

# Principles of Optimization – Fall 2018

*This syllabus is subject to change at the discretion of the instructor.*

Course: Math 364 (3 credits)  
Website: [http://www.math.wsu.edu/faculty/tasaki/...](http://www.math.wsu.edu/faculty/tasaki/)  
Times: Tu/Th 10:35–11:50  
Location: Webster B12  
Instructor: Tom Asaki (tasaki@wsu.edu), Neill 228  
Office Hours: M 1:10-2:00, W 10:30-12:00, Th 12:10-1:00, and by appointment  
Text: Notes supplied by instructor.

## Description

In this course, we will learn the optimization techniques used to model and solve problems from various disciplines such as business, engineering, sciences, sports, etc. In this course students will be introduced to optimization methods for linear, nonlinear, and integer programming. We will emphasize techniques that expand your understanding of Linear Algebra and Calculus concepts as well as how to formulate a model; interpret problems mathematically and geometrically; solution techniques in cases where Calculus cannot be used. We will also emphasize some of the theory behind solution techniques; sensitivity analysis; and how to use Octave/Matlab to solve problems.

## Course Goals

In this course, you will achieve the following:

- Be able to model real-world decision-making as mathematical optimization problems.
- Strengthen your understanding of mathematical tools from Calculus & Linear Algebra.
- Be able to use software solvers.
- Develop geometric intuition for mathematical models.
- Strengthen your mathematical language and writing skills.

## Topics

We will cover some (possibly all) of the following optimization topics. The particular topics covered on any day will vary depending on progress through the material and student interests and needs.

- Optimization concepts, philosophy and notation
- Smooth function constrained optimization: theory and practice
- Linear Programming (LP)

- Software solvers for LPs
- Geometry of LPs and geometric solution methods
- LP modeling concepts
- LP modeling techniques and examples
- Simplex method
- Sensitivity Analysis and Duality
- Integer Programming (IP)
- IP modeling techniques and examples
- IP solution methods
- Interior point solution methods

### Requirements for Success

**In-Class Participation.** In-class participation will be an important part of your learning in this course. We will work through problems to better understand how to create mathematical models, how to solve optimization problems, and how to create these solution paths. Because these interactions are key to learning optimization, participation will be 20% of your grade. This means that attendance is required. For each missed class one-sixth of your attendance grade will be automatically deducted.

**Homework.** Homework will be assigned regularly and collected in class. This homework will help prepare you for class time as well as give you practice of necessary skills to move forward in your understanding. Because of this, late homework will not be accepted without instructor approval. Your homework score will account for 40% of your grade. Your homework is *required* to be legible and complete, demonstrating knowledge of the subject. Collaboration on homework assignments is encouraged, though you must your own work that demonstrates your own understanding. Always indicate on your homework which whom you collaborate and indicate other sources of help/information. In addition, your homework should include the following elements:

1. Your name and student ID number.
2. The homework number and due date.
3. Each individual problem started on a new page.
4. A complete copy of each problem statement.
5. A solution to each problem which includes:
  - (a) Correct mathematical notation.
  - (b) Good English grammar.
  - (c) Clarity for the reader.
  - (d) Explanations of solution methods and reasoning.

**Exams.** There will be one midterm exam and a final exam, each accounting for 20% of your grade. The midterm exam is tentatively scheduled for the first week of October. The final exam will be during finals week at the scheduled time and date determined by the University. Both exams will be proctored in-class without the use of any additional materials.

**Use of Course Materials.** Lecture notes will be provided. Note that all notes, homework assignments, exams and any other materials written by the instructor are copyrighted material. As such, they are provided to you for your use and education. Any other use, including copying or electronic distribution is a violation of this copyright.

### Evaluation Scale

Grade	Class Percent Range
A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

It is possible to also receive a grade with a “+” or a “-” attached to it. Because some professors do not use them and others do, I will only use them if your class percentage is borderline and I feel your work shows enthusiasm toward learning. For example, if your class percentage is say 89% and you show enthusiasm for learning (not just mimicking methods, but truly learning), then I’m likely to give you an A- instead of a B. Another example is if your class percentage is say 82% and you have shown very little effort, then you will likely earn a B-. Note: these are only examples and all results are dependent on individual personalities and work. The best way to be sure you are showing me that you want to learn and think, is to communicate with me. In the end, I may not use “+” or “-” at all.

### WSU Reasonable Accommodation

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

### Academic Integrity

Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate WSU’s Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(3) and

-404) will receive a failing grade on any relevant assignment (and possibly for the course), will not have the option to withdraw from the course pending an appeal, and will be reported to the Office of Student Conduct.

Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). You need to read and understand all of the definitions of cheating. If you have any questions about what is and is not allowed in this course, you should ask course instructor before proceeding.

If you wish to appeal a faculty member's decision relating to academic integrity, please use the form available at [conduct.wsu.edu](http://conduct.wsu.edu).

### **Safety and Emergency**

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the "Alert, Assess, Act," protocol for all types of emergencies and the "Run, Hide, Fight" response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI's Run, Hide, Fight video and visit the WSU safety portal.