Course Information

Course:	COS 374/574 Scientific Computing
Call #:	82905 (COS 574 #82906)
Credit Hours:	3
Room:	Luther Bonney 241
Day/Times:	M/W 12:30 P.M.– 1:45 P.M.
Prerequisites:	Grade of C or higher in COS 160, MAT 252, and MAT 295.
Textbook:	Lambers et al. (2026). *Explorations in Numerical Analysis and Machine Learning with Julia*. World Scientific. ISBN: 978-981-98-1948-5.

Instructor Information

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Office Hours:	T/R 1:00 P.M.- 2:00 P.M.

Course description

A study of the theory and application of computational algorithms for interpolation, equation solving, matrix methods, integration, and error analysis. Prerequisites: grades of C or better in COS 160, MAT 252, and MAT 295, or permission of instructor.

Topics[1]

- Julia Programming Language
- Linear algebra review
- Understanding error
- Computer arithmetic and floating-point system(s)
- Direct methods
- Iterative refinement
- Least-squares approximations
- Indirect methods

Learning Outcomes

By the end of this course, students will be able to:

- Define the basic terminology of numerical analysis, including round-off error, iterative refinement, and indirect solution methods.

[1] Subject to change (see Disclaimer below)

- Explain the potential impact of round-off error on numerical solutions.
- Discuss computer floating-point arithmetic and its implications.
- Implement matrix operations, Gaussian elimination, and least squares solutions in Julia.
- Use indirect methods like Jacobi and Gauss-Seidel to solve systems of equations.
- Compare direct and indirect solution methods for systems of equations.
- Examine the convergence behavior of iterative methods.
- Assess iterative techniques for solving problems based on properties like convergence rate.
- Determine appropriate solution methods for different problem types.
- Develop Julia functions/programs for matrix computations and numerical solutions.

Software

We will use The Julia Programming Language (Julia for short). Julia can be installed at the terminal (Linux/Mac) with the command:

```
curl -fsSL https://install.julialang.org | sh
```

I also recommend downloading Octave. If you wish to refrain from downloading and installing either locally, both can be used in the cloud at `Cocalc.com`.

A collection of mathematical software, papers, and databases maintained by Oak Ridge National Laboratory can be downloaded from Netlib Repository, particularly LAPACK, LINPACK, and BLAS (Basic Linear Algebra Subprograms) packages/libraries.

Course Evaluation and Grading Policies

Attendance and Participation (10%)

Regular attendance and fully engaged participation is expected of all students. You should complete all assigned readings before each class session.

Explorations and Exercises (50%)

Exploration exercises and end-of-chapter exercises will be collected regularly through Brightspace. Prepare assignments in (.tex) or Markdown (.md) and submit them through Brightspace under the associated assignment. You may use the LaTeX template (`https://cs.usm.maine.edu/~james.quinlan/cos280/latex/LaTeX-template.txt`. Submit code in plain text (.txt). Another option to include code is the verbatim environment. For example,

```
for i = 1:10
  println(i)
end
```

Exams (40%)

Midterm and Final exams account for 20% each. Material is taken from class discussions or textbook exercises, explorations, or statements of definitions and theorems found in the book.
In summary, grades are based on the following weighted items:

Item	**% Weight**
Attendance/Participation	10%

Assignments	50%
Exam	20%
Final exam	20%
Total	100%

If you are taking COS 574, you are required to do a significant project. Start the project early. Project requirements:

- Paper/report must be written in LaTeX and follow standard journal article format (abstract, body, reference list).
- Minimum of 10 papers; bibilography done in bibTeX.
- GitHub repo for your code base.

Grade Ranges

Letter grades are assigned based on the final percent using the interval values:

Grade	% bound
A	93 - 100
A-	90 - 92.9
B+	87 - 89.9
B	83 - 86.9
B-	80 - 82.9
C+	77 - 79.9
C	73 - 76.9
C-	70 - 72.9
D	60 - 69.9
F	<60

The grade, "I" (incomplete), can be given ONLY when a student, who is doing otherwise acceptable work (passing grade), is unable to complete a part of work (e.g., the final exam) because of documented illness or other conditions beyond the student's control. In the latter case, the student must discuss with the instructor and complete an application form from the department before the part of work is due or as soon as the circumstances are known.

Student Success Tips

- attend all class meetings
- read the material before coming to class
- complete assignments by the due dates specified
- create a study and/or assignment schedule to stay on track
- read announcements
- communicate regularly with your instructor and peers
- read and respond to course email messages as needed
- access USM Online Student Resources

Important Dates

Labor Day (no classes)	September 1, 2025
Classes Begin	September 2, 2025
Deadline to drop without penalty	September 15, 2025
Fall Break (no classes)	October 13 & 14, 2025
Registration for Winter 2025-26 Begins	October 15, 2025
Deadline to drop for a grade of "W"	October 30, 2025
Veterans Day Observance (no classes)	November 11, 2025
Open Registration for Spring 2026 Begins	November 24, 2025
Thanksgiving Break	November 26 – 30, 2025
Last day of classes	December 12, 2025
Final Exams	December 15 – 19, 2025

Support Services

- **Request disability accommodations** | (207) 780-4706 | `dsc-usm@maine.edu`
- **Report interpersonal violence** | (207) 780-5767 | `usm.titleix@maine.edu`
- **Report on-campus emergencies and safety concerns** | (207) 780-5211 or your local police agency.
- **Get academic help** | `mycampus.maine.edu/group/usm/learning-commons`
- **Get technology help** | `usm.maine.edu/computing/helpdesk`
- **Meet with an academic advisor** | `usm.maine.edu/advising`

For USM's most complete and current information on services available to students, as well as academic policies, use the QR Code to go to the Student Services and Policies Hub webpage.

Figure 1: `https://mycampus.maine.edu/group/usm/student-services-and-policies-hub`

Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check Brightspace site often.