

Syllabus: MA 510/CS 522 Numerical Methods

Fall 2015

Instructor: Zhongqiang Zhang

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Office hours: Monday 3-5pm and by appointment

Class meetings: Thursday 5:30pm-8:20pm, SH 202

Required textbook

Stoer and Bulirsch, *An Introduction to Numerical Analysis*, 3rd edition. Springer, 2002. (Downloadable at the library)

Other References

K. E. Atkinson, *An Introduction to Numerical Analysis*, 2nd Edition, Wiley, 1989.

F. B. Hildebrand, *Introduction to Numerical Analysis*, 2nd Edition Dover, 1987.

Course description

This course provides an introduction to a broad range of modern numerical techniques that are widely used in computational mathematics, science, and engineering. It covers introductory-level material for subjects treated in greater depth in MA 512 and MA 514 and also topics not addressed in either of those courses. It is central to understand the practical performance of numerical algorithms as well as the necessary mathematical theory. Computing will be an integral and important part of the course, and there will be many computing assignments. Students are strongly encouraged to use MATLAB for programming.

Course outline:

Topic 1: Algorithms and Numerical errors

Topic 2: Solutions of linear equations and systems

Topic 3: Solutions of nonlinear equations

Topic 4: Interpolations

Topic 5: Approximation of functions

Topic 6: Numerical integration and differentiation

Topic 7: Numerical solutions to differential equations

Recommended Background

Calculus sequence, Linear algebra, differential equations

Grading

Mid-term Exam = 30% (On Oct. 15, 5:30pm-8:20pm)

Homework = 40% (weekly, Due in class)

Final Exam = 30% (on Dec. 20th, 5:30pm-8:20pm)

Grading policy

Make sure that your work is legible and done neatly; otherwise you will receive no credits for it.

No credits will be given if you have only answers to assignments and exams. You need to show both your answer and the work leading to it with proper wording or expressions.

Homework

Problems will be assigned weekly and be posted on myWPI. Make sure that you turn in your homework on time before the class begins as late homework will not be accepted and will be graded as zero. If you have to miss a class, you may turn in your homework to me a few days before the class or email me your scanned homework.

There will be coding assignments in the homework. You are expected to email me your code and your solutions to the assigned problems.

Assigned readings: Please note that this is a graduate course and reading assignments will be considered as an integral part of this course.

You are encouraged to work together to discuss homework problems. But you are expected to write your solutions in your own words.

Exams Mid-term and final exams will be given. Each exam consists of two parts: in class closed-book test and take-home coding project.

Mid-term

- In class: Thursday October 15
- Take-home: given on Thursday October 15, due Monday October 26

Final

- In class: Thursday December 17
- Take-home: given on Thursday, December 03, due Thursday December 17

Some statements

Cell phones and all electric devices should be turned off or muted.

Academic Dishonesty is not tolerated. Please be aware of WPI's Academic Honesty Policy <http://www.wpi.edu/offices/policies/honesty/policy.html>.

Disability services

If you are eligible for course adaptations or accommodations because of a disability or if you have medical information to share with me, please make an appointment with me as soon as possible. If you are not sure about the eligibility for course adaptations or accommodations, please contact the Disability Services Office (DSO) (<http://www.wpi.edu/offices/disabilities/>), which is located in the Student Development and Counseling Center, 124 Daniels Hall and the phone number is 508-831-4908, e-mail is *DisabilityServices@wpi.edu*

Academic honesty

Each student is expected to familiarize him/herself with WPI's Academic Honesty policies which can be found at <http://www.wpi.edu/offices/policies/honesty>. All acts of fabrication, plagiarism, cheating, and facilitation will be prosecuted according to the university's policy. If you are ever unsure as to whether your intended actions are considered academically honest or not, please contact me.

Tentative schedule

Week	Date	Topic
1	Aug. 27	Monday Schedule
2	Sept. 03	Introduction, tutorial on Matlab and programming
3	Sept. 10	Solutions to linear systems
4	Sept. 17	Interpolation I
5	Sept. 24	Interpolation II
6	Oct. 01	Least square approximations, optimization
7	Oct. 08	Approximation of functions
8	Oct. 15	Mid-term Exam
9	Oct. 22	Fall Recess, No class
10	Oct. 29	Fourier analysis
11	Nov. 05	Numerical integration I
12	Nov. 12	Numerical integration II
13	Nov. 19	Solutions to nonlinear systems
14	Nov. 26	Thanksgiving Recess, No Class
15	Dec. 03	Numerical methods for ODEs: time integrators
16	Dec. 10	BVPs problems for ODEs, numerical PDEs
17	Dec. 17	Final Exam