Michigan Technological University

Course Syllabus

MA5630 – Numerical Linear Algebra
College of Science and Arts
Spring 2025

Instructor Information

Instructor:	Allan Struthers
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Office Hours:	MWF 10-10:50am and T/Th 3:15–4pm

Course Identification

Course Number:	MA5630-R01
Course Name:	Numerical Optimization
Course Location:	Chem Sci 211
Class Times:	T 2-3:15pm, Th
Prerequisites:	MA 4330 or MA 4610 or MA 4630 or MA 5627

Course Description/Overview

Numerical solution of unconstrained and constrained optimization problems and nonlinear equations. Topics include optimality conditions, local convergence of Newton and Quasi-Newton methods, line search and trust region globalization techniques, quadratic penalty and augmented Lagrangian methods for equality-constrained problems, logarithmic barrier method for inequality-constrained problems, and Sequential Quadratic Programming.

Course Resources

Course Website(s)

- Canvas (www.courses.mtu.edu)
- Github (https://github.com/AllanStruthersMTU)

Required Course Text (free on SpringerLink)

- Numerical Optimization, by Nocedal & Wrights, Springer, ISBN 978-0387303031
- Free legal pdf at https://link.springer.com/book/10.1007/978-0-387-40065-5

Course Fees/Supplies (please install)

- Mathematica (available free to any enrolled MTU student)

- Julia freely available for all platforms at https://julialang.org/downloads/

Course Learning Objectives

Upon successful completion of this course, students will be able to

- *Interpret a variety of optimization algorithms.*
- *Implement a variety of optimization algorithms.*

Grading Scheme

Grading System (Note: This is an example and not a Michigan Tech standard)

Letter Grade	***Percentage***	***Grade points/credit***	***Rating***
A	90% & above	4.00	Excellent
AB	90% – 85%	3.50	Very good
B	85% – 80%	3.00	Good
BC	80% – 75%	2.50	Above average
C	75% – 70%	2.00	Average
CD	70% – 65%	1.50	Below average
D	65% - 60%	1.00	Inferior
F	59.9% and below	0.00	Failure
I	Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student's control.		
X	Conditional, with no grade points per credit; given only when the student is at fault in failing to complete a minor segment of a course, but in the judgment of the instructor does not need to repeat the course. It must be made up by the close of the next semester or the grade becomes a failure (F). A (X) grade is included in the grade point average calculation as a (F) grade.		

Point Distribution

Course Component	**Points**
Homework	50
Projects/Exams	50
Total Points	**100**

Late Homework: Almost all HW will be computational. Solutions will be provided and discussed in class. For this reason, late HW will not be accepted.

Course Policies

- *Ask questions in class if you do not get something. You are very unlikely to be the only person with a question if (well actually when) I am less than crystal clear.*
- *Read the appropriate lecture in the text before class: They are mostly pretty short.*
    - *Post questions on the Canvas discussion board before class for better answers!*
- *Everyone is stressed by our current disruptions!*

- *Let's not increase the stress by keeping interactions positive and professional!*

Academic Integrity Rules

You can (and should) discuss homework assignments with anyone willing to help! This includes me, your classmates, and/or your cousin in Auchtermuchty! You can (and also should) use any and all appropriate resources (books, articles, Wikipedia, Chegg, StudySoup, Course Hero, etc.) when appropriately cited. Because it's important to everyone at Michigan Tech that academic standards be maintained, academic misconduct may result in an appropriate conduct sanction/educational condition(s) imposed by the Office of Academic and Community Conduct and/or in an academic penalty (lower grade/failing grade) imposed by the faculty.

For more details on academic integrity, please review the Academic Integrity Policy of Michigan Tech [http://www.admin.mtu.edu/usenate/policies/p109-1.htm].

University Policies

Student work products (exams, essays, projects, etc.) may be used for purposes of university, program, or course assessment. All work used for assessment purposes will not include any individual student identification.

Michigan Tech has standard policies on academic misconduct and complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. For more information about reasonable accommodations or equal access to education or services at Michigan Tech, please call the Dean of Students Office at 906-487-2212. More information is also available from the Syllabi Policies webpage [http://www.mtu.edu/ctl/instructionalresources/syllabus/syllabus_policies.html].

COVID-19

While special protocols for COVID-19 are in place, you may wish to include a statement setting your expectations for wearing personal protective equipment (PPE) like the following:

All students are expected to comply with University protocols in place to reduce the spread of COVID-19, which include wearing a face covering indoors at all times and maintaining six-foot social distancing whenever possible.

Students not in compliance with the face covering protocol may be asked to leave class until they are able to comply. Students unable to medically tolerate a face covering should contact Student Disability Services [https://www.mtu.edu/success/disability/] to explore possible accommodations. Chronically noncompliant or disruptive students may be reported to the Office of Academic and Community Conduct [https://www.mtu.edu/conduct/].

Course Schedule (Preliminary)

The aim is to cover one "lecture" each class day and skip lecture 10. The academic calendar is available at https://www.mtu.edu/registrar/students/calendars/academic/

We will use the final exam slot (scheduled at some point by the registrar) for either an exam or project presentations.