

ISE/OR501-651– INTRODUCTION TO OPERATIONS RESEARCH
SUMMER2026

Course credits: 3 credit hours

Course objectives/description

The course aims to introduce the various types of operations research models and techniques. We will address how to formulate a wide range of decision problems using an appropriate mathematical programming model and solve them using an appropriate algorithm or solver. The emphasis will be given to Linear Programming, Network Models, and Integer Programming. Some example applications of mathematical programming to be covered in this class include production planning, network analysis, project scheduling, logistics network design, fixed charge problems, set covering problem, 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
 - Application areas: Production Planning, Network analysis (Shortest Path, Max Flow, Project Scheduling, Minimum Cost Network Flow, etc.)
 - Integer Programming
 - Model building
 - Branch and bound algorithm
 - Application areas: Capital allocation, Logistics Network Optimization, Fixed charge production-location problems, set covering problems, 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 and integer programming problems and some network 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 2025

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

Prerequisites

An undergraduate course in calculus math, linear algebra

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/Grading

Assignments	Percentage of Final Grade
Homework Assignments (around 10)^a	20%
Project	10%
Exam 1 (Tue, June 23-Wed, June 24, lectures 1-10, HW1-5)	20^b%
Exam 2 (Thu, July 16-Fri, July 17, lectures 10-16, HW6-8)	25%
Exam 3 , Final Exam (Mon, Aug 3-Tue, Aug 4, lectures 17-25, HW9-11)	25%

^aStudents are required to submit at least **seven** HW assignments. The students' average HW grade will be computed considering their best seven HW grades.

^bThe exam with the lowest grade among the three exams will be assigned 20%, and the other two will be assigned 25% each.

Software needed*

Excel Solver, LINDO and GAMS (free demo versions)

*No prior knowledge of the software is required; 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 for 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 policy

The **use of artificial intelligence** (sources such as ChatGPT) in the graded assignments **is strictly prohibited** and will be considered as an academic integrity violation.

Posting any course materials (lecture notes, HW solutions, exams, etc.) **on internet websites** (such as course hero, etc.) **is strictly prohibited** and subject to copyright infringement and academic integrity violation.

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 receive 0 grade. In case you need more time to complete the work, you must 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/>.

A student who violates academic integrity in any graded assignment (HW, project, exams) 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/>). A student who violates the academic integrity 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.

Examples for academic integrity violation include but are not limited to the following:

- Copying somebody else's work partly or entirely in HW and exams
 - Reading and copying the solutions of the HW problems that were posted in previous years (the instructor's solution files or any former student's solution file)
 - Copying a classmate's work who is not in your HW group.
 - The **use of artificial intelligence** sources (such as ChatGPT) in HW assignments.
 - Any kind of communication (verbal/written) with a classmate during the exam.
 - Reading a classmate's work during the exam.
 - Letting a classmate see your solutions in HW and exam problems.
- Asking a classmate to sign the attendance sheet for the day you will be absent or signing the attendance sheet for a classmate who is absent.
- Posting class materials (lecture notes, hw solutions) on internet websites

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 reduced 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