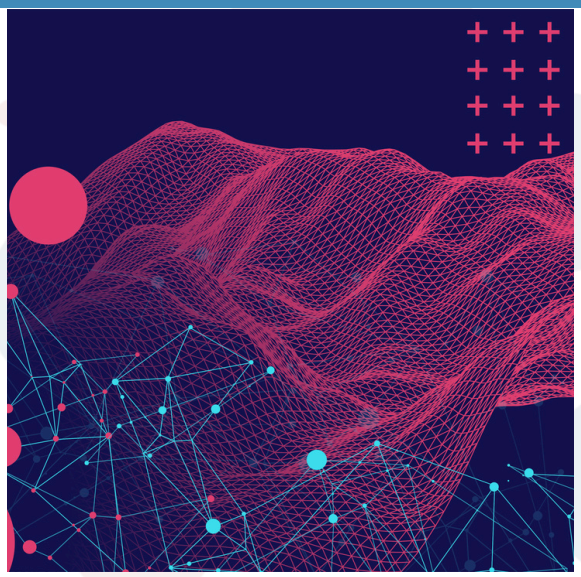
THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING
Systems & Industrial Engineering

# SIE 545 FUNDAMENTALS OF OPTIMIZATION

## COURSE DESCRIPTION

This is a graduate level course on optimization, with an emphasis on the classical mathematical concepts, theories and techniques for linear and nonlinear optimization problems. The course will cover fundamental concepts in optimization, modeling nonlinear/linear problems, basic results in convex analysis, and optimality conditions for constrained and unconstrained problems, duality theory, and some algorithms.



## EXPECTED LEARNING OUTCOMES

- Improve their ability to formulate real-world problems as optimization problems by some modeling and reformulation tricks, and recognize when problems they consider are nonlinear programming problems
- Extend knowledge and understanding of the mathematical foundations of optimization
- Be able to understand optimality conditions for both unconstrained and constrained nonlinear programming problems
- Be able to understand when and how to apply optimality conditions for solving particular problems
- Be able to apply some basic computational algorithms for nonlinear programs.

## COURSE FORMAT

- In-Person | 1**5-week** semester
- Tailored to your **professional needs**
- **3-credit** hour | You may apply it towards SIE MS and PhD programs
- **SIE 340** or equivalent., knowledge of elementary calculus and matrix algebra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ENROLLMENT
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## COURSE TOPICS

### MATHEMATICAL MODELING

▶ 5 Lectures

### CONVEX ANALYSIS

▶ Convex Sets (3 lectures)
▶ Convex Functions and Generalizations (4 lectures)

### OPTIMALITY CONDITIONS AND DUALITY

▶ Optimality Conditions for Unconstrained and Constrained Problems (6 lectures)
▶ Lagrangian Duality and Saddle Point Optimality Conditions (4 lectures)

### ALGORITHMS

▶ 3 Lectures

Real-World Application
Flexible/Interactive Learning
Bridge Theory & Practice
Innovative Curriculum
Distinguished Faculty

FROM EFFICIENCY TO INNOVATION–LEAD THE FUTURE OF INDUSTRIAL ENGINEERING.