/or forms a basis.
- Define and compute quotient spaces, the dual, the annihilator and the codimension of a linear space.
- Describe and prove the properties of the basic vector spaces associated with a linear mapping.
- Prove and apply the fundamental theorem of linear algebra to interpolation and difference equations problems.
- Rigorously define determinant and trace, describe and prove their properties and use them in applications.
- Compute eigenvectors, generalized eigenvectors and the spectral decomposition of a given matrix.
- Compute the Jordan canonical form of a given matrix
- Perform Gram-Schmidt orthonormalization, compute projections, and use them in optimization problems.
- Compute the spectral resolution of self-adjoint and normal linear maps.
- Give a variational characterization of the eigenvalues of real symmetric linear maps.

CLASS POLICY: This class will move at a very quick pace and it is your responsibility to keep up with the material. It is expected that you will prepare for class by reading the textbook before class and review the reading and class notes after each class. There is too much material for me to present all examples and proofs in class. You are expected to be reading the textbook to complement the material covered in class. Expect homeworks to take several hours to complete each week. Make sure that your homeworks are clear, precise, and neatly presented; your work will be held to a high standard. I expect that you will start your homeworks early. Expect this course to take a considerable amount of your time (at least 8-10 hours outside of class per week).

MAKE-UP POLICY: NO make-ups of missed exams will be allowed. In the event that a student misses an exam due to a documented excused absence, that student's final exam score will be substituted for the missing exam score. Any student who misses an exam and cannot provide documentation indicating that the absence was excused will receive a 0 for the exam.

GRADING: The final grade will be calculated as follows:

Homeworks: 30% | Midterm 1: 10% | Midterm 2: 30% | Final exam: 30%

In the computation of the grade, numbers will be rounded to an integer using the floor operator, e.g. floor(79.77)=79. The grade will follow the scheme

A | 90-100	B | 89-80	C | 79-70	D | 69-60	F | 59-0

PLAGIARISM: I encourage you to consult with your colleagues when you are working on homework. However, you will not understand the material or do well on the exams unless the work that you turn in is ultimately your own. Therefore, you must write up your answers alone, and without looking at anything you wrote down while working with your group. The work you turn in must be your own.

You must cite everyone with whom you worked or consulted about each problem, as well as any material (books and online resources other than the course books and lecture notes) that you used to solve the problem. You can help another student, but you must not show him your homework.

Any breach of this policy will be considered an act of plagiarism, and will be reported.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES: Student Disability Services coordinates the provision of reasonable accommodations for students with physical, emotional or learning disabilities. Accommodations are individualized, flexible and confidential based on the nature of the disability. Current documentation of a specific disability from a licensed professional is needed. Please consult with the Student Disability Services staff, G-23 Redfern Health Center, 864-656-6848, in regard to these matters. Details on policies and procedures are available at `http://www.clemson.edu/asc`.

ACADEMIC INTEGRITY STATEMENT: As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.
See also `http://www.clemson.edu/academics/academic-integrity`.

TITLE IX: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972.
This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/.