

ESI4317: Advanced Topics in Operations Research

Class Periods: M,W,F — Period 8 (3:00 PM - 3:50 PM)

Academic Term: Fall 2023

Location: FLG 0285

1 Instructor

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- *Office Phone:* 352-294-7728
- *Office hours and location:* Tuesday 3:30 PM - 4:45 PM at Weil 401D, or by appointment for additional time slots.

2 Teaching Assistant/Peer Mentor/Supervised Teaching Student

None

3 Course Description

Credit number: 3

Catalog Description: Discusses advanced operations research topics on non-linear optimization, convex optimization, dynamic programming, and stochastic optimization. Study large or complex problems from two different perspectives: Static approach and Dynamic approach.

4 Prerequisites/Co-Requisites

Pre-requisites: ESI 3312 (with a minimum grade of C) and ESI 4313 (with a minimum grade of C).

To succeed in this class, a working knowledge of calculus, linear algebra, matrix, and probability, as well as some experience with basic programming techniques in Matlab or equivalent, is needed.

5 Course Objectives

At the end of this course, students will be able to:

- Understand natural extensions of linear optimization such as non-linear optimization;
- Assess solutions to optimization models through KKT conditions;
- Distinguish static nature of a problem vs. dynamic approach to a problem;
- Implement mainstream optimization algorithms for problem instances motivated by real-world applications.

6 Materials and Supply Fees

None.

7 Relation to Program Outcomes (ABET)

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

8 Required Textbooks and Software

None

9 Recommended Materials

- Recommended Material 1
 - Title: Optimization
 - Author: Kenneth Lange
 - Edition: 2nd Edition
 - ISBN number: 9781461458371
- Recommended Material 2
 - Title: Introduction to Stochastic Program
 - Author: John Birge, Francois Louveaux
 - Edition: 2nd Edition
 - ISBN number: 9781461402367

10 Course Schedule

Below is a list of topics for the class. Items may be added to or reduced from the list according to the pace of the class.

Week	Topic
1	Introduction and review
2	Computational complexity: P, NP, NP-hard
3	Introduction to nonlinear programming
3, 4	Necessary conditions and constraint qualifications; Quiz 1*
4, 5	Convexity and convexity preserving operations
5, 6	Mini-Project Presentation 1
7, 8	Algorithms for unconstrained optimization
8	Algorithms for constrained optimization; Quiz 2*
9	Mini-Project Presentation 2
10,11	Stochastic programming
12	Stochastic programming; dynamic programming; Quiz 3*
13, 14 (break),15	Dynamic programming
15, 16	Mini-Project presentation 3

*The schedules for the quizzes are tentative and subject to changes on short notices.

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

11.1 Attendance Policy and Class Expectations

Attendance is strongly recommended either online or physically. It will be to your benefit to attend all lectures. Students will be responsible for all material covered in class. If you cannot follow the lecture any more, you can leave the class quietly; I will not be offended. Please, remember to turn off your cell phone as soon as you enter the classroom. Those who behave inappropriately will be asked to leave.

In principle, no online/virtual learning will be accommodated, unless approved ahead of time. Though zoom links for the lectures will be provided, they are only for students that cannot attend the lectures for health reasons. A student will not be allowed to join the lectures through online for other reasons.

11.2 Make-Up Policy

The format of the evaluation is through quizzes and projects. We anticipate the students to be present without exception in the quizzes or class presentations; please make all other plans in avoidance of conflicts with the dates for your scheduled quizzes/presentation, unless in medical emergencies with accompanied by a doctor's note. If the absent student fails to take part on the assigned day and do not have a valid excuse, there will be no makeup quiz/presentation and a zero (0) grade will be given on the exam. Reasons such as job interviews, employer events, weddings, vacations, etc., are not valid excuses for being absent in any of the quizzes or presentations scheduled for you. Due to the format of evaluation is through presentation. Maximally one make-up quiz is allowed through out this semester. If the student cannot work during the period of presentation for the aforementioned reasons, a make-up presentation can be arranged at a time slot that is chosen by the instructor and works for the rest of the students in the same team.

12 Evaluation of Grades

12.1 Components of the class grades

Class grades will be based on:

- a. Quiz(zes) (18%)
- b. Mini-project 1: deliverables (15%), presentation (6%), and Q&A (5%)

- c. Mini-project 2: deliverables (15%), presentation (6%), and Q&A (5%)
- d. Mini-project 3: deliverables (15%), presentation (6%), and Q&A (5%)
- e. In-class participation (4%)

Deliverables are presentation slides (in powerpoint or pdf) and codes (if applicable).

No collaboration is allowed for any of the coursework, projects, quizzes, etc., unless explicitly stated otherwise. If the activity is designed as a team effort, collaborations within the team is permitted.

12.2 Grading Appeals

The instructor will make every effort to ensure that grading is as objective and fair possible. Students are allowed to submit an appeal in writing within one week of grade notification. The written appeal should indicate the reason why you believe re-grade is appropriate. At the receipt of such an appeal, the instructor will regrade the entire component in question to ensure that all parts are properly graded. It is possible that the second grade will be either higher or lower than the first grade.

No re-grade will take place on the spot nor will be considered face-to-face. The instructor keeps the prerogative of deciding of a complete re-grade of the paper when you request the re-grade of any of its parts. This rule is to prevent frivolous complaints. Finally, be aware that samples of quizzes and tests are photocopied and kept to verify if any alteration was made between the return of a paper and the request for a re-grade. In the case of such event, you will receive a failing grade for the totality of your paper and the case will be handed to the Dean of Students Office for prosecution.

Please be aware that if the grader misunderstood your answer during the first grading, it is probably that it was not clear. Explaining what you meant afterwards will not earn you any point as it should have been clear the first time around.

13 Grading Policy

The grading scale for the class is as below:

Grade	Range	Grade Points
A	[93, 100]	4.00
A-	[90, 93)	3.67
B+	[87, 90)	3.33
B	[83, 87)	3.00
B-	[80, 83)	2.67
C+	[77, 80)	2.33
C	[73, 77)	2.00
C-	[70, 73)	1.67
D+	[65, 70)	1.33
D	[60, 65)	1.00
D-	[55, 60)	0.67

Curving might occur in any assignment/exam if the average result is too low. More information on UF grading policy may be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Grades are not subject to negotiation and will be solely based on your performance in this course; that is, no outside factors will be considered. Those outside factors include the plan to graduate within certain timeline and the current grade being near to the next higher or lower grade.

A grade of C is required to pass this class. A C- is NOT considered passing.

14 Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

15 Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

16 In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

17 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://sccr.dso.ufl.edu/process/student-conduct-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.

18 Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

19 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.

20 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: <https://registrar.ufl.edu/ferpa.html>

21 Campus Resources

Health and Wellness

U Matter, We Care: Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

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 Discrimination, Harassment, Assault, or Violence: If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance (<https://titleix.ufl.edu/>), located at Yon Hall

Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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

University Police Department: 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. <http://lss.at.ufl.edu/help.shtml>.

Career Connections Center. Reitz Union, 392-1601. Career assistance and counseling; <https://career.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. <http://teachingcenter.ufl.edu/>.

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

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.