

COURSE SYLLABUS
ESI 4614: Decision Analytics Design
 Spring 2025

Instructed by Zixuan Feng

Overview

Credits 3 (no pass/fail allowed)
Meetings Tues., 8:30–9:20 (pd. 2), WEIM 1084
 Thurs., 8:30–10:25 (pds. 2–3), WEIM 1084
Website Canvas through elearning.ufl.edu

Instructor: Zixuan Feng (she/her/hers)
Email zixuan.feng@ufl.edu (see [Communication Guidelines](#) below)
Office Weil 401
Office hours TBD based on class poll

Syllabus Contents

1 Course Description and Objectives	2
2 Guidelines on Communication and Class Meetings	2
3 Tentative Course Schedule	3
4 Class Materials	4
5 Professional Component (ABET)	5
6 Grading Policy, Assignments, Exams, and Effort	5
6.1 Evaluation of Grades	5
6.2 Attendance & Participation	6
6.3 Homework	6
6.4 Exams	7
6.5 Project	7
6.6 Regrade Policy	7
7 Honor Code	8
8 Course Evaluation	8
9 Course Recording	8
10 Accommodations	9
11 Student Privacy	9
12 Commitment to a Safe and Inclusive Learning Environment	9
13 Land Acknowledgement	10
14 Campus Resources	10
14.1 Health and Wellness	10
14.2 Academic Resources	11

1 Course Description and Objectives

Catalog Description of ESI 4614

3 Credits (Letter Grade)

Studies methods for designing and evaluating analytics systems for optimizing decision making. Teaches technical and programming skills for implementation and feedback of an analytics pipeline from input data curation, processing, and validation, to prescribing outcomes.

Prerequisite: ESI 3312 (Operations Research I) and ESI 4610 (Introduction to Data Analytics) both with a minimum grade of C or COP 2273 (Python Programming for Engineers) with a minimum grade of C.

Instructor’s Description of the Class Our focus is on building and evaluating *prescriptive analytics* frameworks, in which decisions are made with the help of optimization. We further interface with decentralized systems, in the presence of potentially strategic self-interested agents, for which we draw from *computational economics* and *applied mechanism design* concepts and applications, including axiomatic treatments of desiderata of outcomes, and incorporating preferences and incentives in analyzing how algorithms are deployed. The overarching optimization lens will be *matching problems* that arise in practice. To succeed in this class, students should already have experience writing Python code. It will also be helpful to have familiarity with basic concepts in optimization, such as the definition of *variable*, *constraint*, and *objective function*, and how to formulate a linear program.

Learning Outcomes By the end of this course, you will be expected to:

- Identify key components of a decision analytics problem in practice and formulate an optimization model with appropriate variables, constraints, and objective function.
- Implement computer code to solve analytics problems while providing relevant input data.
- Model preferences and analyze incentives within analytics tasks.
- Evaluate algorithms via metrics relevant to all parties affected by the underlying task.
- Test and improve the performance of analytical models.

The course objectives will be pursued through exercises in various forms to help you understand and communicate these concepts, including assignments asking you to implement and analyze models of real-world phenomena and analytics algorithms, and a final project.

2 Guidelines on Communication and Class Meetings

Communication Guidelines

- Canvas* Please use Canvas Discussions to ask all nonconfidential course questions.
- Email* Emails regarding this course should have “[ESI 4614]” in the beginning of the Subject line, so your email can be answered more quickly.
- Meetings* If you need to schedule a face-to-face meeting for any reason, please reach out over email.

3 Tentative Course Schedule

Wk	Day	Topics*	Assignments
1	Jan 14 Jan 16	Intro to applied analytics for social good Intro to Github Classroom + Matching problems	HW 0 out (ungraded)
2	Jan 21 Jan 23	Modeling / Construct an optimization problem Clearing problem in kidney exchange + Learn to use <i>Gurobipy</i>	HW 1 out HW 0 due
3	Jan 28 Jan 30	Stable matching + DA algo DA algo (continued) + Incentives in matching markets	HW 2 out HW 1 due
4	Feb 04 Feb 06	Pareto optimality Design a Pareto optimal mechanism	HW 3 out
5	Feb 11 Feb 13	Fair division Fair division (continued)	HW 2 due
6	Feb 18 Feb 20	<i>Project selection and team formation</i> Exam 1	HW 3 due Exam (in class)
7	Feb 25 Feb 27	Social choice theory Voting axioms	HW 4 out Proposal due
8	Mar 04 Mar 06	Kemeny Generating preference profiles	HW 5 out HW 4 due
9	Mar 11 Mar 13	Participatory budgeting Apportionment	
10	Mar 18 Mar 20	<i>Spring break</i> <i>Spring break</i>	
11	Mar 25 Mar 27	Review Exam 2	HW 5 due Exam (in class)
12	Apr 01 Apr 03	Redistricting Redistricting (continued) + Auction	HW 6 out
13	Apr 08 Apr 10	Auction (continued) + Revenue maximization Revenue maximization (continued)	
14	Apr 15 Apr 17	TBD <i>Project presentations</i>	HW 6 due Project due
15	Apr 22 Apr 24	TBD <i>Reading Days</i>	
16	Apr 29 May 02	(No Class) Exam 3 (<i>WEIM 1084, 12:30–2:30pm</i>)	Exam

*Subject to change.

4 Class Materials

There is no required textbook or materials & supplies fee. I suggest the following references:

- Felix Brandt, Vincent Conitzer, Ulle Endriss, Jérôme Lang, and Ariel D. Procaccia, *Handbook of Computational Social Choice*, 2016, ISBN 9781107060432.
Free version: http://www.cambridge.org/download_file/898428, password cam1CSC.
- *Online and Matching-Based Market Design*, Edited by Federico Echenique, Nicole Immorlica, Vijay V. Vazirani, 2023, ISBN 9781108937535. (Free access available.)
- David Easley and Jon Kleinberg, *Networks, Crowds, and Markets*, 2010, ISBN 9780521195331.
Free version: <https://www.cs.cornell.edu/home/kleinber/networks-book/>.
- Tim Roughgarden, *Twenty Lectures on Algorithmic Game Theory*, 2016, ISBN 9781316779309.
- Martin J. Osborne and Ariel Rubinstein, *Models in Microeconomic Theory*, 2023. <https://www.economics.utoronto.ca/osborne/mmt/index.html>.
- Solon Barocas, Moritz Hardt, Arvind Narayanan, *Fairness and Machine Learning*, 2019. <https://fairmlbook.org>
- Supplemental reading and lecture notes may be provided.

Other references that may be useful:

- Cathy O’Neil, *Weapons of Math Destruction*, 2016, ISBN 9780553418835.
- Alvin E. Roth, *Who Gets What — and Why: The New Economics of Matchmaking and Market Design*, 2016, ISBN 9780544705289.
- Michael Kearns and Aaron Roth, *The Ethical Algorithm*, 2019, ISBN 9780190948207.

You are expected to take your own class notes, but any slides that are prepared for the course will be made available to you. These are not intended to replace the actual lecture, but rather to serve as an outline. *Any material I distribute to the class should be kept strictly within this class; without my express permission, you cannot share course content (aside from this syllabus) to anyone not enrolled in the class.*

Instructional materials for this course consist of only those materials specifically reviewed, selected, and assigned by the instructor. The instructor is only responsible for these instructional materials.

Software Use We will code in **Python**. It will be required to learn to use **Jupyter notebooks**. There is no required optimization software for assignments, but class examples will refer to the commercial software **Gurobi**. Assignments are to be submitted through **GitHub** or an alternative discussed with the instructor. Please note that *public repositories* hosted on a website are *not* FERPA compliant as anyone can then access your submitted work. If you wish to maintain confidentiality, please keep your repository private except for providing access to teammates and course staff. See **Section 11** for the FERPA disclosure.

All faculty, staff, and students of the University of Florida 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.**

5 Professional Component (ABET)

This course supports the ISE undergraduate program educational objectives of producing graduates who

- “will be successful professionals using industrial and systems engineering skills”,
- “can acquire advanced knowledge through continuing education or advanced degree programs”, and
- “can become active leaders in their profession and/or community”.

Relation to Program Outcomes (ABET)

<i>Outcome</i>	<i>Coverage</i>
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
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	Medium
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	Medium
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	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

6 Grading Policy, Assignments, Exams, and Effort

6.1 Evaluation of Grades

You should expect to spend **~6 hours** on this class per week, on average, outside of lectures. Your course grade will be based on these criteria:

Participation	5%
Quizzes	5%
Homeworks	35%
Exams	40%
Project	15%

The quizzes will occasionally be given in class, and will be graded based on completion. Only your top five quiz scores will be considered in your final grade. Similarly, homework grades will be determined using your best five homework scores. There will be three exams, with your lowest exam score contributing 10% to your final grade and the other two accounting for 15% each.

The (tentative) grading scale is: A = $[93.\bar{3}, 100]$, A- = $[90, 93.\bar{3})$, B+ = $[86.\bar{6}, 90)$, B = $[83.\bar{3}, 86.\bar{6})$, B- = $[80, 83.\bar{3})$, C+ = $[76.\bar{6}, 80)$, C = $[73.\bar{3}, 76.\bar{6})$, C- = $[70, 73.\bar{3})$, D+ = $[66.\bar{6}, 70)$, D = $[63.\bar{3}, 66.\bar{6})$, D- = $[60, 63.\bar{3})$, E = $[0, 60)$. Some assignments or exams may be curved if the average is too low. See also the Undergraduate Academic Regulations on Grading at catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

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

6.2 Attendance & Participation

Attendance is mandatory, but will not be directly recorded. Participation will be based on in-class activities and virtual discussions via Canvas / GitHub; active involvement in both is highly encouraged. In-class activities may include ungraded work in small groups to reinforce class concepts and gain hands-on experience.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: catalog.ufl.edu/UGRD/academic-regulations/attendance-policies.

6.3 Homework

Homework assignments will be used to develop your skills in: modeling real-world problems, analyzing key metrics when evaluating proposed solutions, implementing code to test your ideas.

For each team / individual assignment, you will submit: (1) one write up, with all team members clearly indicated; (2) any relevant code for your solutions; (3) a *separate* page with attributions (sources) consulted for every question and a brief summary of each person's contribution to the assignment.

Collaboration Policy You *are* allowed to discuss problems with other students/teams in the class, such as via Canvas, but you *cannot* share complete answers with each other before everyone involved in the discussion has submitted their work. However, I strongly encourage you to first **sincerely attempt each problem on your own**, and to *learn* from any external references you consult. If you have attempted a problem on your own but could not find a solution, your next step should be to talk to your classmates or me. You may also refer to online resources, but do not abuse this policy: if you find a solution or partial solution to a problem, please leave it aside and only refer to it as a last resort, after exhausting the options of seeking help via Canvas and course staff. Even at that point, the

best thing to do is to use outside resources partially, to get a sense of a path to the solution, and then to attempt the problem on your own again. If you do read a solution from an external source, I advise you to internalize *how* and *why* the solution works, possibly with my help. In that situation, write your own solution while not looking at the external source, to ensure you really understood it.

You *must* properly attribute your sources for each problem, even if it is yourself or teammates (via “Attribution: self”). For example, if Bob asks Alice for advice on question 3, then Bob would write at the beginning of their solution to question 3: “Attribution: Discussed with Alice”. *You will not lose points for telling the truth.*

Late Homework Assignment Policy Late submissions on homework assignments are allowed for up to one week after the official due date. However, there are two penalties for late submission: first, a deduction of $5x$ points, where x is the number of days the submission is late; second, a potential delay in grading, which may be significant. Any assignments submitted more than 7 days after the due date will not be graded. Special arrangements will be made in the event of an *excused absence*. Excused absences must be in compliance with University policies in the Undergraduate Catalog (catalog.ufl.edu/UGRD/academic-regulations) and require appropriate documentation.

6.4 Exams

There will be three exams. You are not allowed to consult other people or any online sources for the tests, but you are permitted to use your class notes. Please check the course website for the latest exam schedule.

Exam Make-Up Policy If you are unable to take an exam due to a family or medical emergency, and you notify the instructor in advance of the exam, then a make-up exam will be organized as soon as it is feasible for both you and the instructor.

6.5 Project

You will work on a data analytics team project to practice the skills learned during the class. The goal of the project is to go through the complete data analytics process to answer questions about a topic of your own choosing. The project work consists of the following stages: data acquisition, data analysis, visualization, and presentation of results. There are several graded deliverables that will make up your final project score.

- (1) Project proposal (PDF file)
- (2) Final project report (PDF file)
- (3) Project presentation (file or link from your favorite presentation software)
- (4) Code (Python and/or Jupyter notebook files)

Projects teams will be formed in the middle of the semester.

6.6 Regrade Policy

Every student may request a regrade of their assignments and exams. Only one regrade will be considered per assignment/exam. The deadline for requesting a review is two weeks after the graded work is returned to the class, even if you were not present that day. The request

for regrading must be done in writing together with a detailed description of the reasons why you believe there was a mistake in your grade. Note that requesting a regrade implies that the *entire* assignment may be reviewed. This means points could actually be *deducted*.

7 Honor Code

All course participants (myself and students) must abide by the requirements and spirit of the University of Florida Student Honor Code, which can be found at

<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>.

Every University of Florida student is subject to the following Honor Pledge:

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Student 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.”

You are obligated to report any condition that facilitates academic misconduct to appropriate personnel. Any honor code violations will be handled by the University’s **honor code process**.

In this course, collaboration on exams is expressly forbidden, as is the exchange of complete answers to homework assignments prior to submission. Please ask if at any point you need clarification regarding the honor code expectations, or you need assistance in any way in complying with the honor code.

8 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 is available at 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 ufl.bluera.com/ufl. Summaries of course evaluation results are available to students at gatorevals.aa.ufl.edu/public-results.

9 Course Recording

Instructor Recording of Class Sessions

Class sessions may be audiovisually recorded and made available for private review. **If you participate in class, you acknowledge that your voice and potentially your image, such as your video or profile picture, may be captured on this recording. If you do not consent, you must inform the instructor(s) as soon as possible, to discuss alternatives.** As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited. In particular, you are not permitted to distribute recordings of this class to anyone not enrolled.

Student Recording of Class Sessions

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](#).

10 Accommodations

For students requiring accommodations, please [reach out](#) as early as possible in the semester to discuss how to ensure accessibility for you. You can connect with the Disability Resource Center by visiting disability.ufl.edu/students/get-started; they can provide an accommodation letter, which will assist in understanding your accessibility needs.

11 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 the [Notification to Students of FERPA Rights](#) and visit registrar.ufl.edu/ferpa.

12 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 Program Coordinator
- HWCOC 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@ufl.edu

13 Land Acknowledgement

A **land acknowledgement** is a formal statement that recognizes and respects Indigenous Peoples as traditional stewards of this land, as well as their enduring relationship with it. Specifically, the University of Florida is located on the **traditional territory** of the **Potano** (part of the **Timucua** people) tribe, and later lived on by **Seminole** tribes. We are not only recognizing and reflecting on the context in which our (land grant) institution of higher learning exists, but also identifying an ongoing process of marginalization and colonialism. I encourage you to read the history of Indigenous Peoples and consider what you can do to support current indigenous populations. The significance of a land acknowledgment is summarized at nativegov.org/news/a-guide-to-indigenous-land-acknowledgment.

14 Campus Resources

14.1 Health and Wellness

Take care of yourself by paying attention and devoting time to your physical and mental wellbeing. Do not hesitate to reach out to me or a qualified professional if you are ever in need of support. Resources that are available to you include:

- **University Police Department:** 352-392-1111 (call 911 for emergencies).
- **U Matter, We Care:** If you or someone you know is in distress, please contact umatter@ufl.edu or call 352-392-1575 (a nighttime and weekend crisis counselor is available). The U Matter, We Care Team can help connect students to many other helping resources available including, but not limited to, **Victim Services**, Housing Staff, and the **Counseling and Wellness Center**. Please remember that asking for help is a sign of strength. <https://umatter.ufl.edu>
- **Counseling and Wellness Center:** Visit the center or call 352-392-1575 for information on crisis and non-crisis services. <https://counseling.ufl.edu>
- **Student Health Care Center:** Visit the SHCC website or call 352-392-1161 for 24/7 information to help you find the care you need. <https://shcc.ufl.edu>
- **UF Health Shands Emergency Room / Trauma Center:** For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608. <https://ufhealth.org/uf-health-shands-emergency-room-trauma-center>

- **Sexual Discrimination, Harassment, Assault, or Violence** If you or someone you know has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence, contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, 352-273-1094, title-ix@ufl.edu. <https://titleix.ufl.edu>
- Sexual Assault Recovery Services (SARS): Sexual assault counseling available through the Student Health Center, 352-392-1161.

14.2 Academic Resources

- **e-Learning Technical Support**: 352-392-4357 (option 2) or learning-support@ufl.edu.
- **Career Connections Center**: Career assistance and counseling, Reitz Union, 352-392-1601.
- **Library Support**: Receive assistance with using the libraries or finding resources.
- **Teaching Center**: General study skills and tutoring, Broward Hall, 352-392-2010 or 352-392-6420.
- **Writing Studio**: Help brainstorming, formatting, and writing papers, 302 Tigert Hall, 352-846-1138.
- **The Care Area**: Address student complaints, create success plans and ongoing support for students in distress, and help students complete necessary medical petition paperwork for all courses or medical withdrawals from a course.
- **Distance Learning Complaints**: Student complaints for online distance learning programs.