

8/18/21

IE 335–Operations Research - Optimization, *Fall 2021*

CRN 22023- Section 001 – In Class Lecture - Mondays, Wednesdays, and Fridays 12:30 – 1:20 PM, @STEW 130

Instructional Modality: Face-to-Face

Instructor: Dr. Erhan Karakaya, **Email:** ekarakay@purdue.edu

Office Hours: 2:00 pm – 3:00 pm on Thursdays@Zoom on Brightspace or **Zoom Meeting ID:** 98918921274

Zoom Link: <https://purdue-edu.zoom.us/j/98918921274>

Office Location: Grissom 386

The E-mail will be the fastest way to get your questions answered. If my office hours do not work for you, you are welcome to set up an appointment via email.

Teaching Assistants:

Jun He, **Email:** he184@purdue.edu

Office hour: 2:00 pm - 3:00 pm on Mondays, Wednesdays@Zoom in Brightspace

Zoom Meeting ID: 914 2968 5472, **Zoom Link:** <https://purdue-edu.zoom.us/j/91429685472>

Frederik Weber, **Email:** weber215@purdue.edu

Office hour: 9:00 am – 10:00 am on Tuesdays, Wednesdays @Zoom in Brightspace

Zoom Meeting ID: 945 511 9613, **Zoom Link:** <https://purdue-edu.zoom.us/j/9455119613>

Dawoon Jung, **Email:** jung321@purdue.edu

Office hour: 4:00 pm – 5:00 pm on Tuesdays, Wednesdays @Zoom in Brightspace

Zoom Meeting ID: 95895415929, **Zoom Link:** <https://purdue-edu.zoom.us/j/95895415929>

Saichandar Reddy Naini, **Email:** snaini@purdue.edu

Office hour: 10:00 am - 11:00 am on Wednesdays, Thursdays@Zoom in Brightspace

Zoom Meeting ID: 923 6482 0095, **Zoom Link:** <https://purdue-edu.zoom.us/j/92364820095>

You may consult any teaching assistant (TA) for help. If none of the scheduled office hours work for you, the TAs are happy to make an appointment to see you. If changes are made, an announcement will be made on Brightspace. Please use your **Purdue** Zoom account (email) to join any Zoom meeting.

Course format: This course will be taught in the classroom. The class will meet in person on Mondays, Wednesdays and Fridays. All course-related materials will be available online. However, students are expected to attend in-person courses unless they have any official excuse. Attendance is not required but highly recommended. Students are responsible for any missed class-related work as a result of an absence.

Course Catalog Description: Introduction to deterministic optimization modeling and algorithms in operations research. Emphasis on formulation and solution of linear programs, networks flows, and integer programs.

Learning Outcomes:

- Build linear programs using specific problem data and using general form mathematical notation.
- Recognize, formulate, and solve network flow problems.
- Formulate real life problems into (linear/nonlinear) optimization problems.
- Model logic constraints in mathematical models using binary variables.
- Graphically solve two or three dimensional (linear/nonlinear) optimization problems.
- Performing solution analysis: existence/uniqueness, (in)feasibility, (un)boundedness, and optimality.
- Understand linear programming: solution analysis, solution methods (the simplex and interior-point algorithm).
- Understand and execute (by hand) the simplex algorithm.
- Solve linear programs using the gurobipy package in python.

Class Schedule: The class schedule is placed in Brightspace> Content> Miscellaneous. The class schedule is tentative and subject to change. Any changes will be communicated to the class via Brightspace as announcement.

Learning Resources, Technology & Texts

Website: Brightspace (<https://purdue.brightspace.com/d2l/home/341490>) All applicable course material and any course announcements will be found on the course website. *Check Brightspace regularly for updates!*

- For all class activities that occur on Zoom, you must be logged in with your Purdue University email address.
- You can access Zoom office hours (given the link above) in Brightspace> Content> External Learning Tools > Zoom.
- We will be using **Gradescope** to submit your assignments. You should have already been enrolled. You can check it in Brightspace> Content> External Learning Tools > Gradescope. If you are not enrolled yet for any reason (e.g. late enrollment for the class etc.), you can enroll yourself using the entry code “RWYVVD”.
- All students will need to be able to scan and upload their work. This can be done using a regular physical scanner or a phone application.
- Some in-class activities will use online tools including but not limited to Kahoot. Students should have access to a web-enabled device during class.
- All students will need to be able to use Microsoft Excel, Gurobi, and Python. Additional information regarding Python and Gurobi will be provided before their first use in class assignments.

- Lectures will be a primary source for information in this course. If you miss a class you are responsible for the content of that class.
- Please note that it is your responsibility to follow the course announcements both in classroom and in Brightspace. Check your notification setting to get timely notifications.
- In case a student needs to take test or join class meetings online, all students must have a web-cam for online class activities and have access to a computer that meets the Respondus system requirements.
- We are going to use **Piazza** for discussions. You should have already been enrolled. You can check it in Brightspace> Content> External Learning Tools > Piazza. If you are not enrolled yet for any reason (e.g. late enrollment for the class etc.) or you want to un-enroll, you can enroll or un-enroll yourself using the link (piazza.com/purdue/fall2021/wl202210ie33500001).
 - Please use your name and Purdue email address in Piazza as listed in Brightspace not to cause any conflict for extra point grading.
 - Please do not edit someone else's comment or question in Piazza. Make a follow up comment or question.

Textbooks:

- ❖ Intro to Operations Research by Hillier and Lieberman, 11th Edition. You may use an older edition of the textbook, but you will need to check to ensure that reading sections and assigned homework problems are the same.
- ❖ (W) Operations Research: Applications and Algorithms by W. Winston, Fourth edition. Thomson-Brooks, 2004.
- ❖ Optimization in Operations Research by R. Rardin. Prentice-Hall, 1998.
- ❖ Operations Research: An Introduction by Hamdy A. Taha. Tenth edition. Pearson, 2017.

Grading:

Assignment	Quantity	Weight
Quizzes	6 quizzes, each of equal weight, drop lowest quiz grade	60%
Homework	7	20%
Final	1, cumulative	20%
Extra Credit	n, extra credits by doing different activities	3%

Grade Breakdown*:

A+: >=98	A: [94, 98)	A-: [90, 94)	
B+: [88,90)	B: [84, 88)	B-: [80,84)	
C+: [78,80)	C: [74,78)	C-: [70,74)	
D+: [68,70)	D: [64-68)	D-: [60-64)	F: <60

Note: * Do not ask to be bumped-up if you are near the threshold (eg. 89.9 and request an A-). I will not modify the thresholds for individuals. Please work hard from Day 1 to obtain your desired grades.

You can only question your grade regarding accuracy. Accuracy problems include such things as missing grades and incorrect grades, but not “but I really tried hard and turned everything in.” I will not give you extra work, I will not bump you up if you are 0.1 below a threshold, and I will not change the threshold. If you don’t want to “just miss” an A, don’t be close to the threshold. The time to worry about your grade is during the semester, not at the end of it.

Assignments

Homework

There will be graded and ungraded assignments during the course of the semester. You will need to upload your solution file on GradeScope for graded assignments. All homework will be posted in Brightspace and graded in GradeScope. All graded homework due will be 11:59 PM. No late submission will be accepted. You can submit your work until the next day at 11:59 am (noon) with 25 % penalty.

Collaboration during the conceptualization and formulation process of homework assignments is allowed. However, all homework assignments must be completed and written up individually. Violation of this policy will certainly lead to a failing grade “F” for the class and action that is more stringent might be taken. **Any work copied from any website will be reported and result “F” for the class.**

Quizzes: All quizzes will be taken at the end of class or whole class period in classroom. Each quiz will consist of one or more modified homework problems or similar questions solved in class. The **lowest** quiz grade will be dropped, except in the case of receiving a “0” **due to an Academic Honesty violation**. Any changes to the proposed quiz dates will be announced in class and on Brightspace. The quizzes are not cumulative but the content itself is (e.g., Quiz 1 will not specifically test you about contents covered in Quiz 1 but to solve problems in Quiz 2, you will need to use the knowledge you have learned in the material covered by Quiz 1).

Exams: There will be a cumulative Final exam in this course. Exam will cover material discussed in class, assigned reading material, homework and quizzes. The date will be scheduled by The Office of the Registrar.

Final exam and quizzes will be given in the classroom. Writing must be legible and must clearly show work and label the answer(s). The problems will be graded using partial credit. All quizzes and final exam will be closed note and closed book.

All tests will not be curved and will be graded on an absolute scale.

Makeup exams: No makeup exams will be given, except in the event of illness, University sponsored activities, or death in the close family. These all require documentation. Please note that job interviews are not considered excused absences by the University. It is your responsibility to arrange for a makeup exam. Make up quizzes will be held on the Tuesday at 6:00PM following the scheduled test date. If you miss any test and want to make up, you **must** send an email to request a makeup before Tuesday.

- In the event of illness, you must bring a signed letter from your physician stating that you were unfit to take the exam at the original date and time. A yellow PUSH note is not acceptable.
- In the event of a University sponsored activity, you are responsible to provide valid official documentation.

- In the unfortunate case of family death, you must follow the Grief Absence Policy for Students (GAPS) through the Office of the Dean of Students.
- In the case of quarantine, you will be still expected to complete the test or any other assignment by the schedule time.

Regrades: If you believe there was a mistake in the grading of a homework, quiz, or exam, you may request a regrade. However, your entire homework, quiz, or exam may be regraded, so your final score could increase or decrease. If simply the total score was incorrectly added, we will just make the correction.

Any regrade request for a hard-copy submission must consist of a typed or written note (dated and signed), clearly explaining the error, attached to the original document. For electronic submissions, an email containing the same information is needed. For online assignments submitted in Gradescope, you have to use regrade request feature in Gradescope. No in-person arguments about regrades are allowed.

All regrade requests must be made within **one-week** of when the graded work was first available. Any regrade request after the regrade dates will not be considered.

Contact the Instructional Team:

- If your question is content-related (e.g., clarifications on a concept, how to approach a homework problem, exam policies, etc.), please ask them in **Piazza** so we and your classmates can answer your common questions. We will be monitoring the discussion board often. Posting your questions there can help benefit other students who may have the same question. You can also answer each other's questions. There will be extra points for each endorsed contribution in Piazza (Brightspace> Content> External Learning Tools > Piazza). 3% of total earned extra points will be added to your overall grade.
- If your question is more personal, please send an email using your **Purdue email** address and include "**IE 335**" in the subject. Any email without "IE 335" subject will **not** be answered. When sending email to the teaching staff, send to ALL the TAs (not a single one) and the instructor.
- Emails will be replied within 24 hours except weekends. Do **NOT** wait until the last day for any assignment or any excuse related questions.
- Emails sent over the weekend will be processed on the following Monday or Tuesday.
- Your feedback is welcomed at any time during the semester. We are here to help your learning. Please help us to better help you!

Calculator Policy

You will not need a calculator during quizzes and exams unless otherwise will be announced in Brightspace for any particular quiz or final exam. In case there will be a calculator allowance by announcement, the policy below will be followed:

A one-line or a two-line basic scientific calculator is allowed. Any calculator with programmability, large memory capacity, wireless communication, graphing features etc. are NOT allowed. To avoid academic dishonesty, students are not to have calculators that store text/formula and/or can connect to Bluetooth devices during class. The only calculators acceptable for this class exams or quizzes will be listed in Brightspace (Content > Miscellaneous > Accepted Calculators).

The use of any unauthorized calculators during an exam will be deemed an academic dishonesty infraction. Students who violate this policy are subject to sanctions from the instructor, up to and including a “F” grade on the exam or even “F” the grade in the course. Furthermore, all infractions will also be reported to the Office of the Dean of Students as potential violations of the Purdue University Code of Student Conduct, which may result in additional sanctions being assigned, including probation, suspension, or even expulsion from the University. Any questions about this policy should be addressed to the instructor on **Piazza**.

Accessibility

Purdue University is committed to making learning experiences accessible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Attendance Policy

This course follows Purdue’s academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. However, attendance will not be taken but is recommended for better understanding of class material. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. Any late notice after the scheduled assignment date will not be considered. For unanticipated or emergency absences when advance notification to the instructor is not possible, the student should contact the instructor as soon as possible by email or phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor’s department because of circumstances beyond the student’s control, and in cases falling under excused absence regulations, the student or the student’s representative should contact or go to the Office of the Dean of Students website to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted for cases of grief/bereavement, military service, jury duty, and parenting leave. For details, see the Academic Regulations & Student Conduct section of the University Catalog website.

Guidance on class attendance related to COVID-19 are outlined in the [Protect Purdue Pledge for Fall 2021](#) on the Protect Purdue website.

Academic Guidance in the Event a Student is Quarantined/Isolated

If you must quarantine or isolate at any point in time during the semester, please reach out to me via email at ekarakay@purdue.edu so that we can communicate about how you can continue to learn remotely. Work with

the Protect Purdue Health Center (PPHC) to get documentation and support, including access to an Academic Case Manager who can provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Your Academic Case Manager can be reached at acmg@purdue.edu. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email. We will make arrangements based on your particular situation. Please note that, according to [Details for Students on Normal Operations for Fall 2021](#) announced on the Protect Purdue website, “individuals who test positive for COVID-19 are not guaranteed remote access to all course activities, materials, and assignments.”

In case of a student is instructed to quarantine or isolate:

The test will be available in the tests module of Brightspace during the scheduled test time. In addition to that, you must submit a file showing your work (you can take a photo or scan the solution sheet where you will solve the questions) to Gradescope. As Brightspace does not give partial credit, we will look at your calculations on that file. In addition to that, it will be used to verify your answers. The link to submit your file will be available in Gradescope.

On the solution sheet, writing must be legible and must clearly show work and label the answer(s) and your name. It is completely your responsibility to make your name and solution clear. Use your name in the classlist.

Classroom Guidance Regarding Protect Purdue

Any student who has substantial reason to believe that another person is threatening the safety of others by not complying with Protect Purdue protocols is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the [Office of the Student Rights and Responsibilities](#). See also [Purdue University Bill of Student Rights](#) and the Violent Behavior Policy under University Resources in Brightspace.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.

Incidents of academic misconduct in this course will be addressed by the course instructor and referred to the Office of Student Rights and Responsibilities (OSRR) for review at the university level. Any violation of course policies as it relates to academic integrity will result minimally in a failing or zero grade for that particular assignment, and at the instructor’s discretion may result in a failing grade for the course. In addition, all incidents of academic misconduct will be forwarded to OSRR, where university penalties, including removal from the university, may be considered.

In addition, be aware that you as students can report issues of academic integrity that you observe, and may do so anonymously, through the OSRR by calling 765-494-8778 or emailing integrity@purdue.edu

The material of the course (slides, handouts, HW, Exam, Quizzes, etc.) is protected by copyright. You are not allowed to share it with others outside the class or posted online anywhere. This will be considered failing ethic, and by consequence, getting an “F” for the course.

Nondiscrimination Statement

A hyperlink to Purdue’s full Nondiscrimination Policy Statement is included in our course Brightspace under University Policies.

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [WellTrack](#). Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one-on-one virtual or in-person sessions with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you’re struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Emergency Preparation

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor’s control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.