



**Textbook:** The required textbook for the course is:

- J. Nocedal and S. J. Wright, *Numerical Optimization*, Second Edition, Springer Series in Operations Research, Springer, New York, NY, USA, 2006.

Reading the textbook is not required, but it is recommended. You are not responsible for textbook material that is not covered in lecture. Course material also will be derived from the following recommended textbooks:

- M. S. Bazaraa, H. D. Sherali, and C. M. Shetty, *Nonlinear Programming: Theory and Algorithms*, John Wiley & Sons, Hoboken, NJ, USA, 2006.
- D. P. Bertsekas, *Nonlinear Programming*, Second Edition, Athena Scientific, Belmont, MA, USA, 1999.
- D. P. Bertsekas, *Convex Optimization Theory*, Athena Scientific, Nashua, NH, USA, 2009.
- R. L. Burden and J. D. Faires, *Numerical Analysis*, Seventh Edition, Brooks/Cole, Pacific Grove, CA, USA, 2001.
- J. E. Dennis, Jr. and R. B. Schnabel, *Numerical Methods for Unconstrained Optimization and Non-linear Equations*, Classics in Applied Mathematics, SIAM, Philadelphia, PA, USA, 1996.
- R. Fletcher, *Practical Methods of Optimization*, Second Edition, John Wiley & Sons, Chichester, West Sussex, England, 1987.
- A. Ruszczyński, *Nonlinear Optimization*, Princeton University Press, Princeton, NJ, USA, 2006.

**Expected Schedule:**

Week	Dates	Topics	Notes
1	1/20, 1/22	Introduction, Fundamental Concepts, Unconstrained Optimization Theory	
2	1/27, 1/29	Convex Optimization Algorithms	
3	2/03, 2/05	Newton's Method, Numerical Analysis	
4	2/10, 2/12	Line Search Methods	
5	2/17, 2/19	Trust Region Methods	
6	2/24, 2/26	Conjugate Direction Methods	
7	3/03, 3/05	Quasi-Newton Methods	
8	3/10, 3/12	(No lectures)	Spring Break
9	3/17, 3/19	(Tuesday lecture time used for exam)	Midterm Exam
		Constrained Optimization Theory	Project Posted
10	3/24, 3/26	Constraint Qualifications, Duality Theory	
11	3/31, 4/02	Linear Optimization, Quadratic Optimization	
12	4/07, 4/09	Penalty Methods	
13	4/14, 4/16	Sequential Quadratic Optimization (Thursday lecture to be rescheduled)	ISE Banquet
14	4/21, 4/23	Interior-Point Methods	
15	4/28, 4/30	Nonlinear Optimization Software	Project Due
16	5/04–5/08		Final Exams

**Grading:** Your grade will be calculated as follows.

Homework:	25%
Project:	20%
Midterm Exam:	20%
Final Exam:	25%
Participation:	10%

**Homeworks:** There will be regular homework assignments throughout the semester, generally assigned and due every few weeks. Each homework must be submitted electronically via Course Site. No credit will be given for any late assignment. You are free to consult with other students when working on homework, but the work you turn in must be your own. *Please cite any references you use, including fellow students.*

**Project:** The course project will involve implementing software and writing a report to describe your software and numerical results obtained on test problems. Much of the code will come from the accumulation of coding exercises that will be made available throughout the semester. All coding must be done in Matlab. If you are not experienced in coding and/or Matlab, then I suggest you start practicing early as you will be expected to learn these things on your own. Ask me if you have any questions. The grade for the project will be based on the quality of your report, the correctness of the code, and the comments/documentation that you provide. When in doubt, comment every line of your code.

**Collaboration Policy:** The sharing of ideas is educationally useful and you are encouraged to discuss assignments with other students. However, *plagiarism* of any kind is destructive, fraudulent, and unacceptable. You are *strictly* forbidden to copy another student's written work, whole or in part, and submit that work under your name. You are also *strictly* forbidden to make trivial or mechanical changes to another student's written work and submit that work under your name. Note that while electronic plagiarism is easier to perform (via copy-and-paste), it is also easier to detect. Plagiarized work will receive no credit and repeat offenses will result in more severe action. A sure way to avoid this issue is to discuss the assignments with fellow students, but then write your solutions individually and independently.

**L<sup>A</sup>T<sub>E</sub>X:** Homework solutions and the project report must be submitted as documents produced with L<sup>A</sup>T<sub>E</sub>X. There are no exceptions to this requirement. I am happy to provide assistance for those new to L<sup>A</sup>T<sub>E</sub>X; simply e-mail me to set up a time or come to office hours. I will also provide a template for homework solutions. It is not required that you use the provided template, but it is recommended.

**Exams:** The midterm will be a cumulative, closed-book, closed-notes, in-class, *written* exam. The final will be a cumulative, closed-book, closed-notes, *oral* exam.

**Participation:** Attendance will not be taken. However, participation will factor into your grade. If you are unable to participate in lecture, then participation entails being a presence online—via e-mail or Course Site—or in office hours. In short, if by the end of the semester we have not had any one-on-one discussions about the course and/or course material, then your participation grade will suffer.

**Emergencies:** Everyone is responsible for all material covered and announcements made in lecture. If you believe you will miss a long period of time in the course due to illness, a family emergency, etc., then please contact me as early as possible. Under no circumstances will credit be given for missed work unless you have discussed your absence with me in advance.

**Regrade Requests:** If you disagree with a grade you receive, then you may submit a regrade request. This request must be written and submitted no more than 48 hours after you receive the grade.

**Recording Devices:** Voice and/or video recording devices may be used only with the approval of everyone in the classroom. Please let me know in advance if you wish to use these types of devices.

**Students with Disabilities:** If you have a disability for which you are or may be requesting accommodations, please contact me and the Office of Academic Support Services, University Center C212 (+1 (610) 758-4152) as early as possible in the semester. You must have documentation from Academic Support Services before accommodations can be granted.

**Equitable Community Principles:** Lehigh University endorses The Principles of Our Equitable Community (<http://www4.lehigh.edu/diversity/principles>). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.