# SYLLABUS *

# NUMERICAL ANALYSIS I

FALL 2020

https://www.phys.uconn.edu/~rozman/Courses/m3510_20f/

Last modified: August 25, 2020

**Course description:** The goal of numerical analysis is the design and analysis of techniques to give approximate but accurate solutions to hard problems. MATH 3510 *Numerical Analysis I* teaches this analysis concentrating on direct methods of solution of linear systems, finding zeros of non-linear equations, approximating and interpolating, numerical differentiation and integration, and on solving initial value problem for ordinary differential equations. The attention is given to sources and propagation of numerical errors and to computational efficiency of the algorithms.

**Course format:** Hybrid/Blended. The class has both in-person and online components. The class will not meet in-person for all meetings, but in-person instruction will be available.

**Lectures:** TuTh 5:00 – 6:15, Arjona 105

**Course website:** https://www.phys.uconn.edu/~rozman/Courses/m3510_20f/

*Syllabus information may be subject to change. The most up-to-date syllabus is located on the course website linked above.

**Instructor:** Michael Rozman

| | |
|---|---|
| email: | michael.rozman@uconn.edu |
| gitlab username: | m3510_20f_in |
| office hours: | Tu 6:15 PM – 7:15 PM in TBA,<br>Th 6:15 PM – 7:15 PM in TBA,<br>and by appointments |

**Textbook:** T. Driscoll and R. Braun, *Fundamentals of Numerical Computation*, SIAM, 2017
Do not purchase the textbook before the third week of classes.

**Exams:** Two midterm take-home exams and a *cumulative* online final exam (also see *Grading scheme* below w.r.t. the final exam).

**Grading scheme:** The course grade will be calculated using the following two schemes:

| | |
|---|---|
| Homework projects | 35% |
| 2 Midterms | 35% |
| Final exam | 30% |

Course grade = 0.35*HW + 0.35*[(M1 + M2)/2] + 0.3*F, correctly rounded to integer and capped at 100%.

| | |
|---|---|
| Homework projects | 40% |
| 2 Midterms | 60% |

Course grade = 0.4*HW + 0.3*(M1 + M2), correctly rounded to integer and capped at 100%.

The better of the two grades will be used.

The rounding to integers is done using the default rounding mode specified in the IEEE754 standard for floating point arithmetic.

The percent grades are converted to the letter grades as following.

| **Percent grade** | **Letter grade** |
|---|---|
| 94+ | A |
| 90-93 | A- |
| 87-89 | B+ |
| 83-86 | B |

| | |
|---|---|
| 80-82 | B- |
| 77-79 | C+ |
| 73-76 | C |
| 70-72 | C- |
| 67-69 | D+ |
| 63-66 | D |
| 60-62 | D- |

**Course objectives:** By the end of the semester, you should be able to: choose, develop and apply the appropriate numerical techniques for your problem, interpret the results, and assess their accuracy.

**Class schedule:** this is a *preliminary* schedule.

| Week(s) | Subject |
|---|---|
| 1-2 | Matlab programming |
| 3-5 | Square linear systems of equations |
| 6 | **Midterm I** – Tue, Sep 29 |
| 6-7 | Overdetermined linear systems |
| 8-10 | Solution of nonlinear equations |
| 10 | **Midterm II** – Thu, Oct 29 |
| 11-12 | Piecewise interpolation. Numerical differentiation and integration |
| 13 | Initial value problem for ODE |
| 14 | **Thanksgiving recess** |
| 15 | Initial value problem for ODE |

For an up-to-date schedule consult the *Academic Calendar* at https://www.phys.uconn.edu/~rozman/Courses/m3510_20f//downloads/calendar.pdf

**Communications:** talking in person (including videoconferencing) is the preferred method to communicate with the instructor with regards to the course matters; email is a good option to ask/answer a short question or to schedule a video appointment.

- use your UConn email for class communications.
- please include the tag `[math3510]` in the subject of your email, e.g. "[math3510] midterm II review session".
- the subject line of your email should communicate what the email is about so that the recipient can prioritize the email's importance without opening it. E.g. "[math3510] Tacoma bridge collapsed - cannot come to the final" would be a good email subject (assuming email existed in 1940 . . . ); "urgent", "important", "a question" are bad ones. Do not use your name as subject – the sender name is already visible as a part of email header.
- please no emails with attachments unless requested by the instructor.

**Homework:** Homework assignments submitted on time may be returned (at the discretion of the instructor) for corrections after initial grading.

Homework assignments are not accepted after the solutions had been discussed in class, and/or had been posted online, and/or graded assignments returned. Individual emergencies can be accommodated by extra credit assignments.

You are welcome to discuss the homework's problems with others in order to better understand them but the work you turn in must be your own. In particular, you must run your own calculations (where applicable) and communicate and explain the results in your own words.

Members of collaborating groups must consistently list all collaborators names.

Assignments that are hard to understand are also hard to grade correctly, therefore: (a) use words and pictures to supplement your equations; (b) work must progress linearly down the page – recopy solutions that are too nonlinear.

Requirements for written assignments:

- Use letter-size paper. Use only one side of each sheet.
- $\boxed{\text{Box}}$ your final answer(s) and important intermediate results.
- When submitting an assignment on paper, staple your notes together, (i.e. no paper clips, torn or folded corners) with the assignment cover page (if applicable).

Highly recommended: make copies of homework assignments for your own files.

- When submitting an assignment online, scan your submission, and convert the scan(s) into a single pdf document.

**Honors conversion:** Students interested in honors conversion should contact the instructor during *the first week of classes*.

**Computer programming:**

Homework projects typically require writing simple computer programs.

Knowledge of at least one programming language is an enrollment requirement for the class.

Matlab is used as a programming language for teaching in MATH3510 (as well as the followup course MATH3511). An option to use another programming language for homework assignements is not available in the Fall 2020 semester.

The recommended version of Matlab to use in class is `Matlab R2020a` which is the latest stable release. This version is installed on *UConn Anyware* and available for installation on students' personal computers.

**Student responsibilities and academic policies:**

Students at the University of Connecticut are held to certain standards and academic policies. Review these important standards, policies — the links are provided on the course website.