ISE/OR501-651 – INTRODUCTION TO OPERATIONS RESEARCH

SUMMER 2024

Course objectives/description

The course aims to introduce the various types of operations research models and techniques, with an emphasis on linear programming and integer programming. The course will address how to formulate a wide range of decision problems using an appropriate mathematical program and solve using an appropriate algorithm or solver. Some example applications of mathematical programming to be covered in this class include aggregate production planning, network analysis, project scheduling, logistics network design, etc.

Course Topics

- Introduction to Model Building and the Use of Computer Tools (LINDO, Excel Solver, GAMS)
- Operations Research Techniques
    - Linear Programming
        - Model building
        - Simplex algorithm, Sensitivity analysis
        - Application areas: Production Planning, Network analysis (Shortest Path, Max Flow, Minimum Cost Network Flow, Minimum Spanning Tree, Project Scheduling)
    - Integer Programming
        - Model building
        - Application areas: Knapsack problem (Capital allocation), Fixed charge problems (facility location, production planning with set up costs), Set Covering Problem, Either-Or Constraints

Learning outcomes

By the end of this course, students will be able to:

1. Learn the characteristics of the various types of mathematical programming models,
2. Build concise and accurate mathematical models for various real-life situations,
3. Apply the basic algorithms for solving linear programming problems,
4. Use appropriate computer tools for solving the mathematical programming formulations,
5. Recognize, formulate, and solve decision-making problems in a wide range of applications using operations research tools.

Class Time: SUMMER 2024
Teaching mode: Online Asynchronous
Classroom: N/A - ONLINE

Instructor: Semra Sebnem AHISKA KING
Office Location: 4179, Fitts-Woolard Hall
Office hours: by appointment, online with Zoom
Email: ssahiska@ncsu.edu

Teaching Assistants: N/A
Office Location: N/A
TA Office hours: N/A
Email: N/A

Prerequisites
An undergraduate course in math

Textbook (optional for the student, no purchase is required)

Operations Research: Applications and Algorithms, Wayne L. Winston, 4th edition, 2004, Thomson Brooks/Cole, ISBN-13: 978-0534380588, ISBN-10: 0534380581

Course requirements

Assignments	Percentage of Final Grade
Homework Assignments (around 9)[a]	**20%**
Project	**10%**
Exam 1 (June 13-14, lectures 1-11, HW1-4)	**20[b]%**
Exam 2 (July 11-12, lectures 11-18, HW5-7)	**25%**
Exam 3, Final Exam (July 29-30, lectures 19-26, HW8-9)	**25%**

[a]Students are required to submit at least **six** HW assignments. The students' average HW grade will be computed considering their best six HW grades.
[b]The exam with lowest grade among the three exams will be assigned 20% while the other two will be assigned 25% each.

Software needed*
Excel Solver, Lindo, Gams (demo versions)
*No prior knowledge of the software is needed, the use of software will be taught in class.

Lecture mode and Class attendance policy: The instruction mode is online asynchronous. The students are expected to watch all the lecture recordings in a timely manner according to the weekly schedule provided.

Course structure
The lectures will be delivered by the instructor. Many in-class examples will be provided to the students to learn the introduced concepts/techniques. The students will then have the opportunity to enhance their knowledge through challenging HW assignments and project.

Course Moodle page

The Moodle page will be used for posting all the course materials and for HW/project submissions.

Moodle page for the course is accessible at:
https://wolfware.ncsu.edu/courses/my-wolfware/

OTHER IMPORTANT NOTES ON HW SUBMISSIONS AND EXAMS:

- HW/project submissions will be done online using Moodle by midnight of their due date.
- All the homework/project assignments must be submitted by their due date. Late submissions will not be graded. In case you need more time to complete the work, you should talk with the instructor at least 1 day before the due date, in which case you may be granted an extended deadline if you have an acceptable excuse such as medical.
- All three exams are **in-person** exams, and they must be **proctored** at an approved testing center.
- Students are required to attend all the tests within the approved exam window.

ACADEMIC INTEGRITY POLICY

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01. The Code of Student Conduct (NCSU POL11.35.01) serves as the basis for student conduct at NC State. It contains information related to the university's jurisdiction over student behavior, academic and non-academic violations, sanctions available when a violation occurs, and information regarding interim suspension. **Academic violations include cheating, plagiarism, or aiding another to cheat or plagiarize.** Non-academic violations include rules concerning alcohol, drugs, infliction or threat of bodily harm, vandalism, disorderly conduct, harassment, interpersonal violence, and more). All students are strongly encouraged to read and understand the Code of Student Conduct (https://studentconduct.dasa.ncsu.edu/code/).

Academic integrity is the cornerstone of education. Plagiarism and cheating are attacks on the very foundation of academic life and cannot be tolerated within universities. All students are strongly encouraged to review the university policies on academic integrity at https://studentconduct.dasa.ncsu.edu/academic-integrity-overview/.

The students who are suspected of violating the academic integrity in the tests, HW and project assignments will be reported to the Office of Student Conduct for academic misconduct. Violations of academic integrity will be handled in accordance with the Student Discipline Procedures (NCSU REG 11.35.02) (https://studentconduct.dasa.ncsu.edu/procedures/). The procedure followed when a student is accused of violating academic integrity is described at https://studentconduct.dasa.ncsu.edu/students/procedures-overview/.

A student who violates the academic integrity policy in HW, project or exam assignments will fail the course, and lose his/her good academic standing status, which may mean losing several opportunities including TA/RA positions, scholarships, CPT (working off-campus), etc. The student may also be suspended or even terminated from the program.

GRADING SCALE

The following is the standard NCSU grading scale. Based on the overall class performance, the minimum grade required for a particular letter grade may be decreased in favor of the students.

Grade range	Letter grade
97-100	A+
93-96	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-68	D
60-62	D-
<60	F