Syllabus

MAE384 Advanced Mathematical Methods for Engineers - Spring 2021
Monday/Wednesday, 12:00-1:15 PM, SS105, https://asu.zoom.us/j/5116052549

Online: Canvas class site/Gradescope class site

Instructor: Yulia Peet, Email: ypeet@asu.edu
Office Hours:
Tuesday 3:30-5:00 pm, via Sync **https://asu.zoom.us/j/5116052549**
Thursday 2:00-3:00 pm, via Sync **https://asu.zoom.us/j/5116052549**

TAs: Sai Karthik Mysore Mouliswar, Email: smysorem@asu.edu
Poorbayan Das, Email: pdas18@asu.edu

Grader: Angshuman Bhardwaj, abhard22@asu.edu

TA Office Hours:
Sai Karthik
Monday 3:30pm-5:00pm, via Sync https://asu.zoom.us/j/9856912736
Thursday 12:00pm-1:30pm, via Sync https://asu.zoom.us/j/9856912736

Poorbayan
Monday 9:00-10:30am via Sync https://asu.zoom.us/j/8514851990
Wednesday 9:00-10:30am via Sync https://asu.zoom.us/j/8514851990

Recitations:
21040 Wednesday 1:30pm-2:45pm BAL1-25
21039 Wednesday 3:00pm-4:15pm ECGG218
17491 Wednesday 6:00pm-7:15pm BDH219

Please the document on Canvas under Pages ("Recitation schedule, Sync links, and who can attend) for the schedule and attendance information

Textbook: A. Gilat and V. Subramanian *Numerical Methods for Engineers and Scientists. An Introduction with Applications using MATLAB, 3rd edition,* John Wiley & Sons, Incorporated, 2015, ISBN 9781119175520

Grade: 35% - Homework, 10% - Group Project, 5% - In-Class Quizzes
20% - Midterm Exam (one), 30% - Final Exam

Some Important Dates

First day of classes: 1/11/21
Office hours start on: 1/11/21

Recitations start on: 1/20/21
Last day of classes: 4/23/21

Group project due: TBA
Midterm exam: Wednesday, March 3, 12:00-1:15pm, modality TBA
Final exam: TBA

Class Online Communication Platform: Slack

- Post all questions concerning course material, logistics, homework etc. through Slack
- Students can answer (encouraged to) answer other students' questions
- TA or Instructor will monitor the students' answers to endorse correct answers
- Facilitates communication between students, builds confidence and speeds up the learning process
- All questions regarding course material, logistics or homework should be posted through Slack: no such questions posted via e-mail will be answered
- Private posts through Slack are discouraged; students should use email for private questions
- Personal questions such as requests for an appointment, notification of sickness or discussion of ones' progress in class are allowed over e-mail. However, note that **appointments outside of office hours are not guaranteed**

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

Enrollment Requirements
- Prerequisite: MAE 215 Introduction to Programming in MATLAB; MAT 274 Ordinary Differential Equations or 275 Modern Differential Equations; MAT 242 Elementary Linear Algebra or MAT 343 Applied Linear Algebra.
- Pre/corequisite: MAT 267 Calculus for Engineers III or MAT 272 Calculus w/Analytic Geometry III.

Prerequisite competencies
- Solution of linear systems; eigenvalues and eigenvectors; ODE's; programming in MATLAB

Course Topics

- Round-off and Truncation Errors
    - Computer representation of numbers
- Definition of matrix inverse and condition number
- Roots of Equations
    - Bracketing methods
    - Open methods
    - Systems of nonlinear equations
- Curve Fitting
    - Fitting data by least-squares
    - Interpolation
- Fourier Analysis
    - Fourier series
    - Discrete Fourier transform
- Numerical integration and derivatives
    - Newton-Cotes formulas
    - Forward, backward and central differences
    - Accuracy
- Numerical solution to ordinary differential equations
    - Explicit and implicit methods – Euler, Runge-Kutta
    - Accuracy and stability
    - Boundary-value problems (optional)
- Analytical solution to partial differential equations
    - Classification of PDE's
    - Separation of variables solutions for linear homogeneous equations
        - Wave equation
        - Heat equation
        - Laplace equation
    - Inhomogeneous boundary conditions
    - Self-similar solutions (optional)
- Numerical solution to partial differential equations
    - Finite difference solution to the heat equation
    - Finite difference solution to the Laplace equation

Required course outcomes

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

Homework policy

The homework will be assigned according to the schedule posted on Canvas under Syllabus, Course Schedule (.xlsx). Due dates and times for each assignment, as well as submission instructions, will be stated in the posted assignments. **No late homework will be accepted.** Homework will contain both theoretical and numerical problems (that require MATLAB).

All assignment submissions have to be done online using the class' Gradescope site. **No hardcopy paper submissions will be accepted.** You will be able to access the class' Gradescope website via a link on Canvas.

All work must be submitted on the due date and time. **No credit will be given for work submitted late. Please note that the due date/time are hard system cut-off times. If you have not finalized your submission on Gradescope by the exact due date/time, the submission system will not accept your submission and you will automatically receive a score of zero for the entire assignment.** It is thus imperative that you start your online submission as early as possible and that you not wait until the last minute/hour/day.

Note that being sick (with or without the doctor's note) does not excuse the students from submitting their homework on time in this class, since the students are given at least two weeks to complete each assignment. If the sickness is severe and strongly interferes with the performance in class, the class must be dropped.

No extensions for any reason, including due to illness/doctor's notes will be granted for homework and a group project. A doctor's note covering at least 70% of the time an assignment is available to a student will result in the assignment being excluded from the student's grade calculation. This accommodation applies to at most two homework assignments. It does not apply to the group project.

If you wish to contest your homework score or ask for re-grading, **all re-grading requests must be made within one week after the homework grades are posted**.

Regular homework assignments, in-class quizzes, a group project and exams are the only way to demonstrate your performance in class. **No make-up work or extra assignments** will be given to students who wish to improve their grade.

The lowest homework grade will **not** be dropped in this class.

No questions about the homework will be answered on a day it is due. Instructor or TA do not have a capability of looking over the MATLAB codes that the students write at any time before the homework is due.

Group project
One group project will be given during the second part of the course that covers numerical methods for ODEs and contains several problems requiring programming in MATLAB. The due date and time for the group project will be announced separately. Late projects will not be accepted.

In-class Quizzes
During the In-Person/Sync class meetings, the quizzes will be administered. For each In-Person/Sync session, you have to watch the lecture videos (links posted on Canvas under Pages, "Cloud links to lecture videos"). The quizzes will be on the overall comprehension of the material (not on problem solving). They will be limited to 10 minutes, and will be in a multiple-choice format. The two lowest quiz grades will be dropped.

Midterm exam policy
If a student is sick during the midterm exam, 1) instructor must be notified prior to exam (by e-mail), 2) a valid doctor's note must be submitted before the exam, or within 2 days after the exam. The respective exam will then be excluded from the student's grade calculation, an exam re-take will not be offered.

Final exam policy
If a final exam is missed for a medical reason, a student will receive a grade of Incomplete, and accommodations for a retake of the exam during the next semester must be arranged with instructor. If a final exam is missed for any other reason, a student will receive a grade of zero for the final exam, and the final course grade will be calculated accordingly.

Grading policy
Common grading policy for ASU classes is
A: 100%-90%, B: 89%-80%, C: 79%-70%, D: 69%-60%, E: below 59%

ASU Academic Integrity Policy
Academic integrity is mandatory, and any form of plagiarism will not be tolerated. Please see ASU's Student Academic Integrity Policy for details. Per the policy, all academic integrity violations must be reported to the Dean of Academic & Student Affairs. The first violation results in a punishment affecting the current class (zero for the homework/project, reduction of a letter grade, E or XE for the class, depending on the severity of the violation); second violation might result in an expulsion from ASU.

What is considered academic integrity violation/cheating/plagiarism in this class?

- Submitting a solution prepared by anyone else other than a student.
- Copying or consulting other student's solutions or programs for the homework or exam.
- Submitting a plot with your program that does not correspond to your program results (such as taken from the Internet, constructed from a manually modified data or copied from another student).
- Uplifting the code (i.e. copying the code from the Internet, book or posted lecture/recitation examples and submitting it as your assignment). If a student is studying a code found in the book, Internet or examples including the recitation examples, he/she should do it solely for the purpose of understanding. After all aspects of the code are understood, the student should write his/her own code, different from the one in the book, Internet or posted examples.

COVID-19 related information
Until further notified, per ASU policy, faculty, staff, students and visitors, are required to wear face coverings in classrooms, labs, offices and community spaces. Masks are required to attend any in-person lecture or a recitation for MAE 384.

You are not allowed to participate in in-person lectures if you are experiencing any symptoms listed in the ASU Health Checklist document (fever above 100.4, cough, sore throat, shortness of breath or difficulty breathing, body aches, loss of taste and smell, nausea or vomiting, diarrhea, congestion or runny nose).

You are required to take a COVID-19 test if you experience any above-listed symptoms or if you have been in contact with anyone who was tested positive (classmate, roommate, friend).

If you are tested positive, you are required to notify instructor immediately, even if you attend via Sync.

If a positive case is identified among any of the students taking the class (irrespective of their mode of attendance), the class will not be meeting in person (but will be meeting via Sync) for at least 14 days.

If any teaching stuff member (instructor, TAs) are diagnosed with COVID-19, depending on the severity of cases, the Sync instructions might be temporarily suspended until further notice. In this case, reading material and lecture notes will be posted for self-learning.

ASU Sync Courses
This course uses Sync. ASU Sync is a technology-enhanced approach, designed to meet the dynamic needs of the class. During Sync classes, students learn remotely through live class lectures, discussions, study groups and/or tutoring. You can find out more information about ASU Sync for students here, https://provost.asu.edu/sync/students and https://www.asu.edu/about/fall-2020.

To access Sync:

1) Go to my.asu.edu, click on a yellow button next to a class title which says "Class Tools" and choose "Attend via Sync".
2) If this does not work, use direct link **https://asu.zoom.us/j/5116052549** out of any web browser.
3) For recitations, **do not use "Attend via Sync" button** out of my.asu.edu. Rather, use the Sync links provided in a separate document (under Pages/Recitations Sync links)

Sync Technology Requirements:

You are encouraged to use a PC or Apple laptop or desktop equipped with a built-in or standalone webcam. You will need an internet connection that can effectively stream live broadcasts (e.g. 3G, 4G, Cable or DSL Wifi).

If you are not able to personally finance the equipment needed to attend class via ASU Sync, ASU has a laptop and WiFi hotspot checkout program available through ASU Library.

Software/hardware you would need:

Web browsers (Chrome, Mozilla Firefox, or Safari)
Adobe Acrobat Reader (free)
Webcam, microphone, headset/earbuds, and speaker
Microsoft Office (Microsoft 365 is free for all currently-enrolled ASU students)
Reliable broadband internet connection (DSL or cable) to stream videos.

Course Sync Rules:

a) Login with your camera on
b) Login with your microphone muted
c) Unmute the microphone to ask questions during the lecture, or if requested by the instructor/TA (such as, for group discussion)

Attendance Policy
Attending every lecture is mandatory (in person or via Sync), although no checks/sign-in sheets will be used.

Attending either lectures or recitations in person is not required. If you choose to attend either a lecture or a recitation in person, please, follow the schedule posted on Canvas (Syllabus/Class Schedule for lectures, and Pages/Recitation Schedule for recitations) to make sure you can attend on a specific date (attendance is limited to 50% of the class at a time during the room capacity).

You can switch between the modes of attendance (in person or via Sync) as you please (i.e., you can attend some lectures online, and some in person, or all online). You don't have to notify an instructor or TAs in advance of your mode of attendance for every lecture.

Absence Policy

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".

Expected Classroom Behavior Policy
The use of pagers, cell phones, and recording devices is not allowed in the classroom during class times. All In-Person/Sync sessions are recorded and posted on Canvas afterwards. All lectures are pre-recorded and posted on Canvas.

The use of laptops while attending in-person lectures is permitted solely to participate in group Sync-related activities, or in-class Quizzes, and only if specifically requested by instructor.

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. 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.

Accommodation for a Disability
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.

Copyright
All course content and materials, including lectures (Zoom recorded lectures included), are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information).

You 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.

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/faqs.

Mandated sexual harassment reporter: As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish discuss any concerns confidentially and privately.

Other Items

Syllabus changes: Any information in this syllabus (other than grading and absence policies) may be subject to change with reasonable advance notice.

How Long Students Should Wait for an Absent Instructor: In the event the instructor fails to indicate a time obligation, the time obligation will be 15 minutes for class sessions lasting 90 minutes or less, and 30 minutes for class sessions lasting more than 90 minutes. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly.