IE 532 – Analysis of Network Data

Section AN, Fall 2023

Course information

Credit hours:	4
Instructor:	Chrysafis Vogiatzis
Email:	chrys@illinois.edu
Course website:	canvas.illinois.edu
Office:	211 Transportation Building
Office hours:	**T 3:45pm–4:45pm**
	R 9:00am–10:00am
	and by appointment

If you would prefer to meet with me online, please do so at the following link:

https://tinyurl.com/yxqdm847

The details of the Zoom room are:

Meeting ID:	450 021 1406
Password:	069901

Meeting times

The meeting time and room for the lecture is as follows:

Component	Section	Meeting time	Meeting room
Lecture	AN	TR 2:00 pm–3:20 pm	123 David Kinley Hall

Class topics

The class is designed so as to provide a general overview of network theory, network optimization, and network analysis. It will also provide hands-on experience with the handling and analysis of network data. The topics that will be covered in the semester include:

- Fundamentals of networks;
- Network optimization;
- Shortest paths, maximum flow/minimum cut, cut problems, spanning trees;
- Minimum cost network flows;
- Lagrangian relaxation and Benders decomposition.
- Centrality and other graph characteristics.
- Cliques and clique relaxations.

Course communication

All communication of announcements, assignments, and other materials will be done through the course website on canvas.illinois.edu. You can also email the instructor; when doing so, please begin your email subject line with [IE 532]. This helps with class organization and will ensure a faster reply.

Textbooks

1. **Network Flows: Theory, Algorithms, and Applications** by Ravindra K. Ahuja, Thomas L. Magnanti, and James B. Orlin, ISBN-13: 978-0136175490, ISBN-10: 013617549X.
2. **Networks, Crowds, and Markets: Reasoning about a Highly Connected World** by David Easley and Jon Kleinberg, ISBN-13: 978-0521195331, ISBN-10: 0521195330. A pre-publication version is also available at https://www.cs.cornell.edu/home/kleinber/networks-book/.
3. **Integer Programming** by Laurence A. Wolsey, 1st edition, ISBN-13: 978-0471283669, ISBN-10: 0471283665.

While the textbooks are not required, they come highly recommended for their reference value. All materials necessary for the students in the classroom will be provided by the instructor.

Course description

This course will focus on statistical aspects analyzing network data. It will review illustrative problems relating to aggregation of information, decision-making, and inference tasks over various graphical models and networks. ISE graduate students and students enrolled in the Master of Science in Advanced Analytics (MSAA) are eligible to take the course.

Recommended prerequisites

MATH 412 Introduction to Graph Theory or equivalent. The instructor will provide all necessary background for students without the prerequisite.

Exams

There are two exams in the class: a midterm and a final exam. The final exam will be cumulative. **Both exams will contribute 25% towards the final grade of a student.** Both exams will be given as take-home exams. The midterm exam will be offered at or around the week of October 23, 2023. The final exam will be offered at or around the week of December 4, 2023.

Make-up exams will **only** be provided if notified at least three days prior to the exam date. In the case of an emergency, a make-up exam will be provided with the proper and appropriate documentation justifying your absence no later than one week from the date of the exam.

All exams will be announced on Canvas and submitted online.

In-class activities

There will be some small in-class activities throughout the course of the semester. All in-class activities will be announced one class before the activity is set to take place. **Activities will count towards 20% of a student's final grade.**

In-class activities are to be submitted through Canvas.

Homework assignments

There will be 5-6 homework assignments throughout the course of the semester. Homework assignments will be announced and submitted online through the course website. The deadlines will be end of day (11:59pm) unless otherwise posted. You are encouraged to work with other students on an assignment, however copying violates the honor code and is not allowed under any circumstances. If you use outside sources for a homework assignment (other book/textbook, scientific or other publication, website, etc.) please acknowledge it by citing the source. **Homework assignments will count towards 20% of a student's final grade in the class.**

All homework assignments will be announced on Canvas, but will be taken and submitted through Gradescope.

Class project

A class project requiring network analysis and the use of proper Python packages and other software will be given. The project details will be announced later in the semester. Project teams will include from one to three students.

Students will be asked to submit a report/presentation and all codes for their project during the last week of classes (week of December 4, 2023). **The project contributes towards 10% of a student's grade in the class.**

The class project will have the following milestones/deliverables:

- Project group meeting with me (needs to be done by November 1).
- Project abstract (needs to be submitted by November 10).
- 5-6 page project report (needs to be submitted by December 6).

Re-grade policy

If you believe that an exam, activity, or homework assignment was graded incorrectly, please reach out to me at the latest one week after the announcement of the results. In your email requesting the re-grade, please add an explanation of where and why a re-grade is desired.

General class policies

- Be courteous and kind to others (including me!).
- If online, please mute your microphone, when not asking a question or actively participating in a discussion.

- I will prioritize supporting you, sharing all resources with you early and often, and communicating expectations and opportunities clearly.
- I will remain flexible throughout the semester. Simply ask for an appointment with me to discuss what I can do to contribute to your well-being in the class. If you need any accommodation, please do not hesitate to ask me.
- Please stay kind, flexible, and supportive to the people around you, too.

Grading policy

A: $[93, 100]$, A-: $[90, 93)$, B+: $[87, 90)$, B: $[83, 87)$, B-: $[80, 83)$, C+: $[77, 80)$, C: $[73, 77)$, C-: $[70, 73)$, D+: $[67, 70)$, D: $[63, 67)$, D-: $[60, 63)$, F: $[0, 60)$.

Midterm exam	25%
Final exam	25%
Homework assignments	20%
In-class activities	20%
Class project	10%
Total	**100%**

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: https://studentcode.illinois.edu/article1/part4/1-401/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the

semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/ to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related Accommodations

To obtain disability-related adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217.333.4603, email disability@illinois.edu, or go to the DRES website (at http://disability.illinois.edu).

If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting "Request an Academic Screening" at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Updates to the syllabus

The contents of the syllabus and the policies described are subject to change. If that happens, all the changes will be announced and described on the course website. A summary of the changes will be offered in this page, too.

08/09/2023: Created the document.

Prepared by:	Chrysafis Vogiatzis
Last updated:	August 9, 2023
Major changes:	None.