SIME 5050/6050 - ME EN 5184/6184 Operations Research for Systems
Department of Mechanical Engineering
The University of Utah

Catalog Description: This course provides a broad overview of operations research topics with a focus on finding mathematically optimal solutions for systems. An emphasis is placed upon real world applications. Topics covered include: linear programming, integer programming, nonlinear programming, discrete Markov chains and queueing theory.

LEARNING OUTCOMES

Upon successful completion of this course, a successful student should be able to:

- o Model optimization problems and solve with software
- o Solve linear programs with the simplex method
- o Understand and apply sensitivity analysis
- o Implement methods to solve nonlinear and integer programs (branch and bound, gradient search, one dimensional search)
- o Model and solve discrete and continuous stochastic systems

These objectives will be met and evaluated through projects and exams.

COURSE CONTACTS

Instructor:
Todd Easton
todd.easton@utah.edu
Office: 2340 MEK

Class time: Keep up with the class.

Office hours TBD.

Zoom meetings, if requested will always use
https://utah.zoom.us/j/4802439332
Passcode:427701

REFERENCE TEXTS

There is no required reference textbook for this course. There are several great books that could be used for help or as a reference. Any version would suffice, see class discussion:

Operations Research Applications and Algorithms Wayne Winston (Easiest to understand)
Introduction to Operations Research by F. Hillier and G Lieberman (The most classical)

PREREQUISITE

Graduate standing or one semester of probability or statistics. Typical courses include, but are not limited to, ME EN 2550, CS3130, ECE3530, or MATH 3070

GRADING

	Weight	This course follows the letter grading scheme below:			
Quizzes (Lecture)	10%	93 ≤ **A** ≤ 100 90 ≤ **A-** < 93	87 ≤ **B+** < 90 83 ≤ **B** < 87 80 ≤ **B-** < 83	77 ≤ **C+** < 80 73 ≤ **C** < 77 70 ≤ **C-** < 73	67 ≤ **D+** < 70 63 ≤ **D** < 67 60 ≤ **D-** < 63 0 ≤ **E** < 60
Project 1	10%				
Project 2	10%				
Project 3	10%				
Project 4	10%				
Midterm	20%				
Final Exam	30%				

Regrade and grade correction requests must be made directly to the course instructor (not to the TA) no later than one week after the grade or work in question has been returned. Please monitor your grades posted to Canvas continuously as that system holds the course's official gradebook.

LATE ASSIGNMENTS AND MAKEUP WORK

The grade for an assignment submitted up to one day following the original deadline will have a 50% penalty applied to it. Assignments submitted more than one day after the original deadline will not be accepted or graded. Legitimate excuses must be supported with appropriate documentation. Makeup work, when authorized by the instructor, will be discussed on a case-by-case basis.

COURSE AND LECTURE STRUCTURE

Research on learning has indicated several things about the way people best absorb and retain information. Research indicates that learning is better accomplished through a combination of repetition and active learning about a topic. I will use a lecture based tutoring teaching style. If you are here, you can expect to be called upon by name and asked a question. This is an excellent opportunity to practice communication skills. Thus, attendance is heavily encouraged, but not required.

GENERAL POLICIES

All students and instructional staff are expected to follow proper classroom behavior and treat others with civility and respect. If anyone's actions or behavior become disruptive, the instructor reserves the right to invite them to leave for the remainder of that day.

The use of computers and other communication devices during class is allowed for taking notes, referring to an electronic version of the textbook, and/or using calculation software. Cell phones must be silenced. Voice calls, texting, and social media are prohibited unless in case of emergencies or when explicitly authorized by the instructor. Snacks, coffee, and other refreshments can be consumed if permitted by the building code. Liquids must be kept in leak- and spill-proof containers, and food must not produce strong smell or noise. Please properly dispose of all waste and help keep our learning environment clean.

ONLINE AND NATURE OF THE CLASS

I have done research on online learning, staying engaged in the class is important. Falling too far behind results in D's and F's and dismissal from the university. Please do not waste my time or your time. I assume that you watch all of the lectures. I give a ton help for the projects in the lectures. Please, please watch all lectures. This is a 3 credit hour class. That means that you should expect about 150 minutes (2 and half hours) of lecture a week. This also means that you should spend 5 hours outside of class working on projects or studying for undergraduates and 7.5 for graduate students.

Do not fall behind. The couple of weeks of the class is fairly trivial. The class builds on itself, and it can become difficult to catch up. We will be doing computer programming in Python. I assume that you have never done any programming prior to this class.

There is a fine line with computer programming help. If you are not frustrated, then you have not made enough of an effort. Getting help will lead to minimal learning. If you are irate, you waited too long to seek help.

Suggestions:

> Start early

> Seek short amounts of help. Just enough to get you unstuck.

> Understand that most people seek help.

> Watch all lectures (I talk fast, I would not watch faster that 1.25).

> When I swear or flip off my computer, I walk away. Time usually helps me have ideas on how to fix it.

GRADUATE VS UNDERGRADUATE

If you are an undergraduate student you may work in groups of 2 or 3 for projects. Graduate students do the projects on their own. If a group is not working out, then I will split a group and each student can do the project on their own.

ACCOMMODATIONS FOR DISABILITIES

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, (801) 581-5020. CDS will work with you and the instructor to plan for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

In addition to the standard process above, please inform the instructor if you have any other issues that may prevent you from fully demonstrating your abilities so that accommodations can be made to ensure your full participation in the course and safeguard your educational opportunities at The U.

NON-DISCRIMINATION POLICY

The University of Utah guarantees equality of opportunity in education and strives to provide an academic environment that is free from any form of discrimination. Therefore, discrimination or harassment of any person based on race, color, religion, creed, gender, national origin, age, disability, veteran status, sexual orientation, or gender identity is a violation of state and federal laws and/or The U's policies and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. Be advised that all students, faculty, and staff are required to report instances of sexual harassment, sexual assault, or discrimination to the appropriate offices within the university. Information regarding non-discrimination policies and reporting guidelines can be found at https://oeo.utah.edu.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, (801) 581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, (801) 581-7776. To report to the police, contact the Department of Public Safety, (801) 585-2677(COPS).

Pregnancy/Childbirth: Should you need modifications or adjustments to your course requirements because of pregnancy- or childbirth-related matters, please contact your instructor as soon as possible to discuss an accommodation plan. Congratulations and enjoy the many sleepless nights to come!

Religious Observance: Students may excuse absences that result from religious observances and may reschedule tests and required coursework that fall on religious holidays, without penalty.

LGBTQ+ Individuals: The course instructor advocates in favor of equality for all individuals, regardless of their perceived or actual sexual orientation, gender identity, or gender expression. Please inform your instructor if you have a specific pronoun or chosen/preferred name that you would like to be addressed by.

ACADEMIC INTEGRITY AND STUDENT CONDUCT

Students are required to comply with all university-level policies on academic integrity as published in the Code of Student Rights and Responsibilities. All cases of academic misconduct will be reported to the Office of the Dean of Students. Please review your rights and responsibilities available at https://regulations.utah.edu/academics/6-400.php.

Additionally, academic misconduct policies specific to the Department of Mechanical Engineering will also apply. These policies are available at https://www.mech.utah.edu/academics/me-academic-misconduct-policy. By continuing your enrollment in this course, you acknowledge to be familiar with these policies and commit to abide by them.

Integrity Pledge: Your signature on any test or assignment indicates *"On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exercise."*

UNIVERSITY SAFETY

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit https://safeu.utah.edu.

Please review The U's Emergency Response Guide available at https://alert.utah.edu/emergency-response-guide and be familiar with the official procedures in the events of earthquakes, utility failures, fires, medical assistance in case of injury or illness, environmental quality concerns, active shooters and acts of violence, bomb threats, severe weather, bio/chem/RAD spills, secure in place and shelter in place orders, and evacuation orders.

COVID-19 CAMPUS GUIDELINES

Students are required to self-report if they test positive for COVID-19. To report, please contact: COVID-19 Central @ The U, (801) 213-2874, https://coronavirus.utah.edu. Masks and face coverings are no longer required at University of Utah facilities. Exceptions include:

o   Masks will continue to be required inside University of Utah Health dedicated clinical facilities. Regulations vary for other facilities.
o   Masks will continue to be required on campus buses and shuttles based on a federal public health order.
o   All job-related personal protective equipment (PPE) safety requirements will continue to be required consistent with best practices for worker safety.

According to the CDC, wearing a mask remains an effective means of preventing infection for both unvaccinated and vaccinated people. Regardless of what someone chooses (mask or no mask), the university seeks to foster a sense of community and asks everyone on campus to be respectful of individual decisions on mask wearing.

Some students may qualify for accommodations and exemptions from these guidelines through the Americans with Disabilities Act (ADA). Accommodations should be obtained prior to the first day of class. If you believe you meet these criteria, contact: Center for Disability and Access, 801-581-5020, https://disability.utah.edu.

WITHDRAW/DROP/COLLEGE POLICIESY

The date guidelines for classes can be found at College of Engineering website : https://www.coe.utah.edu/semester-guidelines. This includes tuition refund, dropping, etc.

MENTAL HEALTH AND HEALTH

Your personal health and wellness are essential to your success as a student. Personal concerns like stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student's ability to succeed and thrive in this course and at the University of Utah.

Please feel welcome to reach out to your instructor or TA's to handle issues regarding your coursework. For helpful resources to manage your personal wellness and counseling options, contact:

Center for Student Wellness
801-581-7776
wellness.utah.edu
2100 Eccles Student Life Center
1836 Student Life Way
Salt Lake City, UT 84112

Women's Resource Center
801-581-8030
womenscenter.utah.edu
411 Union Building
200 S. Central Campus Dr.
Salt Lake City, UT 84112

GET INVOLVED

Other Student Groups at the U
To learn more about some of the other resource groups available at the U, check out:
getinvolved.utah.edu/
studentsuccess.utah.edu/resources/student-support

COURSE DELIVERY

Copyright statement: The recordings are the intellectual property of the instructor and may not be shared or reproduced without their explicit and written consent. In addition, privacy rights of others such as students, guest lecturers, and providers of copyrighted material displayed in the recording may be of concern. Students may not share any course recordings with individuals not enrolled in the class or upload them to any other online environment.

COURSE SCHEDULE AND IMPORTANT DEADLINES

This is a very tentative course calendar. Topics covered may dramatically switch weeks based upon student questions and needs.

Week	Topics Covered
1	Course and operations research overview
	Graphical linear programming
2	Linear programming modeling and software
	Project 1 assigned
3	Linear programming modeling and software
4	**Simplex method**
	Project 1 Due
5	Simplex method and sensitivity analysis
	Project 2 Assigned
6	Sensitivity analysis
7	**Duality and Review**
	Project 2 Due
8	Midterm
	Integer program modeling
9	**Project 3 assigned**
	Branch and bound
10	Nonlinear optimization
11	Discrete time Markov chains modelling
	Project 3 Due
12	**Project 4 Assigned**
	Solving discrete time Markov chains
13	Modeling continuous time Markov chains
14	Solving continuous Markov chains/Queueing Theory
	Project 4 Due
15	Summary and test review
16	**Final exam**

Do not hesitate to send any questions you may have to todd.easton@utah.edu. I am here to help you succeed! 😊
I also appreciate feedback. Let me know if things are going well for you. We will work together to resolve any issues.