
Deterministic Methods in Operations Research

ESI6314

Class Periods:

T,R | Period 5 - 6 (11:45 AM - 1:40 PM)

Location: CSE E107

Academic Term : Fall 2019

Instructor:

Yongpei Guan
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352-392-1464

Office hours:

- Tuesdays 1:40-2:40pm

Teaching Assistants:

Xiaojie Wang
Office hours:

- Mondays 8:00-9:00pm,
- Wednesdays 8:00-9:00pm

Course Description:

Credits: 4; Introduction to basic models and their solution with modern computer packages. Emphasis on modeling, computer solution, and sensitivity analysis with minimal reference to model theory and development of algorithmic methods.

Course Pre-Requisites/Co-Requisites:

Although there is no formal prerequisite for this class, students should have a knowledge of basic programming techniques, linear algebra (linear independence, solving systems of equations, basic matrix algebra) and basic knowledge of differential calculus.

Course Objectives:

Operations Research (also called Management Science) is the study of scientific approaches to decision-making. Through mathematical modeling, it seeks to design, improve and operate complex systems in the best possible way. The mathematical tools used for the solution of such models are either deterministic or stochastic, depending on the nature of the system modeled. In this class, we focus on deterministic models and methods in Operations Research. You will learn very powerful modeling and solution techniques for decision-making problems that are used today by many successful companies to help them save/earn millions of dollars.

Materials and Supply Fees:

NA.

Required Textbooks and Software:

Lecture notes will be provided that can be augmented with the book listed below.

Recommended Materials:

Ronald L. Rardin, *Optimization in Operations Research*, Prentice-Hall 1998.

Course Schedule:

A tentative list of topics for the class is given next. This list might be shortened or lengthened depending on the pace of the class.

Chapter 1: Optimization models - an introduction (August, September)

Decision problems - Optimization models - Excel solver - Examples (distribution planning, inventory management, vehicle routing, portfolio optimization, ...).

Chapter 2: Optimization methods - an introduction (September)

Outcomes of optimization problems - Tractability - Local and global optima - Convexity - Optimality Conditions.

Chapter 3: Linear Programming (October)

Linear programming models (production planning, financial planning, shift scheduling, ...) - Standard form - Basic solutions - Simplex algorithm - Two-Phase Method - Duality - Sensitivity and post-optimal analysis - Complementarity slackness.

Chapter 4: Network Programming (November)

Networks - Network flow models (team assignments, single-crew scheduling, ...) - Shortest path - Maximum flow - Assignment - Algorithms.

Chapter 5: Integer Programming (November)

Integer variables - Enumeration - LP and rounding techniques - Branch-and-bound.

Attendance Policy, Class Expectations, and Make-Up Policy:

Attendance is mandatory. Students are expected to attend class and to notify the instructor when they are not able to. Repeated unexcused absences might result in a penalty of up to 10% of the class grade. In the event a student is unable to attend the final exam because of a valid reason (UF-imposed curriculum requirement, religious holiday, jury duty, or a family/medical emergency), a make-up exam will be organized as soon as feasible for both the instructor and the student, provided that the instructor was given advanced notice of the situation. Students who miss an exam without advanced notice to the instructor (or without a valid reason for which such notice could not be given) will receive a F for the exam and will not be given a make-up exam. Make-up will not be given for homework. The instructor might extend the deadline or forgo homework for a student who has a valid reason (see above), provided that the instructor is given advanced notice.

Evaluation of Grades:

Class grades will be based on: homework average grade (25%), midterm (25%), project (25%), and final exam grade (25%).

- Six homework assignments will be given during the course of the semester. You will need to answer and turn in all problems. You will also receive problem sheets with solution for you to gain extra practice. All homework will count equally towards your homework average grade, except that the homework with the lowest grade will be excluded from the computation. You will receive solutions to all the homework sets. The questions will range from theoretical to practical aspects. Some will be simple applications of material seen in class, some will be challenging. Some questions will involve the use of the Excel solver that will be presented in class.

- Students are required to take a midterm and a final exam. The goal is to test the general knowledge and understanding of the class material. The exams will contain modeling problems that will verify that you can convert world problems into quantitative models, solution methodologies problems that will verify that you know and understand the algorithms described in class, and common sense/analysis problems that verify how well you can make sense of solutions you obtain from models. The final will be held 12/12/2019 @ 3:00 PM - 5:00 PM.

Grading Policy:

You will receive numerical grades for homework, and final exam. Your class grade will be determined by the following grading scale: (90-100] A, (80-90] A-, (70-80] B+, (60-70] B, (50-60] B-, (40,50] C+, (30,40] C, (20,30] C-, (10,20] D, [0,10] E. The cut-off points however might be lowered in the case of a particularly hard final exam. More information on UF grading policy may be found at: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: <http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html#grades>

Students Requiring Accommodations:

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation:

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy:

UF students are bound by The Honor Pledge which states, We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment. The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use:

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy:

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>.

Campus Resources:*Health and Wellness*

U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS): Student Health Care Center, 392-1161.

University Police Department: at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support: 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center: Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support: <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall: 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.