

ECE 490 *Introduction to Optimization* Spring 2025

Exam II Information

The second midterm exam will be held *in class*

3081 ECE Bldg *Thu, Apr 3, 11:00 a.m. – 12:20 p.m.*

The exam is closed-book, no calculators allowed (and you will not need one). You are allowed to bring two two-sided sheets of notes. The exam will cover Chapters 5, 6, and 7.

In particular, I expect you to understand perfectly the following concepts:

1. Definition and examples of stochastic gradients, particularly incremental gradients and minibatches (Sec. 5.1).
2. Interpretation and verification of the assumptions on stochastic gradients, first-order moments = unbiasedness, second-order moments = smoothness, behavior near minimizers (Sec. 5.3).
3. Basics of convergence analysis of stochastic gradient methods (Sec. 5.4).
4. Motivation and basic analysis of coordinate descent (Sec. 6.1, 6.2.1, 6.2.2).
5. First-order necessary and sufficient conditions for local and global minima in constrained optimization via normal cones (Sec. 7.1).
6. Definition, examples, basic properties of Euclidean projection (Sec. 7.2).
7. Basics of convergence analysis of projected gradient descent methods (Sec. 7.3.1–7.3.3).
8. Basics of convergence analysis of conditional gradient (Frank–Wolfe) method (Sec. 7.4).