

Math 375, Section 1/CS 375, Section 3

Fall 2024

Course Syllabus

Instructor of Record:

Owen Lewis (owenlewis@unm.edu)

Textbook:

Numerical Analysis (2nd Edition)
by Timothy Sauer
Pearson (ISBN: 978-0321783677)

Optional Alternative:

Numerical Mathematics and Computing (7th Edition)
by Ward Cheney & David Kincaid.
Cengage Learning: (ISBN: 978-1133103714)

Classroom & Hours:

Dane Smith Hall (DSH) 228
Tues./Thurs. 11:00 am - 12:15 pm

Office Hours:

SMLC 340

Tues. 2:30 - 3:30 pm

Thurs. 1:30 - 2:30 pm

or by appointment.

(These may change in the future if there is a need. Any changes will be announced via Canvas)

Website:

All course announcements, lecture videos, course materials, etc. will be distributed via the Canvas webpage. If you are enrolled in the course, you should have access to it via canvas.unm.edu

Course Information: Math 375/CS 375, Introduction to Numerical Computing is a 3-credit hour course. Class meets for two 75-minute sessions of direct instruction for fifteen weeks during the Fall 2024 semester. Please plan for a minimum of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

Course Description: An introductory course covering such topics as solution of linear and nonlinear equations; interpolation and approximation of functions, including splines; techniques for approximate differentiation and integration; solution of differential equations; familiarization with existing software.

Prerequisite: (Math 314 or Math 316 or Math 321) and (Math 2531 or CS 261) and (CS 152L or Phys 2415 or ECE 131L or ENG 130L).

Assignments and Grading

Homework:

Homework assignments are an absolutely critical component of this course and necessary for the desired learning outcomes. This section of the syllabus is somewhat lengthy because of that.

Homework will be assigned every week and administered via Canvas. Homework will consist of a mix of problems that require theory and/or computation (i.e. writing code). Your solutions are to be written up in a neat and clear “report” and then submitted by uploading a PDF document via Canvas by the posted due date. Your submissions should be legibly and neatly presented, and include all the required code, figures, and tables, in the correct order. Figures and tables should be well labeled and not hand written. Please see the example homework that I have posted to the Learn website. This will give you an idea of what I expect when it comes to the presentation of your homework solutions.

Due to the online submission, you will be required to either typeset your homework or scan a some hand-written work to combine with printouts to create a single PDF. If you do not have a scanner, there are several smartphone/tablet apps that you may use. I have personally used GeniusScan (basic version available for free on [iOS](#) and [Android](#)), but you may find one you like better.

You are **encouraged** (but not required) to work on homework in pairs (i.e. a group of 2 students). If you choose to do so, please submit a single report with both students cited at the top. It is expected that both of you be able to explain the analysis and programming aspects of all your submitted work. Groups of more than 2 students are not allowed.

All assignments can be turned in up to 7 days after the original due date. However all late assignments will receive a 50% deduction. This means that if you submit your homework a few minutes late due to technical issues while uploading it to Canvas, you will automatically lose half credit. Do not leave submission until the last minute!

With regards to choice of programing language to use for homework in this course: all code submitted as part of homework assignments should be written in Matlab. Matlab is a propriety programming language and numeric computing environment developed by MathWorks. As a UNM student you have free access to a Matlab license though the universities site license. To install Matlab on a Linux, Mac, or Windows machine begin by visiting the [UNM IT website](#).

Finally, while not required, I encourage you to typeset your homework with a computer. Typeset reports are easier for me to grade, they avoid the hassle of scanning sheets of paper, and they will leave you with a convenient digital copy of your work for your own future reference. For typesetting math assignments, the best choice is often L^AT_EX or one of its many variants. Services such as [Overleaf](#) have made writing documents in L^AT_EX easier than ever. Personally, I like the formatting of the `hmcpset.cls` L^AT_EX class. It can be downloaded at the following GitHub page: <https://github.com/hmcmathematics/hmcpset-class>. There you will also find some documentation and examples of it's use.

Important! Your grades on each homework and exam will be based not only on the correctness of your solution, but on the clarity and completeness of your presentation. You must clearly show all steps taken using correct algebra and notation. Use words where appropriate (complete sentences, please!). If I cannot find or decipher your work, then I will not give you credit for it. Homework and exams will only be “regraded” if I receive, in writing, an explanation as to why you believe you deserve more credit than you were originally given within 7 days of returning your graded assignment.

Midterm:

There will be one midterm exam approximately half way through the course. More details regarding the administration of this exams will be provided as the semester progresses. Make-up exams will only be offered in the event of extreme extenuating circumstances.

Final Exam:

There will be a cumulative final exam that will take place during finals week. The university has assigned us the following date and time-slot: **TBD**

Grading:

Your final score in the course will be calculated as a weighted average of your scores on the homework assignments and the two exams. The weights for these categories is as follows:

- Final: 35%
- Midterms: 30%
- Homework: 35%

Letter grades based on your final score will be assigned as follows:

A	B	C	D	F
90% and above	80% - 89%	70% - 79%	60% - 69%	59% and below

Expected Learning Outcomes: Upon successful completion of this course, a student should be able to:

- Understand the effects of finite precision on numerical computing, including conditioning and error types
- Solve linear systems with Gaussian Elimination (LU, PLU factorizations) and QR factorization.
- Write down and solve systems in MATLAB
- Choose the correct algorithm (LU, triangular, Cholesky, etc...) for a given matrix
- Understand various linear solve algorithms in terms of their computational complexity and impacts on accuracy/conditioning
- Understand the difference between direct and iterative methods, and when to use iterative methods
- Understand the importance of over-determined systems, how such systems arise, and how to solve such systems using the SVD and QR
- Understand how to construct interpolants of functions and choose an appropriate interpolation basis
- Derive numerical methods (e.g., with Taylor's theorem) to approximate derivatives and integrals, solve nonlinear equations, and solve initial value problems
- Evaluate the convergence properties and the numerical accuracy, e.g., for numerical derivatives and integrals, for nonlinear solution methods, for interpolation methods, and for initial value problems.

COVID-19 Health and Awareness:

UNM is a mask friendly, but not a mask required, community. To be registered or employed at UNM, Students, faculty, and staff must all meet UNM's Administrative Mandate on Required COVID-19 vaccination. If you are experiencing COVID-19 symptoms, please do not come to class. If you have a positive COVID-19 test, please stay home for five days and isolate yourself from others, per the Centers for Disease Control (CDC) guidelines. If you do need to stay home, please communicate with me via my above email; I can work with you to provide alternatives for course participation and completion. UNM faculty and staff know that these are challenging times. Please let me, an advisor, or another UNM staff member know that you need support so that we can connect you to the right resources. Please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

If You feel Ill:

I will not require a doctor's note to document illness in the event of missed face-to-face instruction this semester as this may pressure you to attend classes when you are sick and may place an additional burden on UNM Student Health and Counseling (SHAC). If you are worried about illness or COVID-19, you are encouraged to contact SHAC (505-277-3136). They will assist you with testing, health care, and information and support about health measures to protect self and community. The LoboRESPECT Advocacy Center (505-277-2911) can offer help with contacting faculty and managing challenges that impact your UNM experience.

Other Information

Holidays etc.:

There will be no class meeting on Thurs. the 10th of Oct. due to Fall Break.

There will be no class meeting on Thurs. the 28th of Nov. due to Thanksgiving Break.

Drop Date:

The final day to drop classes (while still receiving a full refund and not a "W") is Fri. the 6th of Sept.

The final day to drop classes (without Dean's permission) is Fri. the 8th of Nov.

Support:

Confidential services for students are available at LoboRESPECT Advocacy Center, Women's Resource Center, and the LGBTQ Resource Center. The Women's Resource Center supports all students, including those who are pregnant or are parents. UNM's lactation stations are marked on the UNM campus map: <https://map.unm.edu/>.

Student Health and Counseling (SHAC) (505) 277-3136. <https://shac.unm.edu/>.

LoboRESPECT Advocacy Center (505) 277-2911. <https://loborespect.unm.edu/>.

Women's Resource Center (505) 277-3716. <https://women.unm.edu/>.

LGBTQ Resource Center (505) 277-5428. <http://lgbtqrc.unm.edu/>.

Students Requiring Accommodations:

In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center (<https://arc.unm.edu/>) at arcsrvs@unm.edu or by phone at 505-277-3506.

Student Responsibilities and Academic Dishonesty:

Cheating and plagiarism (academic dishonesty) are often driven by lack of time, desperation, or lack of knowledge about how to identify a source. Communicate with me and ask for help, even at the last minute, rather than risking your academic career by committing academic dishonesty. Academic dishonesty involves presenting material as your own that has been generated on a website, in a publication, by an artificial intelligence algorithm (AI), by another person, or by otherwise breaking the rules of an assignment or exam. It is a Student Code of Conduct (<https://pathfinder.unm.edu/code-of-conduct.html>) violation that can lead to a disciplinary procedure. When you use a resource (such as an AI, article, a friend's work, or a website) in work submitted for this class, document how you used it and distinguish between your original work and the material taken from the resource.

Title XI:

The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University's programs and activities, including the classroom, should always provide a space of mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center (<https://loborespect.unm.edu/>), the Women's Resource Center (<https://women.unm.edu/>), and the LGBTQ Resource Center (<https://lgbtqrc.unm.edu/>). If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see <https://policy.unm.edu/university-policies/2000/2740.html> and CEEO's website.

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at ceeo@unm.edu. The CEEO staff will provide you with access to available resources and supportive measures and assist you in understanding your rights.

If you have any questions, contact Owen Lewis: owenlewis@unm.edu