CS 3513: Numerical Methods for Digital Computers Fall 2020

(Last Revised on Aug 17, 2020)

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1. General Information

Professor:	Thanh Thieu, Ph.D.
Office Location:	Room 230 Mathematics, Statistics, and Computer Science Building
Office Phone:	405-744-2450
Email:	tthieu@okstate.edu (preferred medium of communication)
Teaching Assistant:	Troni (Thanh) Duong
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Office Hours:	Tue/Thu 4:30pm – 5:00pm Mon/Wed 11:00am – 12:00pm	Use the same Zoom meeting as the class lectures
Course Site:	https://canvas.okstate.edu/courses/77407	

2. Course Description

CS 3513: Numerical Methods for Digital Computers. Prerequisites: MATH 2153 (Calculus II); MATH 3013 (Linear Algebra) or concurrent enrollment; or MATH 3263 (Linear Algebra and Differential Equations) and knowledge of programming. Errors, floating point numbers and operations, interpolation and approximation, solution of nonlinear equations and linear systems, condition and stability, acceleration methods, numerical differentiation and integration.

3. Textbook:

- Steven C. Chapra. *Applied Numerical Methods with MATLAB for Engineers and Scientists, 4e*. McGraw-Hill, 2018. ISBN: 978-0-07-339796-2.

4. Course Topics:

1. MATLAB fundamentals and programming (2 weeks)
2. Error Analysis (1 week)
3. Roots of equations. Bracketing methods (1 week)
4. Roots of equations. Open methods (1 week)
5. Linear algebraic equations and matrices. Gauss elimination (1 weeks)
6. LU decomposition (1 week)
7. Matrix inverse and system condition. Iterative methods for systems of equations (1 week)
8. Curve fitting. Linear regression. Nonlinear regression (1week)

9. Curve fitting. Polynomial interpolation. Splines (1week)
10. Numerical integration (1 week)
11. Fast Fourier Transform (1 week)
12. Eigenvalues (1 week)
13. Principal Component Analysis

5. Homework and Examinations

There will be homework/programming assignments, 1 mid-term, and 1 final examination.

6. Course Grade

The course grade is based on the homework (40%), mid-term (30%), and final examination (30%). The passing letter-grade is determined by the following partition of the course grades:

D : [50, 60); C : [60, 70); B : [70, 85); and A : [85, 100]

7. Miscellaneous

- **Attendance**: Attending lectures are not mandatory, but historically, students with active attendance have done significantly better on examinations than their less frequently attending classmates.

- **Homework**: Problem sets form an important part of the learning in the course, and thus, you are required to do them in order to pass.

- **Collaboration**: You are encouraged to collaborate in study groups on the solution of the homework. If you do collaborate you must write up solutions on your own and acknowledge your collaboration in the write-up for each problem. If you obtain a solution with help (e.g., through library work, another student, etc.), acknowledge your source, and write up the solution on your own.

8. Student Disability Services

Student Disability Services and other Student Services are committed to providing support services to students with physical and learning disabilities. Please advise the instructor of desired academic accommodations, and notify Student Disability Services.

9. Academic Dishonesty or Misconduct

Refer to the section in “University Academic Regulations” in current “University Catalog”
http://registrar.okstate.edu/

10. Adding/Dropping/Withdrawing, Important Dates, and Syllabus Attachment

- **Examination**:
  Final examination: 2:00-3:50pm on Tuesday, December 8, 2020
  Location: Online proctored.
  Refer to block "TR 3:00pm" in "Fall 2020 Final Exams" at:
  http://registrar.okstate.edu/Exams
- **Adding/Dropping/Withdrawing and Important Dates**: Refer to the section in "Academic Calendar":
  http://registrar.okstate.edu/
- **Syllabus Attachment**: Refer to:
  http://academicaffairs.okstate.edu/content/resources-students

Class Schedule (Tentative)

Week	Topic	
Aug 18	MATLAB fundamentals and programming	
20		
Aug 25		
27		
Sep 1	Error Analysis	
3		
Sep 8	Roots of equations. Bracketing methods	
10		
Sep 15	Roots of equations. Open methods	
17		
Sep 22	Linear algebraic equations and matrices Gauss elimination	
24		
Oct 29	LU decomposition	
1		
Oct 6	Review	
8	Mid-Term Exam	
Oct 13	Matrix inverse and system condition. Iterative methods for systems of equations	
15		
Oct 20	Curve fitting. Linear regression. Nonlinear regression	
22		
Oct 27	Curve fitting. Polynomial interpolation. Splines	
29		
Nov 3	Numerical integration	
5		
Nov 10	Fast Fourier Transform	
12		
Nov 17	Eigenvalues	
19		
Nov 24	Fall Break	Happy Holidays
26	Thanksgiving	
Dec 1	Principal Component Analysis	Pre-Finals Week Online Delivery
3	Review	
Dec 8	Final Examination, 2:00-3:50pm	