

INSTRUCTOR

- Dr. Padmanabhan Seshaiyer (**PADHU**)
 - E-mail: pseshaiy@gmu.edu
- **Lectures:** Monday (7:20 pm - 10:00 pm)
- **Format:** Synchronous Online: <https://gmu.zoom.us/j/91522053615>
- **Office Hours:**
 - Monday (3:30 pm – 5:00 pm): <https://gmu.zoom.us/j/95057763130>
 - Tuesday (4:00 pm – 5:00 pm): <https://gmu.zoom.us/j/95653009734>
 - By appointment
- **Graduate Learning Assistant (GLA)**
 - Mr. Kiefer Green
 - **GLA Office Hours:** Thursday 2:30pm – 4pm
 - **Prelim Practice Sessions:** Friday 2pm – 3pm

ABOUT THE COURSE

It is well-known that the use of numerical methods for the analysis, simulation, and design of engineering processes and industrial systems has been increasing at a rapid rate. Therefore, this course is intended to better prepare future mathematicians, scientists and engineers (as well as to assist practicing engineers and computational scientists), in understanding the fundamentals of numerical methods, especially their application, limitations, and potentials.

This course is designed as an introductory course in computational techniques for solving problems from science and engineering with emphasis on applications. The course will cover the classical fundamental topics in numerical methods such as, computer arithmetic, approximation, numerical integration, numerical linear algebra, solution of nonlinear algebraic systems and solution of ordinary and partial differential equations. The viewpoint will be modern, with connections made between each topic and a variety of applications. By the end of the course, the student should not only be familiar, but more confident, in effectively using numerical tools to solve problems in their own field of interest.

PREREQUISITES

Sufficient recall of advanced calculus, undergraduate linear algebra, differential equations and computer literacy.

COURSE OUTLINE

Problem-based learning (both in and out of class) will be an integral part of the course.

- The primary reference will be selected topics from "Classical and Modern Numerical Analysis", by A. Ackleh, E. Allen, R. Kearfott and P. Seshaiyer.
- Lecture notes will also be provided by the instructor that will be posted on the course website on a regular basis after each class.
- All topics required for taking the Numerical Analysis Preliminary Exam will be covered as a part of the complete course.

EXPECTED LEARNING OUTCOMES

In this course, the emphasis will be to apply well-known numerical techniques to solve engineering problems and evaluate the results. The objective will be to train students to understand why the methods work, what type of errors to expect, and when an application might lead to difficulties. In particular, the students will become proficient in:

- Understanding the theoretical and practical aspects of the use of numerical methods
- Implementing numerical methods for a variety of multidisciplinary applications
- Establishing the limitations, advantages, and disadvantages of numerical methods

The expected learning outcomes for the course will be assessed through: Exams, homework, in-class activities, class discussions and computer projects. Problem-based learning will be an integral part of the course.

COURSE EVALUATION

Evaluation for the course will be based on the following criteria:

Graded Component	Percentage
Homework	35%
Computer Projects	15%
Midterm Exam	10%
Final Exam	15%
Final Project	10%
In-class Participation	15%

Homework and Projects

- There will be five homework assignments during the semester each worth 7%.
- There will also be two computer projects for a total worth 15%. Besides there will also be a final group project that will also include an in-class presentation worth 10%.
- These items should be written up (or typed) and uploaded via blackboard on time to receive full credit as they add towards 60% of the total grade.

Exams

- There will be one mid-semester exam and one comprehensive final exam for 25% in this course. The Final Exam will be on Monday, Dec 13, 2021 from 7:30 PM - 10:15 PM and will be comprehensive. Make-up exams may be possible only in the case of documented emergencies.

In-class Participation

- There will be in-class activities and reflections that will require your class participation, which is worth 15%.

ACCESSING MATLAB

- MATLAB is available on the Mason academic research system. You can access it using the program SSH terminal (<https://its.gmu.edu/find-a-service/>)
- Alternatively you can use the Virtual Computing Lab (<https://www.vcl.gmu.edu/index.php?mode=selectauth>)
- Connecting to MATLAB
 - Two options for Windows Users
 - Use SSH
 - Download Secure Shell from the mason website: <https://itservices.gmu.edu/downloads>
 - Once you have it installed, open the program.
 - SSH has both an FTP and a Terminal. Open the Terminal.
 - From the SSH client window, click on the 'Quick Connect' button.
 - In the Host Name Box, type mason.gmu.edu and your user name.
 - Press Connect and you will be prompted to enter your password.
 - To begin your Matlab session, at the mason prompt type matlab and press enter.
 - Use Virtual Computing Lab.
 - After clicking on New Reservation, choose from drop down menu: Matlab R2019 (or the latest version)
 - Two options for Mac Users
 - Use Terminal App
 - In Applications/Utilities, open the terminal program.
 - At the command prompt, type : ssh [username@mason.gmu.edu](https://mason.gmu.edu)
 - After you press enter you will be prompted to enter your password.
 - To begin your Matlab session, at the mason prompt type matlab and press enter.
 - Use Virtual Computing Lab
 - After clicking on New Reservation choose from drop down menu: Matlab R2019 (or the latest version)

Policies for New Course Structures and Interactions

Campus Closure

- *If the campus closes or class is canceled due to weather or other concern, students should check Blackboard or email for updates on how to continue learning and information about any changes to events or assignments.*

Basic Course Technology Requirements

- *Activities and assignments in this course will regularly use the Blackboard learning system, available at <https://mymason.gmu.edu>. Students are required to have regular, reliable access to a computer with an updated operating system (recommended: Windows 10 or Mac OSX 10.13 or higher) and a stable broadband Internet connection (cable modem, DSL, satellite broadband, etc., with a consistent 1.5*

Mbps [megabits per second] download speed or higher. You can check your speed settings using the speed test on this website.)

- *Activities and assignments in this course will regularly use web-conferencing software (Zoom). In addition to the requirements above, students are required to have a device with a functional camera and microphone. In an emergency, students can connect through a telephone call, but video connection is the expected norm.*

Course Materials and Student Privacy

- *All course materials posted to Blackboard are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.*
- *Videorecordings — whether made by instructors or students — of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class*
- *Live video conference meetings (e.g. Zoom) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and shared outside the class*
- *Some/All of our synchronous meetings in this class will be recorded to provide necessary information for students in this class. Recordings will be stored on Blackboard and will only be accessible to students taking this course during this semester.*

UNIVERSITY POLICIES

Academic Integrity

- *The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using the appropriate format for this class. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.*
- *As in many classes, a number of projects in this class are designed to be completed within your study group. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product. Other projects are designed to be undertaken independently. In the latter case, you may discuss your ideas with others and conference with peers on drafts of the work; however, it is not appropriate to give your paper to someone else to revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.*
- *Mason is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are*

encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Disability Accommodations

- *Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474*
- *Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474*

Diversity and Inclusion

- ***Women and Gender Studies** seeks to create a learning environment that fosters respect for people across identities. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability. We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own.*
- *The **School of Integrative Studies**, an intentionally inclusive community, promotes and maintains an equitable and just work and learning environment. We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.*

Sexual Harassment, Sexual Misconduct, and Interpersonal Violence

- *As a faculty member and designated “Responsible Employee,” I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s [Title IX Coordinator](#) per [university policy 1412](#). If you wish to speak with someone confidentially, please contact the [Student Support and Advocacy Center](#) (703-380-1434) or [Counseling and Psychological Services](#) (703-993-2380). You may also seek assistance from [Mason’s Title IX Coordinator](#) (703-993-8730; titleix@gmu.edu).*

Privacy

- *Students must use their MasonLive email account to receive important University information, including communications related to this class. I will not respond to messages sent from or send messages to a non-Mason email address.*

Recording and/or sharing class materials

- *Some kinds of participation in online study sites violate the Mason Honor code: these include accessing exam or quiz questions for this class; accessing exam, quiz, or assignment answers for this class; uploading of any of the instructor’s materials or exams; and uploading any of your own answers or finished work. Always consult your syllabus and your professor before using these sites.*