

**MAD 4401 Introduction to Numerical Analysis
(Online) Section 12487**

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Course Description: MAD 4401 is a 3-credit course covering numerical approximation techniques. Topics will include Numerical integration, nonlinear equations, linear and nonlinear systems of equations, differential equations and interpolation.

Course Objective: To develop proficiency in numerical analysis by mastering the following key topics:

- **Differentiate** among absolute error, relative error, accuracy, and precision, and **evaluate** the numerical error in computed results produced by common algorithms.
- **Apply** and **critically assess** root-finding techniques—including Newton's, secant, and bisection methods—by **estimating** convergence order and **verifying** stopping criteria on nonlinear equations drawn from science and engineering.
- **Compute, compare, and interpret** numerical derivatives (finite-difference formulas) and integrals (trapezoidal, Simpson's, and composite rules) by **quantifying** truncation and round-off errors for real-world data sets.
- **Select, implement, and justify** appropriate interpolation strategies (e.g., Lagrange polynomials, Newton forms, and cubic splines) for discrete data, and **estimate** interpolation error using theoretical bounds.
- **Construct, program, and analyze** single-step and multi-step schemes (e.g., forward Euler, classical Runge–Kutta) for initial-value ordinary differential equations, and **assess** stability and local/global error through step-size studies.
- **Communicate** numerical results effectively by **documenting** algorithmic choices, **presenting** error analyses, and **defending** conclusions in written reports that meet professional mathematical standards.

Prerequisites: MAS 3114 or MAS 4105 with a minimum grade of C and experience with a scientific programming language.

Recommended Textbook: Tea Time Numerical Analysis by Leon Brin
Available open source here: <https://open.umn.edu/opentextbooks/textbooks/741>

Supplemental Book: Python Programming and Numerical Methods by Qingkai Kong, Timmy Siau, and Alexandre Bayen. Available open source here:
<https://pythonnumericalmethods.studentorg.berkeley.edu/>

Office Hours: TBA. You may schedule extra office hours by e-mail.

Grades: Your course grade is based on 3 exams worth 45% total, a final exam worth 20%, homework will count 15% total, Discussion Board Participation will count 8% total, Computer Labs will count 15% total.

Assignment	Weight
Homework	15%
Computer Labs	12%
Discussion Board Participation	8%
Exams (Three exams, 15% each)	45%
Final Exam	20%

We will use the following scale:

A [90,100]; A-[87,90); B+[83,87); B [80,83); B-[77,80); C+[73,77); C [68,73);
C-[64,68); D+[62,64); D [57,62); D-[55,57); E [0,55)

Your grade is your responsibility. You have exactly one week once your assignment has been returned to you to discuss that grade. After that week, the grade is final. No additional points will be awarded to “boost” your grade.

Here is the UF grading policies for assigning points: [Grades and Grading Policies < University of Florida \(ufl.edu\)](#)

Homework: Homework assignments will be administered and submitted through MyOpenMath, accessible via Canvas. Each assignment will be due weekly, with due dates posted on Canvas. Homework is designed to reinforce concepts from lectures and help you prepare for exams.

Computer Projects: A computer programming project will be assigned with each unit and will be done in group randomly assigned via Canvas and will change with each project. If a student does not participate in a group, please indicate that within the assignment submission and no credit will be given to that student. Otherwise, all students within a group will receive the same grade. Free software access is available to all UF students for free use at <https://info.apps.ufl.edu/>.

Discussion Board Participation: Canvas is organized by modules, which pertain to each exam. Module 1 corresponds to all the material related to exam 1. Within each module, there is a discussion board where students may ask questions or post answers. This discussion board is an opportunity to engage with your classmates and share insights, questions, and resources related to course content. You can earn a maximum of 5 points with each discussion board.

Each post is worth 1 point. You may earn a point by:

- Asking a mathematical question.
- Answering a classmate’s question.

- You are also encouraged to share external resources (such as a helpful YouTube channel or website) that have aided your study. If you do, include a brief description of how it helped you.

You may ask about any course content, including homework problems, Python, lectures, or computer projects. As long as your post is focused on mathematical or course-related content, it is acceptable. To earn full credit, your contributions should be relevant and thoughtful. Let's use this space to support each other's learning!

Exams: There will be three exams that are each 100 minutes. The three exams' dates provided on the schedule are. Exam 1: February 13th (Friday), Exam 2: March 27th (Friday) and Exam 3: April 22nd (Wednesday)

Final Exam Date: April 29th (Wednesday) and is 2 hours long.

Calculator Policy: You may need a scientific calculator, or graphing calculators to help with homework questions. A scientific calculator (non-graphing calculator) will be permitted on exams via honorlock. You may use that (<https://app.honorlock.com/calc/scientific>). You will also need to be familiar with computer software packages like Mathematica, Matlab, or Python.

UF Policies Link: This course complies with all UF academic policies. This link will direct students to a webpage that provides information on:

- Attendance and make-up policies
- DRC information
- Assigning grade points
- Gator Evals
- Honesty policy
- In-class recording
- Academic and wellness resources

For information on those policies and for resources for students, please see the direct link is <https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/>.

Honorlock Online Proctoring

In order to maintain a high standard of academic integrity and assure that the value of your University of Florida degree is not compromised, course exams will be proctored. Some students will take their exams online and will be proctored by Honorlock. You will take your exam electronically using the course website. You **do not** need to register for your exam. However, you will need to have installed and enabled the Google Chrome Honorlock extension prior to taking your exams. You will need a webcam, speakers, microphone, laptop or desktop computer, and a reliable internet connection to take your exams. Wireless internet is not recommended. You may also need a mirror or other reflective surface. Google Chrome is the only supported browser for taking exams in Canvas.

Before Your Exam

Prior to each exam and in the same environment you plan to take the exam, review the [Honorlock Guidelines \(Links to an external site.\)](#) (PDF), and go to [Honorlock Support \(Links to an external site.\)](#) to run a system check. This process takes just a few minutes and is completely free. If your course offers an Honorlock Practice Quiz, it is strongly recommended that you take it to practice using Honorlock before your exams.

Important: If you are unable to take an exam because of a technical glitch on your end, that is your responsibility. However, if you do experience technical difficulties during the exam, Honorlock's support menu will be visible on-screen for you to contact a support agent.

Getting Help

Honorlock offers 24/7/365 technical support to assist students before, during, and after exams. If you experience any trouble with Honorlock, begin a live chat on the [Honorlock Support \(Links to an external site.\)](#) page, call 844-243-2500, or email Support@Honorlock.com.

Netiquette and Communication Courtesy

It is important to recognize that the online classroom is in fact a classroom, and certain behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette.

Security

Remember that your password is the only thing protecting you from pranks or more serious harm.

- Don't share your password with anyone.
- Change your password if you think someone else might know it.
- Always log out when you are finished using the system.

General Guidelines

When communicating online:

- Treat the instructor with respect, even via email or in any other online communication.
- Always use your professors' proper title: Dr. or Prof., or if you are unsure use Mr. or Ms.
- Unless specifically invited, don't refer to a professor by their first name.
- Use clear and concise language.
- Remember that all college-level communication should have correct spelling and grammar.
- Avoid slang terms such as "wassup?" and texting abbreviations such as "u" instead of "you."
- Use standard fonts such as Times New Roman and use a size 12 or 14 point font.
- Avoid using the caps lock feature AS IT CAN BE INTERPRETED AS YELLING.
- Limit and possibly avoid the use of emoticons like :) .
- Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or be construed as being offensive.
- Be careful with personal information (both yours and others).
- Do not send confidential information via email.

Email

When you send an email to your instructor, teaching assistant, or classmates:

- Use a descriptive subject line.
- Be brief.
- Avoid attachments unless you are sure your recipients can open them.
- Avoid HTML in favor of plain text.
- Sign your message with your name and return email address.
- Think before you send the email to more than one person. Does everyone really need to see your message?
- Be sure you REALLY want everyone to receive your response when you click, "Reply All."
- Be sure that the message author intended for the information to be passed along before you click the "Forward" button.

Discussion Boards

When posting on the discussion board in your online class:

- Check to see if anyone already asked your question and received a reply before posting to the

discussion board.

- Be open-minded.
- If you ask a question and many people respond, summarize all posts for the benefit of the class.
- When posting:
 - Make posts that are on-topic and within the scope of the course material.
 - Be sure to read all messages in a thread before replying.
 - Be as brief as possible while still making a thorough comment.
 - Don't repeat someone else's post without adding something of your own to it.
 - Take your posts seriously. Review and edit your posts before sending.
 - Avoid short, generic replies such as, "I agree." You should include why you agree or add to the previous point.
 - If you refer to something that was said in an earlier post, quote a few key lines so readers do not have to go back and figure out which post you are referring to.
 - Always give proper credit when referencing or quoting another source.
 - If you reply to a classmate's question make sure your answer is correct, don't guess.
 - Always be respectful of others' opinions even when they differ from your own.
 - When you disagree with someone, you should express your differing opinion in a respectful, non-critical way.
 - Do not make personal or insulting remarks.
 - Do not write anything sarcastic or angry, it always backfires.
 - Do not type in ALL CAPS, if you do IT WILL LOOK LIKE YOU ARE YELLING.

Tentative Weekly Schedule

Introduction and Review	1 week
Error Analysis and Computer Arithmetic	2 weeks
Root finding methods	3 weeks
Interpolation and Polynomial Approximation	3 weeks
Linear Regression	1 weeks
Numerical Differentiation and Integration	2 weeks
Initial Value Problems for ODE	3 weeks

* I reserve the right to change anything in this syllabus if needed. Please check Canvas for changes.