ISE 4623/5023: Deterministic Systems Models / Systems Optimization

University of Oklahoma
School of Industrial and Systems Engineering
Fall 2019

Instructor: Andrés D. González
Office: Carson Engineering Center (CEC) 215C
Email: andres.gonzalez@ou.edu
Office Hours: Tuesdays/Thursdays, 8:00AM-9:00AM

Teaching Assistants:

Name	Elaheh Jafarigol	Tasfiq Alam
Email	elaheh.jafarigol@ou.edu	tasfiq@ou.edu
Office Hours	Fridays, 12:15PM-2:15PM	Tuesdays, 11AM-1PM
Office	CEC 431	CEC 436

Course Meeting Times: Tuesdays & Thursdays, 3:00PM-4:15PM
Course Location: Dale Hall 218

Course Description:
This course focuses on discussing diverse techniques for problem solving using analytical models, including theory, methodology, and applications. Topics include linear programming, simplex algorithm and sensitivity analysis, integer programming, and dynamic programming. We will cover multiple practical applications in transportation networks, project management and scheduling, deterministic inventory models, decision making, and systems integration, among others. The class will also have a strong component related to solution methods using computer software.

Course Pre-requisites:
- ISE 2823 (Enterprise Engineering)

Course Goals and Outcomes:
After taking this class, the students should be able to:
- *Adequately formulate an optimization problem, indicating the decision variables, objective function(s), and associated constraints, as well as the required input data.*
- *Understand the Simplex method and its applications*
- *Formulate and solve diverse optimization problems associated with transportation, network design, and inventory management, among others*

Texts and Materials:
Required:

B1. Taha, H. A. 2017. *Operations Research: An Introduction*. 10th Edition. Boston, MA: Pearson https://bit.ly/2Zctbm1

Note that additional readings will be placed on the course website or in the library or required for look-up when appropriate course content is being covered. These readings will be required.

Recommended:

B2. Hillier, F. S. & Lieberman, G. 2015. *Introduction to Operations Research*. 10th Edition. Ney York, NY: Mc Graw Hill https://bit.ly/2Hhc9Np

B3. Winston, W. L. 2004. Operations Research: Applications and Algorithms. 4th Edition. https://bit.ly/2NrlmGK

Teaching Philosophy:

The main skills and abilities encouraged and developed in this class are related to

- Developing strong conceptual foundations and problem-solving intuition
- Expanding critical thinking and reasoning
- Enriching collaborative work proficiency
- Enhancing problem formulation and solution skills

Grading details:

Grade percentages associated with individual and group work are as follows:

Group (3-4 people) work: 30%	
Group assignments / quizzes / case studies	20%
Final project	10%
Individual work: 70%	
Individual assignments / quizzes / case studies	10%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final exam	15%

Grading discrepancy review:

Grades can be reviewed and possibly revised, only if requests are made within one week of the grade posting.

Grading scale:

A ← [90, 100]
B ← [80, 90)
C ← [70, 80)
D← [60, 70)
F ← [0, 60)

Grading policy:

Homework due dates and other relevant dates will be announced well in advance. All homework assignments are due at the beginning of class on the date due. Late homework assignments will be penalized as follows (unless indicated otherwise):

Submission time	*Maximum grade possible*
On time	100%
0 to 48 hours late	75%
More than 48 hours late	0%

A course project near the end of the semester will allow you to practice the concepts covered in class. A project proposal summarizing the anticipated project will be due at a subsequent date to be determined and is subject to approval by the instructor.

***For graduate students*:** The project for students enrolled in 5023 will be research-oriented and will likely require students to review advanced topics not covered in this course.

Tentative Schedule:

Module	**Unit**
1. Introduction	What is operations research? [B1.Ch1]
	Introduction to Linear Algebra [B3.Ch2]
	Modeling with Linear Programming [B1.Ch2]
2. Simplex method	The Simplex Method and Sensitivity Analysis [B1.Ch3]
	Duality and Post-Optimal Analysis [B1.Ch4]
EXAM 1	*Includes modules 1 and 2*
3. Models	Transportation model and its variants [B1.Ch5]
	Network Model [B1.Ch6]
	Traveling Salesperson Problem [B1.Ch11]
	Inventory modeling [B1.Ch13]
EXAM 2	*Includes module 3*
4. Advanced linear programming	Advanced Linear Programming [B1.Ch7]
	Goal Programming [B1.Ch18]
	Integer Linear Programming [B1.Ch9]
	Heuristic Programming [B1.Ch10]
	Deterministic Dynamic Programming [B1.Ch12]
EXAM 3	*Includes module 4*
5. Introduction to non-linear and non-deterministic optimization	Introduction to non-linear optimization
	Introduction to stochastic programming
FINAL EXAM	*Includes modules 1-5*

Important Dates:

- Exam 1: *Thursday, September 26, 2019, 3:00PM*
- Exam 2: *Tuesday, October 15, 2019, 3:00PM*
- Exam 3: *Tuesday, November 19, 2019, 3:00PM*
- Project (due date): *Tuesday, November 26, 2019, 3:00PM*
- Final exam: *Monday, Dec 9, 2019, 4:30PM*

University Policies:

Academic Integrity

To be successful in this class, all work labeled as "individual" must be yours and yours alone. You may not receive outside help. On examinations and quizzes, you will never be permitted to use your notes, textbooks, calculators, or any other study aids, unless indicated otherwise. Should you see someone else engaging in this behavior, I encourage you to report it to myself or directly to the Office of Academic Integrity Programs. Be aware that it is my professional obligation to report academic misconduct, which I will not hesitate to do. In professional and personal contexts, it is important to adequately integrate the analytical tools and abilities developed in class with strong integrity and ethics. For more information on this subject, please refer to the Student's Guide to Academic Integrity at http://integrity.ou.edu/students_guide.html

Reasonable Accommodation Policy
Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website http://www.ou.edu/drc/home.html Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

Religious Observance
It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays. Please contact me in advance to ensure adequate accommodations.

Title IX Resources and Reporting Requirement
For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24.7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. To learn more about this or to report an incident, please contact the Sexual Misconduct Office at 405/325-2215 (8AM to 5PM, M-F) or smo@ou.edu. Incidents can also be reported confidentially to OU Advocates at 405/615-0013 (phones are answered 24 hours a day, 7 days a week). Also, please be advised that a professor/GA/TA is required to report instances of sexual harassment, sexual assault, or discrimination to the Sexual Misconduct Office. Inquiries regarding non-discrimination policies may be directed to: Bobby J. Mason, University Equal Opportunity Officer and Title IX Coordinator at 405/325-3546 or bjm@ou.edu. For more information, visit http://www.ou.edu/eoo.html.

Adjustments for Pregnancy/Childbirth Related Issues
Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see www.ou.edu/content/eoo/faqs/pregnancy-faqs.html for commonly asked questions.

Final Exam Preparation Period
Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy (https://apps.hr.ou.edu/FacultyHandbook#4.10).

Emergency Protocol
During an emergency, there are official university procedures that will maximize your safety.
Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather *1. LOOK* for severe weather refuge location maps located inside most OU buildings near the entrances *2. SEEK* refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building. *3. GO* to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows. *4.* GET IN, GET DOWN, COVER UP. 5. *WAIT* for official notice to resume normal activities.
Link to Severe Weather Refuge Areas , *Severe Weather Preparedness - Video*

Armed Subject/Campus Intruder

If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots:

1. GET OUT: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. *2. HIDE OUT*: If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. *3. TAKE OUT*: As a last resort fight to defend yourself.

For more information, visit http://www.ou.edu/emergencypreparedness.html

Shots Fired on Campus Procedure - Video

Fire Alarm/General Emergency

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: *1. LEAVE* the building. Do not use the elevators. *2. KNOW* at least two building exits *3. ASSIST* those that may need help *4. PROCEED* to the emergency assembly area *5 ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues. 6. WAIT* for official notice before attempting to re-enter the building.

OU Fire Safety on Campus

Students are responsible for any changes/additions to this syllabus announced in class.