

**MAT 781: Advanced Numerical Methods:
Nonlinear Programming, Fall 2013**

Dr. Lixin Shen

206 D Carnegie Hall

Phone: 3-2889, E-Mail: lshen03@syr.edu

Lecture Time: 12:30 - 1:50 pm, TTh

Lecture Place: *Carnegie Hall, Room 124*

Office Hour: 3:30–4:30 pm, TTh, or by appointment

This is a course on optimization for graduate students in mathematics, statistics, computer science, engineering and physics. Students who take this course are required to have advanced calculus, linear algebra and basic numerical methods.

Topics: Subgradient, cutting-plane, and ellipsoid methods. Decentralized convex optimization via primal and dual decomposition. Alternating projections. Exploiting problem structure in implementation. Convex relaxations of hard problems. Robust optimization. Selected applications in areas such as signal processing and image processing. The instructor will balance mathematical theory of optimization and numerical algorithms.

References:

- Heinz H. Bauschke and Patrick L. Combettes, *Convex Analysis and Monotone Operator Theory in Hilbert Spaces*, Springer, 2011.
- D. P. Bertsekas, with A. Nedic and A. Ozdaglar, *Convex Analysis and Optimization*, Athena Scientific, Belmont, MA, 2003.
- S. Boyd and L. Vandenberghe, *Convex Optimization*, Cambridge University Press.
- D. P. Bertsekas, *Nonlinear Programming*, Second Edition, Athena Scientific, Belmont, MA, 1999.
- S. J. Wright, *Primal-Dual Interior-Point Methods*, SIAM, 1997.

Grades: Homework 30%, project 40%, final 30%