

IE 3390 OPERATIONS RESEARCH I Fall 2023

Course description

An introduction to deterministic optimization models. These include the concepts of operations research modeling, classical optimization, linear programming, transportation problems and network analysis.

Prerequisites

Probability with a grade of C or better; Working Knowledge of Data Analysis, some experience with MS Excel or other spreadsheet programs.

Textbook and Course Materials

- *Operations Research: An Introduction, 11th Edition, 2022, by H.A. Taha, Published by Pearson. You can rent the textbook online for about \$11 for the duration of the semester at the following link:*
<https://www.pearson.com/en-us/subject-catalog/p/operations-research-an-introduction/P200000003221/9780137625727>
- Other supplemental handouts including a set of lecture slides (prepared by Drs. Aguirre and Cram from previous administrations of the course), Excel spreadsheets for Solver analyses provided by instructor and TA.

Instructor

Dr. Arunkumar Pennathur (most students call me “Dr. Pennathur” or “Dr. P” or simply “Doc” – you take your pick), A240, Engineering Building, IMSE Department, UTEP; E-mail: apennathur@utep.edu.

Teaching Assistant

Ms. Prajina Edayath. Ms. Edayath is a PhD scholar in Interdisciplinary Health Sciences and will coordinate all Excel solver problem solving sessions and will keep your grades. Her email is pedayath@miners.utep.edu. **Office location: please schedule a Teams meeting with Ms. Edayath.**

Office Hours

Mondays 3 PM to 430 PM. Other Times by Appointment. Please note that I will be able to serve you best by devoting all my attention to you if you contact me during the office hours or make a prior appointment so that I can create a block of time for you – we both optimize our time this way.

E-mail is the fastest, cheapest, and easiest way to contact me – I read my e-mail twice a day if I am in town and will respond to your queries within a day.

For most questions you may have with the content, Ms. Edayath will hold regular office hours – she has expertise in the course material and will be able to assist you with your questions about the content and the material. **Her office hours are: Wednesdays and Thursdays 11 am to 1230 am. Other times by appointment – please email her for an appointment.**

Class Meetings

Mondays and Wednesdays, 9-10:20 AM in Education Building 203.

Course Objectives

The objectives of the course are to introduce the student to deterministic optimization tools in operations research. The objectives are achieved through in-class lectures and modeling/problem solving, computer modeling problems, and case studies that illustrate the principles of operations research. Use of Excel Solver for solving problem is recommended. The text also comes with TORA which can be used to practice rudimentary modeling. You can also download LINDO, AMPL, even Python, and use it for your learning if you like. But, given the prevalent use of

Excel in industry (this is a marketable skill you can include in your resume), and the powerful tools available in Excel for modeling, this course will only use Excel.

At the end of the course, a student-taking the course should be able:

- To become familiar with OR concepts such as modeling, LP, the simplex algorithm, and its implementation conducting sensitivity analyses, transportation and assignment algorithms, and optimization.
- To identify, formulate, solve, and interpret OR models.
- Understand how math modeling concepts are applied typically in the real world.
- Learn commonly used and available software to model and analyze OR problems.

Course Coverage

- ❖ Course Introduction and Overview of Operations Research (Chapter 1 of text)
- ❖ Modeling with Linear Programming (including the Graphical Approach) (Chapter 2 of text)
- ❖ The Simplex Method and Sensitivity Analysis (Chapter 3 of text)
- ❖ Transportation and Assignment Models (Chapter 5 of text)
- ❖ Selected Topics in Network Optimization Models (Chapter 6 of text)
- ❖ Selected Topics in Decision Analysis (Chapter 15 of text)
- ❖ Duality and Post-Optimality Analysis (Time permitting) (Chapter 4 of text)

Course Grading

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| ❖ 2 modular exams at 20% each: | 40% |
| ❖ Homework assignments (not including spreadsheets): | 10% |
| ❖ Spreadsheet assignments: | 10% |
| ❖ 2 Case Studies (Team-based): | 40% |

Grading Scale

- | | |
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| ❖ A | 90-100 |
| ❖ B | 80-89 |
| ❖ C | 70-79 |
| ❖ D | 60-69 |
| ❖ F | < 60 |

Fractions less than 0.5 will be rounded down. Fractions equal to or more than 0.5 will be rounded up for final letter grades.

Examination Information

This class will have two modular, in person examinations on the following dates:

- ❖ Exam 1: October 18, 2023 (Wednesday)
- ❖ Exam 2: December 6, 2023 (Wednesday)

Case Studies

There will be two modeling/spreadsheet analyses case studies assigned to the class this semester to be done in teams of up to 4 members. **We will form teams first week of classes.** Team member performance on the case reports and analyses will also be graded, so all members in a team may not get the same grade. For each case study, the project teams will be required to provide a written report with a well-documented and professionally formatted spreadsheet of their analyses for the cases. **Each set of case analyses and documentation will carry 20% of your grade.** Late reports will not be accepted. Completed case assignments will be due in November – the first one will be due **November 1, 2023**, and the second will be due **November 29, 2023**. Please see Blackboard assignments section for how your case reports and spreadsheets will be graded.

Homework and Spreadsheet Assignments

Throughout the semester, homework assignments both modeling problems, and spreadsheet assignments will be assigned. You may consult with each other on how best to solve the homework and spreadsheet assignments, **but you must submit your own individual work**. You must typewrite your assignments and submit them as a Word/Excel documents. Please see blackboard for assignments and submission guidelines (these will be posted no later than the second week of classes). Please anticipate about 4 or so homework assignments and about 4 or 5 spreadsheet assignments.

Examinations

The two modular examinations will be closed book, closed notes. **There will be no opportunity for make-up in modular exams (excepted documented medical reasons)**. The exam will consist of short problems and multiple-choice, filling blanks, true/false type questions.

UTEP Policy on Academic Dishonesty

Any attempts of academic dishonesty in any aspect of this course will **not be tolerated** and will be dealt with according to applicable UTEP Policy. Please read the information below to understand academic dishonesty and applicable UTEP policy from the UTEP Dean of Students.

Academic Dishonesty at UTEP

It is the official policy of the university that all suspected cases or acts of alleged scholastic dishonesty must be referred to the Dean of Students for investigation and appropriate disposition. Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

A. "Cheating" includes:

1. Copying from the test paper of another student, engaging in written, oral, or any other means of communication with another student during a test, or giving aid to or seeking aid from another student during a test;
2. possession and/or use during a test of materials which are not authorized by the person giving the test, such as class notes, books, or specifically designed "crib notes";
3. using, obtaining, or attempting to obtain by any means the whole or any part of non-administered test, test key, homework solution, or computer program; using a test that has been administered in prior classes or semesters but which will be used again either in whole or in part without permission of the instructor; or accessing a test bank without instructor permission;
4. collaborating with or seeking aid from another student for an assignment without authority;
5. substituting for another person, or permitting another person to substitute for one's self, to take a test; and
6. falsifying research data, laboratory reports, and/or other records or academic work offered for credit;

B. "plagiarism" means the appropriation, buying, receiving as a gift, or obtaining by any means another's work and the unacknowledged submission or incorporation of it in one's own academic work offered for credit, or using work in a paper or assignment for which the student had received credit in another course without direct permission of all involved instructors.

C. "collusion" means the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on scholastic dishonesty.

Additionally, during your exams, since the exams are planned to be short in time commitment, once you are inside the exam hall, you will not be permitted to go to the restroom. Please complete all your restroom formalities **BEFORE** you enter the exam hall. You will also not be permitted to leave the exam hall for cell-phone conversations during the exam. **If you must leave the hall during the exam, you must turn in your exam and will not have an opportunity to work on it further.** You will also leave all your bags and other belongings at a central location in the classroom to be specified by the instructor.