EE4070 數值分析

Numerical Analysis

EE/NTHU

February 13, 2017

Numerical Analysis – Course Information

- Class time: M34, W3: lectures and discussions.
- Class room: 台達館 211.
- Text book
  - *Numerical Mathematics*, by A. Quarteroni, R. Sacco, F. Saleri, 2nd edition, Springer, 2007.
- Reference books
  - *Introduction to Numerical Analysis*, J. Stoer, R. Bulirsch, 3rd edition, Springer, 2002.
  - *Introduction to Numerical Analysis*, E.B. Hildebrand, 2nd edition, Dover, 1987.
  - *Numerical Recipes in C*, W.H. Press, B.P. Flannery, S.A. Teukolsky, W.T. Vetterling, Cambridge University Press, 1988.
- TA: 許哲維 <roger147333444@hotmail.com>
- Office hours: Tuesday 10 - 11:30 AM.
  - Or by appointment (michang@ee.nthu.edu.tw).

Numerical Analysis – Syllabus

Unit 0. Introduction
- 0.0. Course information
- 0.1. Introduction
- 0.2. C++ review
- 0.3. Vector and matrix classes

Unit 1. Linear system solutions
- 1.1 Direct solution method
- 1.2 Special matrices
- 1.3 Error bounds
- 1.4 Applications

Unit 2. Errors
- 2.1 Error analysis

Unit 3. Iterative solutions
- 3.1 Linear iterative methods
- 3.2 Conjugate gradient method

Unit 4. Eigenvalues
- 4.1 Power method
- 4.2 QR method

Unit 5. Interpolations
- 5.1 Polynomial interpolations.
- 5.2 Spline interpolations.

Unit 6. Integrations
- 6.1 Quadrature Formulas.
- 6.2 Special Integrals.

Unit 7. Nonlinear system solutions
- 7.1 Nonlinear equation solutions
- 7.2 Roots of Polynomials
- 7.3 Nonlinear system solutions

Unit 8. Ordinary differential equations
- 8.1 One step methods.
- 8.2 Multistep methods.
- 8.3 Solution stability.
- 8.4 Variable step methods.

Unit 9. Partial differential equations
- 9.1 Finite difference approach.
- 9.2 Finite element approach.

Evaluation

- Evaluation

Category	% each	Number	Total
Homework	4.5	12	54
Midterm	14	2	28
Final	18	1	18
Absence	-1	-	-

- Homework:
  - Could be a significant loading,
  - C++ programming and report writing.
- Mid-term exams:
  - Apr. 10,
  - May 8,
  - Machine tests at EECS 406
- Final exam:
  - Jun. 12,
  - Machine test at EECS 406

Homework

- Homework is designed for you to practice what you have learned in class.
- Grading criteria:
  - Ontime submission (20%),
    - Due on 11:59 PM of the day specified on the announcement.
  - Solution correctness (50%),
  - Program and report writing (30%),
    - Legibility and efficiency,
    - Clearness and logic,
    - Solution approach and comments.
- Download and submit on EE workstations.
- Discussions with classmates encouraged but no plagiarism.
  - Write your own programs.

Handouts and Homework

- Class handouts can be found on EE workstation.
  - Download (ftp) through daisy (140.114.24.31).
  - Directory: ~ee407002/notes
    - lec00.pdf,
    - lec10.pdf,
    - lec21.pdf, ...
- Homework can be found in each homework directory.
  - ~ee407002/hw01,
  - ~ee407002/hw02, ...
- Homework should be turned in on EE workstations.
- Submission command:

```
$ ~ee407002/bin/submit hw01 hw01.cpp hw01a.pdf
```

- To check homework or exam grades:

```
$ ~ee407002/bin/score
```

A Few Suggestions

- Be an active learner.
  - "Stay Hungry. Stay Foolish."
  - Make it a life long habit.
- Ask questions.
  - It is an important tool.
  - Make the most out of the time you spent.
- Practice makes it perfect.
  - "The devil is in the details."
  - You really learn the subject if you can put it in use.
  - Apply to your study, research or work.
  - Understand the assumptions and limitations.