Introduction to Optimization / Deterministic OR Models
MTH 5007 / ORP 5001
Fall 2018

Time and Location: Tu,Th 5:00-6:15pm CRF 401

Instructor: Dr. Vladislav Bukshtynov
Office: CRF 314
Office hours: M 10-11am; Tu,Th 2-3pm or by appointment
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Course web page(s):
- Canvas: grades, some course materials (lecture notes/slides, coding examples, etc.) and general announcements will be posted here
- http://my.fit.edu/~vbukshtynov/mth5007-f18 for general course information

Prerequisite(s): At least one upper-level undergraduate math course.

Course Topics: An applied treatment of modeling, analysis and solution of deterministic (e.g., nonprobabilistic) problems including model formulation, linear programming, network flow, transportation problems, discrete optimization and dynamic programming.

Textbook(s):


Course Outline:

Optimization Models: Introduction to Optimization ◦ Types of Optimizations and Optimization Models ◦ Linear Optimization ◦ Least-Squares Data Fitting ◦ Nonlinear Optimization ◦ Optimization Applications

Fundamentals of Optimization: Feasibility ◦ Optimality ◦ Convexity ◦ Convergence
Minimization Approaches for Functions of One Variable: Analytical Approach ◦ Bisection (Binary Search) Method ◦ Golden Section Search Method ◦ Exhaustive (Brute-Force) Search ◦ On Optimal Methods ◦ Linear and Parabolic Approximations ◦ Stochastic Approximation

Test 1: Tuesday, September 25

Representation of Linear Constraints: Basic Concepts ◦ Null and Range Spaces

Geometry of Linear Programming (LP): Introduction to LP ◦ Standard Form ◦ Basic Solutions and Extreme Points ◦ Representation of Solutions and Optimality

The Simplex Method: Introduction to Simplex Method ◦ Degeneracy and Termination ◦ The Dual Problem ◦ Duality Theory ◦ The Dual Simplex Method ◦ Sensitivity

Test 2: Tuesday, November 13

Network Problems: Basic Concepts and Examples ◦ Representation of the Basis ◦ The Network Simplex Method ◦ Resolving Degeneracy

Computational Complexity of LP

Interior-Point Method (IPM) for LP: The Primal-Dual IPM ◦ Feasibility and Self-Dual Formulations ◦ Some Concepts from Nonlinear Optimization ◦ Affine-Scaling Methods ◦ Path-Following Methods

Final Exam: Tuesday, December 11, 6-8pm CRF 401

Grading: Your course grade will be calculated as follows

Quizzes: 20%
Midterm tests: 40%
Final exam: 30%
Project: 10%

Required reading associated with the lecture material as well as suggested problems for homework will be regularly given in class after lectures and posted on the course web page http://my.fit.edu/~vbukhtynov/mth5007-f18 and/or Canvas. Quizzes with problems which are similar to the suggested homework problems will be administered in class. The quiz score will be the sum of the best 5 out of 6 quiz scores. Two midterm exams will take place on the dates provided in the course outline above, at the same location and time as the scheduled lecture. A final project will be given on the basis of the student’s interests and background. A list of the proposed topics with the instructions will be posted online.
Students are also encouraged to suggest their own choice of the research problems. Time for final project presentations will be announced closer to the end of the term.

The right to alter your final grade is reserved by the instructor, in which case, however, the grade may only be increased. The grading system for graduate students published on the Office of Graduate Programs web site at https://policy.fit.edu/Graduate-Policies is used to convert between percentages and letter grades. The instructor reserves the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice will be given with clear explanations on all changes. It is the responsibility of the student to check their course web site regularly during the term and to note any changes.

**Attendance for the entire course is required** and will be checked regularly. Please refer to https://policy.fit.edu/Graduate-Policies.

**Academic dishonesty** consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit for the entire course, and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty, please refer to the Standards - Academic Honesty section in the Florida Tech Student Handbook posted at http://www.fit.edu/studenthandbook/.

**What is Title IX?** Title IX of the Educational Amendments Act of 1972 is the federal law prohibiting discrimination based on sex under any education program and/or activity operated by an institution receiving and/or benefiting from federal financial assistance. Behaviors that can be considered “sexual discrimination” include sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct, and gender discrimination. You are encouraged to report these behaviors.

**Reporting:** Florida Tech can better support students in trouble if we know about what is happening. Reporting also helps us to identify patterns that might arise - for example, if more than one complainant reports having been assaulted or harassed by the same individual. Florida Tech is committed to providing a safe and positive learning experience. To report a violation of sexual misconduct or gender discrimination, please contact Linda Jancheson, Title IX Coordinator at (321) 674-7277 or ljancheson@fit.edu.

* Please note that as your professor, I am required to report any incidents to the Title IX Coordinator. Confidential support for students is available by contacting the Student Counseling Center at (321) 674-8050.