Syllabus

MAE384 Advanced Mathematical Methods for Engineers - Spring 2022

Lecture: Tu/Th 9:00-10:15 AM, Classroom: SS 105 Recitation: Class# 16778: Tu 3:00-4:15 PM, ECA 219 Class# 17676: Tu 4:30-5:45 PM, ECG 236 Class# 16777: Tu 6:00-7:15 PM, ECG 236

1. Contact Information

Instructor: Huei-Ping Huang (hp.huang@asu.edu), ERC 359

2. Office Hours

Monday 3-5 PM, Tuesday 3-5 PM, or by appointment.

3. Course Description

Methods for numerical solutions to engineering problems. Nonlinear equations, quadrature, ordinary differential equations. Analytical and numerical solutions to partial differential equations.

4. Enrollment Requirements

Prereqisites: Engineering major; CSE 100, 110, or MAE 215 with C or better; MAT 242, 342, or 343 with C or better; MAT 274 or 275 with C or better Pre- or corequisites: MAT 267 or 272 with C or better if completed Credit for only CEE 384 or MAE 384

5. Course Objectives and Expected Outcome

Course Core Outcome	Achievement Level
Students will demonstrate basic numerical methods for solution to	Application
problems of root finding, curve fitting and integration	
Students will estimate numerical errors in application of numerical	Application
methods	
Students will present analytical solutions to linear partial differential	Comprehension
equations	
Students will perform DFT on periodic data	Comprehension
Students will present numerical solutions to ordinary and partial	Comprehension
differential equations	
Students will present numerical results in appropriate fashion	Application

6. Grade Policies

Grade will be based on performances in homework (6-7 assignments expected), and two exams, as weighted in the following: Homework 60%, Midterm 20%, Final exam 20%.

The expected thresholds for letter grades are: A = 90%, B = 80%, C = 70%, D = 60%, E = Below 60%. These thresholds are subject to adjustments depending on the distribution of the total scores for the class.

7. Absence and Attendance Policies

(a) General Policy

Instructor will arrange make-up exams, extension of deadline for projects, and/or assignment of alternative projects for students who are excused from class with proper reasons. This policy will accommodate students with the following circumstances:

a. Excused absences related to religious observances/practices that are in accord with ACD 304–04, "Accommodation for Religious Practices"

b. Excused absences related to university sanctioned events/activities that are in accord with ACD 304–02, "Missed Classes Due to University-Sanctioned Activities"

c. Excused absences related to missed class due to military line-of-duty activities that are in accord with ACD 304–11, "Missed Class Due to Military Line-of-Duty Activities," and SSM 201–18, "Accommodating Active Duty Military" Students who expect to miss class due to officially university-sanctioned activities should inform the instructor early in the semester. Alternative arrangements will generally be made for any examinations and other graded in-class work affected by such absences.

(b) Attendance

Instructor does not plan to take attendance for class participation on a regular basis. Students are strongly encouraged to attend all classes to acquire the knowledge and skills that are needed to succeed in this class.

8. Faculty recording of class sessions

Faculty may record class meetings to make an archived recording available to enrolled students, instructors, or support personnel. Creation of recordings for groups beyond these requires consent from students who are recorded.

For this class, lectures will not be recorded on a regular basis. However, recordings or similar supplementary material will be made if needed to assist students who are absent for illness or other legitimate personal reasons.

9. Readings, Assignments, Examinations, Special Materials, Required Activities

Textbook: **Numerical Methods Matlab, 3rd Edition** (multiple authors, custom-made for this course), Wiley, ISBN: 978111917552, Required

Course Outline

Part I Numerical Methods

- Overview
- Numerical solution of nonlinear equation
- Solution of system of linear equations
- Curve fitting and interpolation
- Numerical differentiation
- Numerical integration
- Numerical solution of ordinary differential equation initial value problem
- Numerical solution of ordinary differential equation boundary value problem

Part II Additional topics

- Fourier analysis
- Introduction to partial differential equation; Analytic and numerical solution

Requirement of programming using Matlab or equivalent: Many homework assignments will require programming using Matlab. Uses of other programming languages/tools such as Fortran, C++, R, Python, and Java are acceptable. A beginner's guide for Matlab will be posted to the class website. **The recitations will be based exclusively on Matlab.**

10. Policy regarding expected classroom behavior

Adhering to ASU guideline, any violent or threatening conduct by a student in this class will be reported to the Office of the Dean of Students.

11. Academic Integrity

Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty

can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains record of all violations and has access to academic integrity violations committed in all other ASU college/schools. Specific rules for collaboration on homework and projects will be released separately in the beginning of the semester. A violation of the rule(s) may lead to lowering of the score for the assignment, in addition to consequences of a violation of ASU's Academic Integrity Policy.

12. Copyright

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. The contents of this course, including lectures and other instructional materials, are copyrighted materials. Students may not share outside the class, including uploading, selling or distributing course content or notes taken during the conduct of the course. Any recording of class sessions is authorized only for the use of students enrolled in this course during their enrollment in this course. Recordings and excerpts of recordings may not be distributed to others. (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information).

13. Policy against threatening behavior, per the Student Services Manual, SSM 104–02

Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services (see SSM 104-02,

https://www.asu.edu/aad/manuals/ssm/ssm104-02.html). Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on-or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students

14. Warning of Offensive Class Materials

Participants of this class who find any course material objectionable may consult with the instructor or MAE Program Chair to identify appropriate accommodations.

15. Disability Accommodations

Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU Disabilities Resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged. See ACD 304-08 Classroom and Testing Accommodations for Students with Disabilities.

16. Harassment and Sexual Discrimination

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information. Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/fags. As a mandated reporter, instructor is obligated to report any information that instructor becomes aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <u>https://eoss.asu.edu/counseling</u>, is available if students wish discuss any concerns confidentially and privately.

17. Update of Syllabus

Any information in this syllabus may be subject to change with reasonable advance notice.