

ISYE 370: Operations Research: Deterministic Models

Syllabus

Term: Fall 2019

Credit hours: 3

Classroom: Engineering building 241

Day and Time: Tuesday/Thursday 12:30 pm – 1:45 pm

Instructor: Dr. Ziteng Wang

- **Office:** EB 240
- **Email:** zwang3@niu.edu
- **Phone:** (815) 753-9971

Office hour: Tuesday 3:00 pm – 4:30 pm or by appointment

Teaching assistant:

- **Name:** Upala Junaida Islam
- **Email:** Z1848364@students.niu.edu
- **Office hour:** Wednesday 2:00 pm – 4:00 pm or by appointment
- **Office hour location:** Logistics lab

Course description: Introduction to deterministic optimization models and techniques. Basic linear algebra concepts and linear programming. Other optimization techniques.

Prerequisites:

- MATH 232

Textbook:

- *Operations Research: An Introduction, 10th Edition*, Hamdy A. Taha, Pearson Education, 2017.

Course objective: To provide students with a working knowledge of fundamental methods and applications of deterministic operations research models.

Learning outcomes: Upon completion of this course, a student should be able to do the following:

- Determine an appropriate OR model for formulation and understanding of a practical engineering problem or system.
 - This is associated with ABET outcome 1.1: “Formulates the given system appropriately for the purpose of understanding the qualitative and/or quantitative behavior of the system and the effects of potential changes made to the system.”
- Formulate a valid model with clearly defined problem statement, model objective, constraints and variables.
 - This is associated with ABET outcome 6.1: “Defines a problem statement, dependent/independent variables and/or appropriate hypothesis.”

- Solve the model by using techniques learned to identify areas of improvement and to achieve optimal solution.
 - This is associated with ABET outcome 1.2 “Identifies constraints or customer requirements and key areas in a given system where improvements can be made”; ABET outcome 1.4 “Applies appropriate science principles to solve complex Industrial and Systems engineering problems”; ABET outcome 1.5 “Applies appropriate mathematical tools to solve complex Industrial and Systems engineering problems”; ABET outcome 1.6 “Chooses the “best” solution based on stated criteria and formulates evidence that supports the solution.”
- Interpret results of the model in the context of the original engineering problem.
 - This is associated with ABET outcome 6.4: “Interprets results and draws conclusions with respect to the assumptions and constraints.”

Course topics: The following topics will be covered in this course:

- Introduction to Operations Research and modeling
- Introduction to Linear Programming: formulation, graphical method, simplex method, duality, sensitivity analysis and Excel solver
- Some special linear programming models: transportation problem and assignment problem
- Introduction to network flow models: minimal spanning tree, shortest route and maximal flow
- Introduction to Integer Programming and Nonlinear Programming

Assignments and Grading:

- Homework: 30%
 - There will be a homework assignment each week.
 - Homework must be submitted before the beginning of class on the due date.
 - Homework must be completed individually.
 - No late homework will be accepted.
- In-class Quiz: 10%
 - In-class quiz will be assigned occasionally, but no more than once a week.
 - No make-up quiz is allowed.
- Midterm exam: 30%
 - There will be one midterm exam.
 - Time: Tuesday, October 22, 12:30 p.m. – 1:45 p.m.
 - Location: Classroom
 - Format: Closed book. A one-sided 8.5’x11’ cheat sheet is allowed. Calculator is allowed.
- Final exam: 30%
 - There will be one final exam.
 - Time: Tuesday, December 10, Noon – 1:50 p.m.
 - Location: Classroom
 - Format: Closed book. A two-sided 8.5’x11’ cheat sheet is allowed. Calculator is allowed.
- Bonus: 0 – 4 points
 - The bonus assignment is optional.
 - The bonus assignment is a 15-minute in-class presentation. Topics of the presentation include but are not limited to: a successful story of Operations Research, a case study, an introduction to an emerging field/trend in Operations Research, a review of an industry

where Operations Research is extensively applied, and other self-study of Operations Research related topics.

- The bonus assignment can be done individually or by a group of two students.
- Students should sign up with instructor and get approval of the topic to be presented.
- There will be no more than one presentation in each class. Once all available spots are signed up, no more presentations will be accepted.
- Honor section
 - Students in honor section will be assigned extra questions in homework assignments. The purpose of these questions is to motivate self-learning and research of topics that are not covered in class.
- Each student will receive a letter grade based on his or her cumulative percentage score according to the following scales:
 - A 94 – 100
 - A- 88 – 93.99
 - B+ 82 – 87.99
 - B 76 – 81.99
 - B- 70 – 75.99
 - C+ 64 – 69.99
 - C 58 – 63.99
 - C- 52 – 57.99
 - D 46 – 51.99
 - F 0 – 45.99
- Exam policies:
 - Students must complete the exams individually. Receiving help from others or giving help to others is strictly prohibited. No late work will be accepted.
 - Students must contact the instructor ahead of time if unable to take an exam within its specified time frame except for medical or other emergencies after which proper documentation will be required.
 - No make-up exams will be allowed without instructor's approval.

Tentative course schedule:

Week	Date(s)	Topics	
		Tuesday	Thursday
1	08/27, 08/29	Course overview; Introduction to Operations Research	Introduction to Operations Research;
2	09/03, 09/05	Introduction to Linear Programming	Introduction to Linear Programming
3	09/10, 09/12	Linear Programming – model formulation	Linear Programming – graphical method
4	09/17, 09/19	Linear Programming – Excel solver	Linear Programming – simplex method
5	09/24, 09/26	Linear Programming – simplex method	Linear Programming – simplex method
6	10/01, 10/03	Linear Programming – simplex method	Linear Programming – simplex method
7	10/08, 10/10	Linear Programming – sensitivity analysis	Linear Programming – sensitivity analysis

8	10/15, 10/17	Linear Programming – duality	Midterm review; Engineering job fair
9	10/22, 10/24	Midterm exam: Tuesday, October 22, 12:30 p.m. - 1:45 p.m.	Linear Programming – duality
10	10/29, 10/31	Transportation problem	Transportation and assignment problems
11	11/05, 11/07	Network models	Network models; Minimal spanning tree
12	11/12, 11/14	Minimal spanning tree	Shortest route problem
13	11/19, 11/21	Shortest route problem	Maximal flow problem
14	11/26, 11/28	Maximal flow problem	THANKSGIVING – no class
15	12/03, 12/05	Introduction to Integer Programming	Introduction to Nonlinear Programming
16	12/10	Final exam: Tuesday, December 10, Noon-1:50 p.m.	

Academic integrity: Good academic work must be based on honesty. The attempt of any student to present as his or her own work that which he or she has not produced is regarded by the faculty and administration as a serious offense. Students are considered to have cheated if they copy the work of another during an examination or turn in a paper or an assignment written, in whole or in part, by someone else. Students are guilty of plagiarism, intentional or not, if they copy material from books, magazines, or other sources without identifying and acknowledging those sources or if they paraphrase ideas from such sources without acknowledging them. Students guilty of, or assisting others in, either cheating or plagiarism on an assignment, quiz, or examination may receive a grade of F for the course involved and may be suspended or dismissed from the university.

Each student is responsible to know and observe the university academic regulations that can be found in the Undergraduate Catalog.

Accommodations for students with disabilities: If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.

Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

Syllabus change policy: This syllabus is a guide and every attempt is made to provide an accurate overview of the course and its requirements. However, certain circumstances may make it necessary for the instructor to modify the syllabus during the semester for the benefit of the students and the changes may depend, in part, on course progress and students' needs. Changes to the syllabus will be made with advance notice to students and approval by the department.