Numerical Linear Algebra - Course Syllabus

Course Number: AMCS 251

Course Title: Numerical Linear Algebra

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan, 24, 2016	**Semester End Date:**	May, 19, 2016

Class Schedule: Tuesday and Thursday 9:00-10:30

Classroom Number:

Instructor(s) Name(s): Jean-Marie Morvan
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Teaching Assistant name:
Email:

Office Location: 2301 bd 1
Office Hours: By appointment

COURSE DESCRIPTION FROM PROGRAM GUIDE

Linear algebra from a numerical solution perspective.Singular Value Decomposition, matrix factorizations, linear least squares, Gram-Schmidt orthogonalization, conditioning and stability, eigenanalysis, Krylov subspace methods and reconditioning, and optimization and conjugate gradient methods.

COMPREHENSIVE COURSE DESCRIPTION

After some reminders and complements on matrix reductions, this course gives different methods to calculate or approximate solutions of linear systems and more generally to solve a problem of linear algebra. The main chapters are the following: Matrix conditioning, preconditioning.

- Direct methods: Gaussian elimination, LU decomposition, Choleski method, QR factorization, SVD Decomposition.

- Least square problems, Householder algorithm.

- Iterative methods: Jacobi, Gauss-Seidel methods, Krylov subspace method.

- Conjugate gradient method and algorithms.

- Computing eigenvalues: The general problem. Some classical methods. Jacobi, QR, Givens-Householder.

GOALS AND OBJECTIVES

The goal of this course is to give tools (as classical algorithms) to solve numerically problems in linear algebra, (in particular to solve linear systems by different methods, and to find the eigenvalues eigenvalues of a matrix).

REQUIRED KNOWLEDGE

Elementary linear algebra is needed, and a software as Matlab, Maple or Mathematica will be used in the homeworks.

REFERENCE TEXTS

- Numerical Linear Algebra, Lloyd N. Trefethen, David Bau,I I I. This book is in the library.

- My notes (they will be on the blackboard).

METHOD OF EVALUATION

Percentages %	Graded content
10%	**- Graded Homework**
20%	**- Quiz**
20%	**- First midterm**
20%	**- Second midterm**
30%	**- Final exam**

COURSE REQUIREMENTS

Assignments

- **Homework and Quizzes**:

There will be homeworks and/or quizzes every week. Solutions of homeworks will be provided. It is very important that you attend all classes and be on time. All quizzes will be closed-book /closed-notes.
Collaboration and checking answers on homeworks is allowed and encouraged. Of course copying homework is not tolerated. In brief you are allowed to collaborate on all homework problems according to the following rules:
You must first attempt to solve each problem on your own. If you get stuck you can then talk to any student currently enrolled in the class about the problem, as well as the instructor. However solutions should not be exchanged (i.e., you still must work through the details of the problem after you have gotten help, write the final solutions alone, and understand them fully).

- **Exams**:

Three exams are scheduled in class during the term (two midterms and a final exam). The exams are closed books and closed notes.

Course Policies

- All homework assignments, quizzes, and exams are required. Students who do not show up for a quiz or an exam should expect a grade of zero on that exam.

- If you dispute your grade on any homework, quiz, or exam, you may request a re-grade (from the TA for the homeworks and quizzes or from the instructor for the exams) only within 48 hours of receiving the graded exam.

- Incomplete (I) grade for the course will only be given under extraordinary circumstances such as sickness, and these extraordinary circumstances must be verifiable. The assignment of an (I) requires first an approval of the dean and then a written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements.

Additional Information

NOTE
The instructor reserves the right to make changes to this syllabus as necessary.