

MA3231 Syllabus

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MA 3231 – A01, A Term 2025
Linear Programming
Text: “Linear Programming:
Foundations and Extensions”
by Robert J. Vanderbei (5th ed.)
Meetings: 10-10:50 MTRF, AK233

The goal of this course is to introduce the student to the theory, algorithms and applications of linear optimization. The subject and many relevant texts are arguably misnamed. I will explain this in class.

Requiring only a background in basic linear algebra, we will explore a range of linear programming problems from various disciplines. The general theme is to minimize cost, or maximize profit, subject to some set of linear constraints (inequalities). We will develop a theory by looking at algebraic structures, geometric objects and algorithmic issues related to solving such problems. Our focus will be on the mathematics of solving such problems, with modeling and computational issues as secondary interests.

Topics will include: modeling, the simplex method, duality, the dual simplex method, sensitivity analysis, convex geometry, game theory, the affine scaling method, applications.

TERM SCHEDULE

Here is a rough outline of what I expect us to cover in the 28 class meetings:

Aug. 21 and Aug. 22	<i>Introduction</i>	Chapters 1 & 2
Aug. 25 to Aug. 29	<i>Simplex Method, Degeneracy</i>	Chapters 2,3,4
Sep. 2 to Sep. 5	<i>Duality</i>	Chapter 5
Sep. 8 to Sep. 12	<i>Matrix Notation, Sensitivity</i>	Chapters 6, 7
Sep. 15 to Sep. 18	<i>Dual Simplex</i>	Chapter 9
Sep. 22 to Sep. 26	<i>Game Theory</i>	Chapter 11
Sep. 29 to Oct. 3	<i>Path Following, Affine Scaling</i>	Chapter 21
Oct. 6 to Oct. 10	<i>additional topics, AI, catch-up</i>	Chapters 10,17,18 (as time permits)

GRADES

A: 100 % – 90 %; **B:** 89.99 % – 75 %; **C:** 74.99 % – 60 %

GRADING SCHEME

Homework (best 4 out of 7 assignments):	16 %
Quizzes on reading (up to 4, as needed):	9 %
3 Tests (Sept. 12, Sep. 26, Oct. 10):	75 %

Due dates for assignments will be determined when the assignments are distributed¹ In most cases, late assignments will not be accepted for credit. But you can ask.

¹The initial plan is to have assignments due on Tuesdays.

All students are expected to attend all tests, unless prior arrangements have been made.

ACADEMIC INTEGRITY

As a student in this course, you are expected to familiarize yourself with WPI's Academic Integrity policies which can be found at

<https://www.wpi.edu/about/policies/academic-integrity>

All acts of fabrication, plagiarism, cheating, and facilitation will be prosecuted according to the university's policy. If you are ever unsure as to whether your intended actions are considered academically honest or not, please see Professor Martin (or check here).

Note that any unauthorized use of web search or AI such as ChatGPT is an act of academic dishonesty. One may easily obtain the best time in a marathon foot race by using a city bus for part of the trip but that in no way reflects positively on one's personal ability to run. And it is terribly unfair to the honest runners in the race.

STUDENTS WITH DISABILITIES

Students with approved academic accommodations should plan to submit their accommodation letters through the Office of Accessibility Services Student Portal. Should you have any questions about how accommodations can be implemented in this particular course, please contact me as soon as possible. Students who are not currently registered with the Office of Accessibility Services (OAS) but who would like to find out more information about requesting accommodations, documentation guidelines, and what the accommodated interactive process entails should plan to contact OAS either by email: AccessibilityServices@wpi.edu, by phone (508) 831-4908, or by stopping by the office on the 5th floor of Unity Hall.

This syllabus is subject to change at the professor's discretion.