



Florida State University

MAD 5420 0001

Numerical Optimization
2026 Fall

Course Information

Credit Hours: 3

Course Delivery Method: In Person/Traditional

Meeting Location: LOV0102

Meeting Days and Times: 09:20 AM 10:10 AM M|W|F

Instructor Information

Kyle Gallivan

Email: kgallivan@fsu.edu

Department/Office Location

421 LOV

Office Hours

MWF 11:30 to 13:30 and by appointment

Prerequisites or Co-requisites

Prerequisites: MAC 2313, MAS 3105, and C, C++, or Fortran.

Course Description

This course covers the theoretical and computational concepts , techniques and tools to design, analyze, and evaluate algorithms for fundamental problems in numerical optimization.

Course Objectives

By completing this course material, it is expected that students will be able to demonstrate the following skills, which are fundamental to the design, analysis and use of algorithms to solve important problems in numerical linear optimization:

1. Ability to identify and exploit the algebraic and structural properties of cost functions and feasible sets relevant to algorithm choice and design for important problems in numerical optimization;
2. Ability to derive the algorithms based on the properties identified;
3. Ability to determine the convergence and robustness of the algorithms;
4. Ability to implement efficient versions of the algorithms;
5. Ability to empirically investigate the performance of the algorithms;

Required Textbooks and Readings

No required textbook

Topical Outline /Course Schedule

1. Introduction to types of optimization problems.
2. Key assumptions for standard unconstrained problems.
3. Basic theory of sufficient, necessary conditions for optimality and stationarity.
4. Influence of basic cost function on convergence results: quadratic cost.
5. Unconstrained optimization on R^n : descent line search methods -- Newton, quasiNewton, limited memory, nonlinear conjugate gradient, momentum; introduction to trust region methods.
6. Linear programming: convexity and optimality conditions; simplex methods.
7. Basic theory of Hilbert spaces, projection, and convexity of feasible sets.
8. Constrained optimization on R^n with a convex feasible region with and without a convex cost function.
9. General nonlinear programming: KKT conditions and stationarity, constraint qualifications, basic nonlinear programming algorithms.
10. Introduction to duality and primal dual methods for linear programming.
11. Selected advanced algorithms for large scale or structured cost function problems.

Assignments and Evaluations

1. Homework assignments including written problems and simple programming.
2. A long-term assignment that involves independent reading and preparing a report on a topic relevant to the course and an associated oral presentation will be used to evaluate student performance.

Grading Scale and Grading Policies

Grading scale breakdown

Letter Grade	Percentage
A	93% to 100%
A-	90% to <93%
B+	87% to <90%
B	83% to <87%
B-	80% to <83%
C+	77% to <80%
C	73% to <77%
C-	70% to <73%
D+	67% to <70%
D	63% to <67%
D-	60% to <63%
F	0% to <60%

This scale will be adjusted based on class performance but the percentage required for a grade will not be higher than those listed above.

University Policies

University Attendance Policy

Excused absences include documented illness, deaths in the family, and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid written excuse. Consideration will also be given to students whose dependent children experience serious illness.

Academic Honor Policy

The Florida State University Academic Honor Policy outlines the

University's expectations for the integrity of student's academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to “. . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University.”

(Florida State University Academic Honor Policy, found at

<http://fda.fsu.edu/academic-resources/academic-integrity-and-grievances/academic-honor-policy>)

Americans With Disabilities Act

FSU is committed to providing reasonable accommodation for all persons with disabilities in a manner that is consistent with the academic standards of the course while empowering the student to meet the integral requirements of the course. Students with disabilities needing academic accommodation should: (1) register with and provide documentation to the Office of Accessibility Services; and (2) request a letter from the Office of Accessibility Services to be sent to the instructor indicating the need for accommodation and what type; and (3) meet (in person, via phone, email, zoom, etc...) with each instructor to whom a letter of accommodation was sent to review approved accommodations. Please note that instructors are not allowed to provide classroom accommodations to a student until appropriate verification from the Office of Accessibility Services has been provided. This syllabus and other class materials are available in an alternative format upon request. For the latest version of this statement and more information about services available to FSU students with disabilities, contact the:

Office of Accessibility Services
874 Traditions Way
108 Student Services Building
Florida State University
Tallahassee, FL 32306-4167

(850) 644-9566 (voice)
(850) 644-8504 (TDD)
oas@fsu.edu
<https://dsst.fsu.edu/oas>

Academic Success

Your academic success is a top priority for Florida State University. University resources to help you succeed include tutoring centers, computer labs, counseling and health services, and services for designated groups, such as veterans and students with disabilities. The following information is not exhaustive, so please check with your advisor or the Department of Student Support and Transitions to learn more.

CONFIDENTIAL CAMPUS RESOURCES:

Various centers and programs are available to assist students with navigating stressors that might impact academic success. These include the following:

Victim Advocate Program

University Center A, Rm. 4100
(850) 644-7161
Available 24/7/365
Office Hours: M-F 8-5
<https://dsst.fsu.edu/vap>

Counseling and Psychological Services (CAPS)

Florida State University's Counseling and Psychological Services (CAPS) primary mission is to address psychological needs and personal concerns, which may interfere with students' academic progress, social development, and emotional well-being. The following in-person and virtual (tele-mental health) services are available to all enrolled students residing in the state of Florida:

1. Individual therapy
2. Group therapy

3. Crisis Intervention
4. Psychoeducational and outreach programming
5. After hours crisis-hotline
6. Access to community providers for specialized treatment

Call 850-644-TALK (8255) for more information on how to initiate services.

Counseling and Psychological Services

250 Askew Student Life Center

942 Learning Way

(850) 644-TALK (8255)

Walk-in and Appointment Hours:

M-F 8 am – 4 pm

<https://counseling.fsu.edu/>

University Health Services

The mission of University Health Services (UHS) is to promote and improve the overall health and well-being of FSU students. UHS provides a coordinated continuum of care through prevention, intervention, and treatment. Services include general medical care, priority care, gynecological services, physicals, allergy injection clinic, immunizations, diagnostic imaging, physical therapy, and a medical response unit. The Center for Health Advocacy and Wellness (CHAW) assists students in their academic success through individual, group, and population-based health and wellness initiatives. Topics include wellness, alcohol and other drugs, hazing prevention, nutrition and body image, sexual health, and power based personal violence prevention. For more information, go to uhs.fsu.edu.

University Health Services

Health and Wellness Center

960 Learning Way

Tallahassee, FL 32306

Hours: M-F, 8 am – 4 pm

(850) 644-6230

<https://uhs.fsu.edu/>

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation statement, this syllabus is a guide for the course and is subject to change with advance notice.

Free Tutoring from FSU

On-campus tutoring and writing assistance is available for many courses at Florida State University. A comprehensive list of on-campus tutoring options is available at **tutoring.fsu.edu** (<https://tutoring.fsu.edu>). High-quality tutoring is available by appointment and on a walk-in basis. These services are offered by tutors trained to encourage the highest level of individual academic success while upholding personal academic integrity.

AI Policy

This course encourages the responsible and ethical use of generative AI tools to support your learning. Read instructions for each assignment carefully as AI use guidelines may vary depending on the assignment. If you are uncertain if an application of AI is appropriate, be sure to ask.

- Review AI results. Generative AI is highly vulnerable to inaccuracy and bias. It is your responsibility to verify the validity of all AI results. You should assume AI output is wrong unless you either know the answer or can verify it with another source.
- Cite all AI use. You may not represent output generated by AI as your own work. Disclose the use of AI in your assignments. When citing AI use, include the name of the AI tool (eg, Gemini) and vendor (eg, Google), as well as a description of how it was used (eg, checking grammar or spelling, brainstorming topics, creating an outline).
- Save a transcript of AI interactions. For each assignment, save a transcript of your interactions with AI. If you ever need to explain why or how you used AI in your assignment, the transcript will provide concrete evidence of your actions and decisions regarding your AI usage, including your drafting and revision process.
- Use AI tools approved by the university. When using generative AI tools, be cautious about what you share as AI tools not licensed through the university retain and share information you provide them. Instead, use tools licensed through the university, such as Microsoft Copilot and Google Gemini. These tools are subject to data privacy agreements that protect your information and work. Make sure you are logging in with your FSU credentials and not via a personal account.

Canvas Support Statement

Canvas works best with Chrome or Firefox browsers. If you use Safari and notice issues on either your mobile or desktop devices, please switch to Chrome or Firefox.

Need help with Canvas?

FSU Canvas Support

Office of Digital Learning and Academic Technology

Email: canvas@fsu.edu

Phone: (850) 644-8004

Website: support.canvas.fsu.edu

Hours: 8am to 5pm, Monday - Friday