

# SIE 640 LARGE SCALE OPTIMIZATION

Fall 2023

**Class meeting times & location:**

T Th 3:30pm – 4:45pm, ENGR 301

**Instructor:** Prof. Pavlo Krokhmal

Office: ENGR 223

Tel: (520) 621-2605

E-mail: [krokhmal@arizona.edu](mailto:krokhmal@arizona.edu)

Office hours: T Th 1:00pm – 2:00pm, or by appointment

**Course Description:** Optimization problems arise in many areas of engineering and science. Often, such problems are *large-scale*, i.e., are characterized by a large number (hundreds of thousands or millions) of variables and/or constraints. Successful solution procedures for large-scale optimization problems typically exploit special features of the problem's structure, e.g., sparsity of constraint matrix. The objective of this course is to familiarize students with the most common techniques and approaches for solving large-scale optimization problems, teach them to recognize the special structure of problems that makes the problem amenable to solution via the appropriate methods and to apply the solution techniques to real-life problems in stochastic optimization, machine learning, etc.

**Course Topics:**

- Review of select topics in optimization and convex analysis
- Applications and examples
- Solution methods in large-scale linear, nonlinear, and mixed-integer programming (Benders decomposition, Lagrangian relaxation, gradient descent, bundling techniques, etc.)
- Modeling with Julia and AMPL

**Required text**

None; instructor will provide references to research papers/monographs on particular class topics.

**Prerequisites:** Courses in linear programming/operations research

**Computer Support:** PC with internet access

**Assignments:** 60% Homework, 30% Project, 10% Research paper presentation

**Grading:**

A: 90 – 100%

B: 80 – 89%

C: 70 – 79%

D: 60 – 69%

E: 0 – 59%

**Attendance Policy:** Students are expected to attend class. If you miss class you are responsible for obtaining the class notes, assignments, and announcements. Phone usage is not allowed during the class; please put your phone into “quiet”, or “vibrate” mode prior to start of the class.

**Accommodation for Students with Special Needs:** Students with disabilities or special needs for accommodations (including in class meetings and exams) are required to contact both the instructor and the S.A.L.T. Center ([www.salt.arizona.edu](http://www.salt.arizona.edu)) or the Disability Resource Center (<http://drc.arizona.edu>) as early as possible in the semester. They are also required to submit appropriate documentations to the instructor before accommodations could be offered.

**Statement of Inclusion:** Inclusive Excellence is a fundamental part of the University of Arizona’s strategic plan and culture. As part of this initiative, the institution embraces and practices diversity and inclusiveness. These values are expected, respected and welcomed in this course.

**Name and Pronoun Usage Statement:** This course supports elective gender pronoun use and self-identification; rosters indicating such choices will be updated throughout the semester, upon student request. As the course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect.

**Academic honesty:** All students are expected to commit themselves to be honest in all academic work and understand that failure to comply with this commitment will result in disciplinary action. This is a reminder to uphold your obligation as a UA student and to be honest in all work submitted and exams taken in this course and all others.

**This syllabus is tentative and the instructor reserves the right to make modifications if appropriate.**