

# My MAE 185 Applied Numerical Analysis UC Irvine, Spring quarter, April 2003

by Nasser M. Abbasi

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## 1 Introduction

I took this course in the department of mechanical engineering. It is an upper division undergraduate course.

### 1.1 course description from catlaog

MAE185 Numerical Analysis in Mechanical Engineering (Credit Units: 4) S. Solution of mechanical-engineering equations by means of numerical methods. Errors in numerical analysis. Nonlinear equations and sets of equations. Numerical differentiation and integration. Ordinary differential equations. Boundary-value problems. Partial differential equations.

Prerequisites: MAE10, Mathematics 3D; Mathematics 2E or equivalent. Only one course from MAE185, CEE185, and Mathematics 105A may be taken for credit. (Design units: 2)

textbook: Applied Numerical Analysis, C.F. Gerald and P.O. Wheatley, 5th Edition, Addison Wesley, 1994.

Coordinator: Dr Chaudhry chaudhry@fullerton.edu

Course Objectives: An introductory course dealing with the solution of mechanical engineering equations by means of numerical methods. Students are trained in the development and application of standard numerical schemes to solve fundamental and practical engineering problems.

Prerequisites by Topic:

1. Understanding of Computer Algorithms (E10) 2. Mathematics (3D and 2E)

Lecture Topics: 1. Solving nonlinear equations

2. Direct methods for solving linear systems

3. Theory of linear systems

4. Iterative methods for linear systems

5. Curve-fitting and interpolation

6. Numerical differentiation

7. Numerical integration

8. Single step methods for ordinary differential equations

9. Multistep methods for ordinary differential equations

10. Systems of ordinary differential equations; convergence

11. Boundary-value problems

12. Numerical determination of eigenvalues

13. Laplace and Poisson equations

14. The alternating-direction-implicit method; theory

15. Parabolic partial differential equations

16. Hyperbolic partial differential equations

Class Schedule: Each class meets 3 hours per week and students are assigned to a 1 hour discussion session per week.

Computer Usage: Heavy computer usage. Students are required to develop computer programs for the solution of a design project.

Units 4 (Quarter system)

## **2 my lecture notes**

PDF

### 3 HWs

HW	link	note
1	HTML	
2	HTML	followup HTML
3	problem 1 problem 2	
4	HTML PDF	
5	problem 25.1 problem 25.2 problem 25.3 problem 25.4 problem 25.5	suplement suplement plots
6	problem 29.2 problem 29.3 problem 29.4	
7	problem 30.1 problem 30.2 problem 30.3 problem 30.4	

## 4 projects

project	link	note
1	HTML problem description	factor a polynomial of order up to 12
2	HTML	Cubic spline determination using the improved method
3	HTML problem description	Solution of Lotka-Volterra 2 species model
4	problem description in PDF my solution in PDF nma_MAE185_proj_4.m.txt Matlab source code	Microstrip line solution by finite difference method

## 5 Exams

Midterm PDF

## 6 notes

1. trapezoidal table HTML
2. romberg table HTML