

IME 770 QUANTITATIVE MODELING

BASIC INFORMATION

IME 770 Quantitative Modeling

Number of credits: 3

Term and year: Fall 2022

Instructor's name: Harun Pirim

Office location: 108 Civil and Industrial Engineering

Office hours: T,Th 11-12 or via e-mail appointment

Phone Number: 701 231 7285

Email Address: harun.pirim@ndsu.edu

BULLETIN DESCRIPTION

Applications modeling and optimization methods. Domains: transportation, logistics, manufacturing, service systems scheduling, and supply-chain management. Decision models: linear programming and sensitivity analysis, transportation and assignment, network models and algorithms, and integer, dynamic and nonlinear programming. Cross-listed with **ENGR 770**.

COURSE OBJECTIVES

Formulate and solve linear programming (LP) problems, evaluate LP solutions employing sensitivity analysis, model network flow problems, formulate and solve integer programming (IP) problems, perform branch and bound algorithms to solve ILP problems, model and solve dynamic programming problems, distinguish and solve nonlinear programming problems, apply heuristics to solve hard problems, solve mathematical programming problems using algebraic modeling languages.

REQUIRED STUDENT RESOURCES

Lecture notes and provided software.

Recommended text books: 1) Linear Programming and Network Flows, M. S. Bazaraa et al., 2010 2) Optimization in Operations Research, R. L. Rardin, 2017

TENTATIVE COURSE SCHEDULE

Week	Topic	Notes
1	Introduction, linear programming problems	
2	Simplex search for linear programming	
3	AMPL introduction	
4	Duality, sensitivity, optimality	
5	Test1	Available by Sep20 12am – No class
5	Network flows and graphs	
6	Network flows and graphs	
7	Shortest paths and discrete dynamic programming	
8	Transportation and assignment models	
9	Test2	Available by Oct18 12am – No class
9	Discrete optimization models	
10	Branch and bound search	
11	Heuristics	
12	Unconstrained nonlinear programming	
13	Constrained nonlinear programming	
14	Paper presentations	Nov23-25 holiday
15	Paper presentations	
16	Review of the topics and applications	Project report or paper due Dec9

EVALUATION PROCEDURES AND GRADING CRITERIA

Short quizzes: 20%

Two Tests: 40%

Paper presentation: 20%

Project: 20%

Letter grades will be assigned using a traditional 10 pt scale (e.g., 90 – 100% = A, 80 – 89.999...% = B, 70 – 79.999...% = C, etc.).

All submissions should be to the Blackboard. Short quizzes will be in class on Tuesdays for formative assessment of the previous week topics. Tests will be 'take home' and will have 24 hours availability. There will be no class on test days. You are welcome to type or hand write as long as you scan and upload. Project scope and topics will be available after the first test. You can collaborate with a friend for the project. Rubrics for the project and paper presentations will be provided. You can select a paper of your own interest to be approved by me or select a paper from a list to be provided. Outcome of the project can be a conference and/or a journal paper.

ATTENDANCE STATEMENT

According to [NDSU Policy 333 \(www.ndsu.edu/fileadmin/policy/333.pdf\)](http://www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. NO make-up quizzes or exams will be given for any reason except university-excused ones. See NDSU Policy 333 for faculty and student responsibilities related to attendance, including for university-sponsored activities. Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.

STUDENTS WITH SPECIAL NEEDS STATEMENT

Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the [Disability Services Office \(www.ndsu.edu/disabilityservices\)](http://www.ndsu.edu/disabilityservices) as soon as possible.

APPROVED ACADEMIC HONESTY STATEMENT

The academic community is operated on the basis of honesty, integrity, and fair play. [NDSU Policy 335: Code of Academic Responsibility and Conduct](#) applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the [Office of Registration and Records](#). Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.