UNIVERSITY of DENVER
DANIELS COLLEGE OF BUSINESS

INFO 3440: Optimization Modeling

Term and Credits:
Winter 2021
4 Credit Hours

Time and Location:
Section 1 CRN 2486 8-9:50am Tu Zoom ID: 87457491100
Th In Person: DCB 105
Section 2 CRN 2587 10-11:50am Tu Zoom ID: 81636980454
Th In Person: DCB 105
Section 3 CRN 6026 2-3:50pm Tu & Thu
Zoom ID: 83294915923
You will be required to review some material outside of class which will be delivered through Canvas. Make sure you have a good internet connection during class.

Instructor:
Name: Kellie Keeling
Department: Business Information & Analytics
Office Location: DCB 590
Office Hours: Schedule an appointment:
https://calendly.com/kkeeling/20min

Virtual Office: https://udenver.zoom.us/my/kelliekeeling
Get the zoom app and use SSO from
https://udenver.zoom.us/

Email: kkeeling@du.edu
Office Phone: 303-871-2296 (forwards to my cell)

Communication Conduct:
Feel free to refer to me as Dr. Keeling, Professor, or Kellie as you feel comfortable.
Slack and/or Email is usually the best way to contact me. If I haven't responded in 36 hours, feel free to resend your message. I prefer Slack for the quickest response.
I will send class level communications via Canvas announcements. I will typically initiate communication with individual students directly through your DU email or through Canvas email.
The Calendly link to the left interacts directly with my calendar and will list open times. It will allow you to make an appointment up to 2.5 hours before the scheduled time.

COURSE DESCRIPTION

This course introduces concepts and techniques for the modeling and solution of business decision problems. It gives broad coverage to the formulation of optimization models and the use of commercially available software tools for solving them. These models include topics such as linear programming, integer programming, the transportation and assignment problems, network optimization models and nonlinear programming. Emphasis is placed on the process of analyzing business scenarios, formulating models in spreadsheet software, and interpreting model output.

COURSE RATIONALE/GOAL

This course teaches how mathematical and optimization modeling can be used to drive business decisions. The critical thinking and analysis skills developed in this class are highly sought after in industry and have widespread applicability across domains.

LEARNING OUTCOMES

By the end of this course, students will:

- Identify problems appropriate for optimization
- Understand the challenges with solution techniques with optimization problems
- Learn to convert written descriptions into optimization problems
- Learn to solve optimization problems using open source software

PREREQUISITE:

INFO 2020

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REQUIRED MATERIAL

Software: Instructions for free installation will be posted in Canvas

- Microsoft Excel with the Data Analysis and Solver Toolkits
- Anaconda Installation of Python 3

Textbook: Optimization Modeling with Spreadsheets, 3rd Edition, Kenneth R. Baker. ISBN: 978-1-118-93769-3

Top Hat: Polling Software (~$30) – look for email inviting you to course or find the link to your section in Canvas.

GRADING STRUCTURE AND SCALE:

A: 93-100%; A-: 90-92.9%; B+: 87-89.9%, B: 83-86.9%; B-: 80-82.9%; etc.

Requirement	Amount
PreClass Reading/Lectures Preparation Quizzes	15%
Class Participation	15%
Group Homework	20%
Project	20%
In Class Quizzes	30%
Total	**100%**

ASSESSMENTS:

It is often helpful to discuss the work in this class with others and get advice about the approaches to solve the problems, but **DO NOT SHARE COMPUTER FILES**. The one exception to this is Group Homework Assignments. If I feel you turn in work that is not your own, I will turn you in to the DU Honor Code reporting system. See policy information here:

http://www.du.edu/studentlife/studentconduct/index.html. If you have a question about what it means to cheat in this class, contact the instructor before you turn in questionable content. As a rule of thumb, if you did not do the analysis and writing yourself, you should not turn it in; this is considered plagiarism under the University's honor code.

LATE: Late work will be accepted with a 12% a day penalty. Canvas will automatically calculate the late points. In Class work (class assignments, top hat, and Quizzes are the exception). See late policies for in class work below.

Pre Class Reading/Lecture Preparation Quizzes: There will be quizzes to be completed before each class (except the first class where the quiz can be completed after the lecture) that will cover the reading material and any video lectures.

Class Participation: In Class Assignments and Top Hat Questions

- **No Late Assignments Accepted**. For an Excused Absence (university activity, job interview, illness; max of 2) to miss class, you can complete this outside of class. You must formally request approval from the Canvas class home page. The missed assignment is due during the next class.
- **In Class Assignments**: Short problems will be assigned for each lesson. These can be completed in groups or individually. You will submit your progress on the problem at the end of class EVEN IF YOU ARE NOT FINISHED. Once you submit your version, you will be able to see my solution to the assignment. You can then continue to work on the problems and grade your work. Your score for this will be based on effort put in during class rather than actual correctness, so make sure to self-grade your work for your own understanding as you move through the material. You will comment on your self-grading in your reflection.
- **Top Hat** – must attend class to get credit and complete web-based quiz questions during class.

Class Participation Weekly Reflection – Each week you will complete a short weekly reflection discussing your self-grading of your in class work and prioritizing what content you need to revisit.

Group Homework: There will be 4 graded homework assignments given during the course which must be turned in via Canvas by the allotted due date. You may work with up to 2 other people. You will self select your groups in Canvas. You may work with people in other sections of the course.

Course Project: Complete instructions will be distributed through Canvas after the half-way point in the class. There will be a proposal as well as a final project submission.

In-Class Quizzes: There are four in-class quizzes that will be scheduled for ~45 minutes during class each worth 30 points. Students will need a personal computer with Solver and Python/Pyomo and will be allowed to reference any notes, programs, or other online or offline materials, except another person. In the event a student has an excused absence which conflicts with a scheduled exam, the student may complete the exam in office hours one week prior to or up to one week after the scheduled date**. It is the students' responsibility to prove the absence is excused and to schedule the alternate time.**

> **Extra Credit: After each quiz, you may complete an extra optional assignment that covers the topics from the quiz. This will be added as another assignment to the quiz portion of your grade. The assignment will be worth 10 points and you must request to have the assignment added in Canvas.**

COURSE POLICIES

Technology Use in the Classroom: Technology use in the classroom is strictly limited to that for educational purposes. Be respectful to those around that might be distracted by your extraneous use of technology.
Attendance Policy: I will take "attendance" by way of the Top Hat polling questions. If you need to miss class, you should meet with a classmate to see what you might have missed.
Class Preparation and Participation Policies: Optimization is a "hands on" activity. We will be putting what you read and watch before class as well as the lecture during class to use during class time, so you need to be prepared to "dig in and work" during class. That means having your equipment ready (computer and software) and being prepared to practice the materials for the day by having read/watched the material beforehand. This includes doing assigned readings, homework or other activities before class starts.

Deliverables:

- All work must submitted on Canvas. You might want to start early just in case you have computer issues. It's up to you to double check that your submission was correctly registered by the system.
- You are required to show all work for HW and Quizzes. If you do not show your work for a given problem, you might receive zero credit for that problem. **As the student, it is your responsibility to clearly communicate your results and how answers were obtained.**

UNIVERSITY EXPECTATIONS, POLICIES, AND RESOURCES:

Students with Disabilities. A student who qualifies for academic accommodations because of a disability must submit a Faculty Letter to the instructor from the DU Disability Services Program (DSP) in a timely manner, so that the needs of the student can be addressed. Accommodations will not be provided retroactively, e.g., following an exam or after the due date of a project. DSP determines eligibility for accommodations based on documented disabilities. DSP is located in Ruffatto Hall, 1999 E. Evans Ave. (303-871-2278).

University Expectations. Please review the University Expectations on the Daniels College of Business syllabus webpage (http://daniels.du.edu/university-expectations/)

- University of Denver Honor Code
- Policy Concerning Official Communication
- Students with Disabilities
- Policy Concerning Religious Accommodations
- Policy Concerning Emergency Procedures
- Policy Concerning Conflicts of Interest, Including Gifts from Students

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CLASS SCHEDULE

The schedule below is tentative and subject to change. Please check Canvas regularly to look for announcements and modified due dates.

	DUE MONDAY	TOPICS	READING	DUE SAT
Week 0		8a-ID: 87457491100 T Online/Th DCB 105 10a-ID: 81636980454 T Online/Th DCB 105 2p-ID: 83294915923 T Online/Th Online	**START HERE!** **Before Class Starts**	
Week 1 Jan 12-14		Course Introduction / Intro to Optimization and LP LP: Allocation, Covering, Blending Problems (Tue RQ Solver) (**Thu RQ 1/2**)	OM Ch. 1 OM Ch. 2	WK1 Reflect
Week 2 Jan 19-21	**DC Ch 1** **RQ 2/3** RQ Install Python	LP: Network Models Python Exploratory Analysis	OM Ch. 3	WK2 Reflect Group HW1
Week 3 Jan 26-28	**DC Ch 2** RQ 4 pyomo	LP: Network Models Parameter Analysis (Wed RQ Sensitivity) **Thu Quiz 1** Optimization Modeling in Python	OM Ch. 3 OM Ch. 4	WK3 Reflect
Week 4 Feb 2-4	DC Ch 3 RQ 4/6	Parameter Analysis/Integer Programming (IP) Models Optimization Modeling in Python	OM Ch. 4.5,6.1-6.2, 6.7	WK4 Reflect Group HW2
Week 5 Feb 9-11	DC Ch 4 RQ 6	Integer Programming (IP) Models **Thu Quiz 2** Optimization Modeling in Python	OM Ch. 6.3-6.4	WK5 Reflect
Week 6 Feb 16-18	RQ 7	IP Logical Constraints Optimization Modeling in Python	OM Ch. 7	WK6 Reflect Group HW 3
Week 7 Feb 23-25	Project Proposal	IP Logical Constraints **Thu Quiz 3** Optimization Modeling in Python	OM Ch. 7	WK7 Reflect
Week 8 Mar 2-4	RQ 8	Nonlinear Models Optimization Modeling in Python	OM Ch. 8	WK8 Reflect
Week 9 Mar 9-11	RQ 9	Nonlinear Models Optimization Modeling in Python	OM Ch. 8	WK9 Reflect Group HW 4
Week 10 Mar 16-18		Evolutionary Algorithms **Thu Quiz 4** In-class coding session for project	OM Ch. 9	Coding Project