



SYLLABUS
IE 8743 Nonlinear Programming I
Spring 2021

INSTRUCTOR: Haifeng Wang, Ph.D.
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OFFICE: McCain 260P
Tel.: 662-325-3923
CLASS HOURS: TR: 09:35AM - 10:50AM
OFFICE HOURS: TR: 2:00pm - 3:30pm; or by appointment
CLASSROOM: MCCAIN 125
WEBSITE: canvas.msstate.edu
COURSE VIDEO LINK: <https://oc-engage02.engr.msstate.edu/engage/ui/index.html>

VIDEO ACCESS:

Information about accessing your courses, videos, and instructions for streaming or downloading course videos can be found on our website at <http://www.bagley.msstate.edu/distance/setup/>.

CATALOG DESCRIPTION:

Three hours lecture. Optimization of nonlinear functions; quadratic programming, gradient methods, Lagrange multipliers and Kuhn-Tucker theory.

PREREQUISITES:

IE 4733 Linear Programming or MA 4733 Linear Programming

BOOKS:

- 1) (*Textbook*) Nocedal, J. and Wright, S.J., Numerical Optimization, Springer, New York, NY, 2006, 2nd Edition.
- 2) Bertsekas, D.P., Nonlinear Programming, Athena Scientific, Belmont, MA, 2016, 3rd Edition.
- 3) Boyd, S., Boyd, S.P. and Vandenberghe, L., Convex Optimization, Cambridge university press, 2004.
- 4) Gill, P.E., Murray, W. and Wright, M.H., Practical Optimization, Academic Press: New York, 1981.
- 5) Luenberger, D.G. and Ye, Y., Linear and nonlinear programming, Springer, 2008, 3rd Edition.
- 6) Bazarara, M.S., Sherali, H.D. and C.M. Shetty, Nonlinear Programming: Theory and Algorithms, Wiley, 2006, 3rd Edition.

COURSE OBJECTIVES:

- To learn the fundamentals of nonlinear programming theory and its applications.
- To understand the convexity and convex optimization theory
- To learn gradient methods and KKT conditions.

GRADE DETERMINATION:

- Homework 30%
- Mid-term Exam 25% (tentatively March 4th Thursday)

- Course Project 35%
- Participation 10%

Final letter grades will be determined: A = 90% through 100%; B = 80% through 89%; C = 70% through 79%; D = 60% through 69%; F = Less than 60%. Grades will be posted on-line. Disputations of grade should be discussed with the professor within one week from the date the grade is submitted. As a note: A request for grade review will result in a complete regrade of the assignment or exam, not only those items in the request.

Homework (30%): 4-5 homework will be assigned. Late homework will not be accepted (unless it is the result of an officially excused absence).

Exam (25%): There will be one exam (midterm).

Course Project (35%): The objective of the course project is to develop a better understanding of the course materials through a hands-on research project. The focus of the project should be an implementation of optimization approaches. The project will be an individual effort on an agreed topic.

- Proposal report (5%)
- Proposal presentation (5%)
- Final presentation (10%)
- Final report (15%)

Participation (10%): Attending class (on-campus students), lecture video watching (online students), CANVAS discussions, and class small presentation.

Suggestions: Suggestions for improvement are welcome at any time.

EXPECTED TOPICS COVERED:

Topics Covered
➤ Brief review of linear algebra
➤ Convex theory
➤ Unconstrained optimization
➤ Gradient methods
➤ Newton's methods
➤ Unconstrained optimization in machine learning
➤ Constrained optimization
➤ The KKT conditions
➤ Duality
➤ Support vector machine

INFORMATION FOR DISTANCE STUDENTS

Exam Proctoring:

Proctoring requirements. Distance students are required to take all the exams via a proctor.

Instructions for registering your proctor. At least one week in advance of each exam, the student must have up-to-date proctor information. Students can submit information about their proctor by accessing

the proctor form (<https://online.msstate.edu/proctoring/>) and following the directions therein. If only one proctor is used for the entire semester, then only one proctor form must be submitted. However, a new proctor form must be submitted for each change in proctor at least one week in advance of the exam. In choosing your proctor, you should find someone who is not related to you and is trustworthy. Examples include your supervisor or someone in Human Resources. If you have a question about whether someone would be an acceptable proctor, please email the instructor.

Procedure for using a proctor. Prior to the exam, the instructor will email a copy of the exam to your proctor. You will then take the exam under their supervision. After you complete the exam, your proctor will scan your work and email it to me. Please be responsible for ensuring that your proctor submits your work to me on time.

When to take exams. Distance students are typically expected to take exams before the end of three days after the exam has given in class. For example, if an exam is given on a Thursday, I would give distance students until Sunday at 11:59 pm to take the exam. If for some reason, the student cannot take the exam on time, the student need to email the instructor before the in-class exam with an eligible excuse.

Please remember that there are some students who may not be able to use physical proctors. Virtual may be an option.

Technical Assistance

Distance students can report technical difficulties at enr-dist-support@lists.msstate.edu directly. Students should remember to include your netid and the name and number of the course you are referencing in the subject line. For example, Tamra Swann (tlh25) CE 8XXX Title of Course.

Distance students who have questions throughout the semester can find answers to many questions via the www.bagley.msstate.edu/distance website. Program specific questions can be found at online.msstate.edu and search for the appropriate program.

Office Hours:

The office hour is scheduled by appointment for distance students in this class. Weekend is open for the office hour appointment.

Learning Progress:

Distance students are expected to keep up-to-date with watching video lectures. A link to the video lectures will be provided on the course website.

ADDITIONAL INFORMATION

Mississippi State University Honor Code <http://www.honorcode.msstate.edu/>

“As a Mississippi State University student, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do” Upon accepting admission to MSU, a student immediately assumes a commitment to uphold the Student Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Student Honor Code. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or processes of the Student Honor Code. If found cheating on any assignment, the instructor will most likely recommend the student receive an “F” in the course.

Title IX

MSU is committed to complying with Title IX, a federal law that prohibits discrimination, including violence and harassment, based on sex. This means that MSU’s educational programs and activities

must be free from sex discrimination, sexual harassment, and other forms of sexual misconduct. If you or someone you know has experienced sex discrimination, sexual violence and/or harassment by any member of the University community, you are encouraged to report the conduct to MSU's Director of Title IX/EEO Programs at 325-8124 or by e-mail to titleix@msstate.edu. Additional resources are available at <http://www.msstate.edu/web/security>, or at <http://students.msstate.edu/sexualmisconduct/>.

Student Services and Testing Accommodations

<http://sss.msstate.edu>

Students who need academic accommodations based on a disability should visit the Office of Student Support Services, 01 Montgomery Hall, call 662-325-3335, or visit the website at www.sss.msstate.edu. The Student Support Services office is available for academic accommodations if needed. Disability Support Services (DSS) assists in determining the classroom accommodations that are most appropriate for students with disabilities based on documentation of their disability. DSS encourages communication with instructors regarding accommodations. DSS will provide instructors with Notification Emails for eligible students regarding their classroom and testing accommodations. Examples of classroom and testing accommodations are varied, but may include: adapted testing arrangements, extended time on tests, testing in a distraction-free environment, and assistance with alternative formats of textbooks.

Please ensure the Notification Email is received by the instructor within the first week of class and notify instructor via email of plans to utilize testing accommodations and what accommodations are necessary a minimum of 3 business days prior to scheduled examination date or your accommodation request will be denied.

University Safety Statement

Mississippi State University values the safety of all campus community members. Students are encouraged to register for Maroon Alert texts and to download the Everbridge App. Visit the Personal Information section in Banner on your mystate portal to register. To report suspicious activity or to request a courtesy escort via Safe Walk, call University Police at 662-325-2121, or in case of emergency, call 911. For more information regarding safety and to view available training resources, including helpful videos, visit ready.msstate.edu.

Pandemic Statements

Facial Coverings: To safeguard the health of all members of the MSU campus during this global pandemic, the university has reconfigured classroom spaces and adjusted room capacities to assure adequate physical distance between all individuals in each room. In addition, the university has published requirements for the use of face coverings for everyone on campus, including specific requirements for their use in all classrooms, labs, and shared office spaces regardless of physical distancing. In order to mutually protect the students' freedom to learn and the instructor's ability to teach in a safe classroom environment, everyone in this classroom is required to wear a face covering in the classroom in accordance with MSU policy (

<https://www.msstate.edu/sites/www.msstate.edu/files/SafeReturnBooklet.pdf>Links to an external site.)

If a student cannot wear a face covering due to a medical condition, they should request an accommodation via the Office of Disability Support Services. If a student simply doesn't want to wear a face covering, they will not be permitted to remain in the classroom or lab.

Continuity of Instruction: In the event that face-to-face classes are suspended due to the pandemic or its effects, the instructor will continue instruction in a manner that best supports the course content and student engagement. In this event, all instructors will notify all students of the change via their university email address (the official vehicle for communication with students). At that time, they will provide details about how instruction and communication will continue, how academic integrity will be ensured, and what students may expect during the time that face-to-face classes are suspended. If a

student becomes unable to continue class participation, the student should contact their instructor and advisor for guidance.

Attendance policy for face-to-face instruction

This section is a face-to-face instructional class. Per Academic Operating Policy 12.09, students are expected to attend all class meetings in person. Should a student expect a university-excused absence from a class, the student should contact the course instructor of record to inform them of the absence and the reason for it. Special instructions regarding illness and contagious infection are included in the syllabus section entitled: Contagious Infection and Other Health Accommodations for face-to-face instruction.

Contagious Infection and Other Health Accommodations for face-to-face instruction

Students required to quarantine due to asymptomatic contagious infection or potential exposure to contagious infection, will be accommodated on a case-by-case basis. Such students must provide an excuse from either the Dean of Students, the Longest Student Health Center, or qualified medical practitioner directing quarantine procedures, and the recommended date of return. Information provided will be enforced at the instructor's discretion.

In cases meriting accommodation, quarantining students may be expected to log into the lecture during the scheduled class time or complete equivalent assignments approved by the instructor. If a student is too ill to participate in a class at the scheduled time, the student may be provided a link to a recording of the lecture or offered a similar accommodation as determined by the instructor.

It is the responsibility of the student to initiate and maintain contact with their instructor(s) regarding their quarantine status. All accommodations are subject to the instructions provided by the Dean of Students', Longest Student Health Center, or qualified medical practitioner.

Important MSU Dates

January 11	Classes begin
January 15	Last day to drop a course without a grade (5th class day) 11:59 p.m.
January 18	Holiday - no classes scheduled
February 22	First progress grade reporting deadline (30th class day)
March 2	Mid-point of semester
March 19	Second progress grade reporting deadline
April 2	Holiday (Classes will not meet)
April 5	Holiday (Classes will not meet)
April 19	Classes end

May 3

Final Grades Due 10:00 a.m.

NOTE

- No Food or Drink in classroom
- This syllabus is subject to change based on the needs of the class; course announcements will be made during the class period or via email.
- If you are a student with special needs, please contact the instructor ASAP.