PME400500: Numerical Analysis (in English under conditions)

Fall 2022

Department of Power Mechanical Engineering, National Tsing Hua University

I. Course Description (課程說明)

Error analysis (Chap. 1), solutions of equations in one variable (Chap. 2), interpolation and polynomial approximation (Chap. 3), numerical differentiation and integrating (Chap. 4), initial-value problems for ordinary differential equations (Chap. 5), direct methods for solving linear systems (Chap. 6), iterative technique in matrix algebra (Chap. 7), and approximation theory (Chap. 8).

Note: *Chapters 9 - 12 are surely not covered.*

Several MATLAB tutoring courses will be also provided.

II. Prerequisite (預修課程)

Engineering Mathematics (I)

III. Textbooks (指定用書)

1. R.L. Burden, and J.D. Faires, *Numerical Analysis*, 10th ed., Thomson Brooks/Cole, Belmont, CA, USA, 2016. (for theory) [代理：歐亞書局]

IV. References (參考書籍)

1. G.R. Lindfield, and J.E.T. Penny, *Numerical Methods: Using MATLAB*, 3rd ed., Elsevier, Waltham, MA, USA, 2012. (for coding)
2. T. Sauer, *Numerical Analysis*, 2nd ed., Pearson Education Inc., Edinburgh Gate, United Kingdom, 2014. (for examples and homework)

V. Time and Location (教學時間與地點)

Lectures (in English) / Lectures review (in Mandarin) / Coding exercises

Written exams (9:00 – 12:00 on Tuesday at Room 209, ENG_I)

VI. Instructor (授課教師)

Dr. Yu-Bin Chen (陳玉彬 教授)

Room 512 in Engineering Building I

03-5715131 (ext. 33767)

ybchen@pme.nthu.edu.tw

Office hour: Friday 11:10 – 12:00 or reserved via e-mail

VII. Teaching Assistants (助教)

Miss Ting-Chun Cheng (鄭亭君)

Room 430 in Engineering Building I

03-5715131 (ext. 33743)

tingchung17@gmail.com

Office hour: Tuesday 14:10 – 16:00 or reserved via e-mail

VIII. Evaluation (成績考核)

Homework:	150	(sum of 5 assignments)
Tests:	240	(1.4 × higher + 1.0 × lower)
Bonus:	80	(attendance, answering to in-class questions)

Grade guidelines are given according to the rules described in the following. Assume student A gets the highest score x in the class. Student B gets the score y, which is higher than 280. Student C gets the score z, which is lower than 280. Then, student A will get **97** in *Numerical Analysis* as the final grade. Student B will get the score "$60 + 37\times(y - 280)/(x - 280)$." Student C will get the score "$55 \times z/280$." For example, we assume that student A gets the highest original score **430**, student B gets **400**, and student C gets the score **260**. The final grade of student A, B, and C will be **97**, $60 + 37\times(400 - 280)/(430 - 280) = 89.6 = 90$, and $55\times260/280 = 51.07 = 51$, respectively.

Note: A student will fail in this course even he or she gets the original score **279**, unless more than **15%** of students are flunked. The criteria **279** can only be slightly reduced till less than **15%** of students are flunked.

Score Range	≥ 280	< 280
Actual Grade	≥ 60	≤ 55

Homework: Please read the relevant sections of the references before each lecture. Read the book examples carefully before doing homework also. There will be **five** homework assignments, due before the class as indicated on the schedule page. Solutions will be announced after the due date. *The steps of solution should be detail enough and clear; otherwise you will not receive full credit even if your answers are correct.* Discussion among classmates is encouraged; however, you are expected to **solve problems independently**. Homework grading will be largely based on efforts and whether you have used the procedures correctly, rather than the numbers. You will receive a penalty for each unsolved problem. All assignments will be counted.

Examination: There will be **two** exams in the semester. See the tentative schedule for examination dates. Please see the instructor immediately if a conflict arises. The first exam will contain 4 problems and last about 120 minutes. Complete solution of all problems will receive **more than 100 points** and the total points gained will be counted as the grades. Hence, you are encouraged to attack all problems in each exam. After the first exam, a vote will be held to decide if the final test is on-line or in-class. If

an on-line test is conducted, more than 5 problems will be given while a student will be specifically asked to solve one problem within the given time (24 hours usually). Students can use any computer and his/her favorite software for this test. Before the time is up, he/she needs to upload answers on the course website and sends e-mails to the TA.

Academic Honesty: Academic integrity and honesty is essential to achieve high-quality education and to keep the prestige of the institution. We will **not tolerate any academic misconduct, such as cheating**. Cheating includes, but is not limited to: copying directly from unauthorized source, such as friends, classmates or a solutions manual; allowing another person to copy your work; signing another person's name or having another person sign your name on an attendance sheet; taking a test or quiz in someone else's name, or having someone else take a test or quiz in your name; or asking for regrade of a paper that has been altered.

IX. Course website (可連結之網頁位址)

清華數位學習平台 eLearn https://elearn.nthu.edu.tw/my/

X. Syllabus (教學進度)

No.	Date	Course Contents		Distribution	Due
1	09/13 (T)	**Chapter 1**	Sec. 1.1 – 1.3	Syllabus	
2	09/20 (T)	**Chapter 2**	Sec. 2.1 – 2.3		
3	09/27 (T)		Sec. 2.4 – 2.6	HW#1	
4	10/04 (T)	**Chapter 3**	Sec. 3.1 – 3.3		HW#1
5	10/11 (T)		Sec. 3.3 – 3.5		
6	10/18 (T)	**Chapter 6**	Sec. 6.1 – 6.3	HW#2	
7	10/25 (T)		Sec. 6.4 – 6.6		HW#2
8	11/01 (T)	**TA time (Q&A for Programing)**			
9	11/08 (T)	**Exam I**			
10	11/15 (T)	**Chapter 4**	Sec. 4.1 – 4.5		
11	11/22 (T)		Sec. 4.6 – 4.9	HW#3	
12	11/29 (T)	**Chapter 5**	Sec. 5.1 – 5.6		HW#3
13	12/06 (T)		Sec. 5.7 – 5.11	HW#4	
14	12/13 (T)	**Chapter 7**	Sec. 7.1 – 7.3		HW#4
15	12/20 (T)		Sec. 7.4 – 7.5	HW#5	
16	12/27 (T)	**Chapter 8**	Sec. 8.1 – 8.3		HW#5
17	01/03 (T)		Sec. 8.4 – 8.6		
18	01/10 (T)	**Exam II**			