

## Syllabus: Network Flow Programming ORI 391Q

You can find lectures, handouts, notes, and a class calendar on the course page:  
<http://neddimitrov.org/teaching/201504NFG.html>

*Instructor:* Ned Dimitrov [ned@austin.utexas.edu](mailto:ned@austin.utexas.edu)  
Office in ETC 5.118

*Lectures:* Tuesday, Thursday  
3:30-5:00pm in ETC 4.150

*Office Hours:* Wednesday 12:30-1:30pm  
Thursday 1:30-2:30pm

E-mail policy: Feel free to send administrative concerns or questions. Ask questions on class material during class, online on the Canvas Discussion board accessible through [canvas.utexas.edu](https://canvas.utexas.edu) or in office hours instead.

### *Course Objectives:*

- 1) Learn to think creatively about network modeling
- 2) Learn basic network and algorithm definitions
- 3) Learn a handful of basic data structures and their properties
- 4) For several graph algorithms, understand:
  - a) How the algorithm works: the algorithm pseudo-code
  - b) Why the algorithm works: proof/intuition of correctness
  - c) The algorithm's basic properties: appropriate uses of the algorithm
  - d) How to apply the algorithm to real problems

### *Course Content:*

Recorded versions of the class lectures are available here:  
<http://neddimitrov.org/teaching/networks-lecture-videos.html>

Lectures: The class lectures are the primary method of presenting the course content. Two helpful texts from which some, but not all, of the lecture material is derived are "Network Flows: Theory, Algorithms, and Applications" by Ahuja, Magnanti, and Orlin (the main book for the class) and "Introduction to Algorithms", by Cormen, Leiserson, Rivest, and Stein (a helpful second reference). Ultimately, you will only be tested on and only be responsible for the material covered in lecture or explicitly assigned during lecture. Recordings of old course lectures are available online for you to view at your convenience.

*Assignments and Evaluation:* There are three types of evaluated assignments for the course:

1. Homework assignments and in-class participation (20% total): We will have several homework assignments, both hand written and programming assignments. The problems are difficult, but you should be able to do them on your own, without looking up solutions. They are there to provide you practice with the class material.

It is a good idea and recommended that you work with other students on the homeworks, usually small groups of two or three work best. When working with other students, everyone has to turn in their own, individually written copy of the assignment. Homeworks are not intended to be stressful, but simply to provide incentive for you to train on the lecture material. The homeworks will be graded on completeness, not correctness.

No late homework assignments will be accepted, however your lowest homework assignment score will be dropped.

2. Exams (2 x 20% each and 1 x 5%): There will be 3 exams during the course. The exams are the primary way of ensuring you have learned the lecture material. Exams will have a strict grading policy in comparison to homeworks. By the time of the exam, you are expected to know the lecture material, and certainly solve problems similar to those assigned for homework or done in class.
3. Project (35%): There will be one small-group project. We'll start thinking about the project early on, but you are expected to do most of the work later in the course. The deliverables include a 20-30 minute in-class presentation and a written paper.

Plus and minus letter grades will be assigned, according to the scale, a part of the grade may be based on class attendance, and there may be extra credit projects in the class:

A	92% or greater
A-	90% to < 92%
B+	88% to < 90%
B	82% to < 88%
B-	80% to < 82%
C+	78% to < 80%
C	70% to < 78%
D	60% to < 70%
F	< 60%

*Class Schedule:*

Aug 27: First day of class

Oct 1: First exam

Oct 29: Second exam

Nov 12: Programming exam

Last weeks of class: Project presentations

Dec 3: Final class day

*Things you can do to be successful:*

1. Communicate with me when you are lost, don't understand, or need help
2. Expect questions without obvious answers in class, homeworks, exams, and lecture
3. Keep up with your understanding of the lecture material because things build up over time
4. Be sure you individually understand the homework solutions
5. Expect to work extensively on course material outside of class every week by doing homework and reviewing lectures

*Rough Course Topics Outline:* We will adapt and change this as we progress. More up-to-date information will be posted on the class website.

Week 1,2: Graph Terms, Storing Graphs in a Computer, Intro to Shortest Path as an LP, Graph Search.

Week 3-5: Graph Search Applications, Dijkstra's algorithm, Directed Acyclic Graphs, In depth Shortest Path as an LP.

Week 6-7: In depth Shortest Path as an LP, Interdicting Shortest Path, Benders for Interdicting Shortest Path, Intro to Max Flow.

Week 8-11: Max Flow – Min Cut, Ford Fulkerson, Reading primal/dual variables, Max Flow applications.

Week 11-13: Max Flow applications, Min Cost Flow, Min Cost Flow applications, Network Simplex.

Week 13-15: Project Presentations.

*Academic Integrity:*

University of Texas Honor Code

The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.

Each student in this course is expected to abide by the University of Texas Honor Code. Any work submitted by a student in this course for academic credit will be the student's own work, except for the places where group work is explicitly allowed by the instructor.

*Other University Notices and Policies:*

Use of E-mail for Official Correspondence to Students

- All students should become familiar with the University's official e-mail student notification policy. It is the student's responsibility to keep the University informed as to

changes in his or her e-mail address. Students are expected to check e-mail on a frequent and regular basis in order to stay current with University-related communications, recognizing that certain communications may be time-critical. It is recommended that e-mail be checked daily, but at a minimum, twice per week. The complete text of this policy and instructions for updating your e-mail address are available at <http://www.utexas.edu/its/help/utmail/1564> .

*Documented Disability Statement:*

Any student with a documented disability who requires academic accommodations should contact Services for Students with Disabilities (SSD) at (512) 471-6259 (voice) or 1-866-329-3986 (video phone). Faculty are not required to provide accommodations without an official accommodation letter from SSD.

- Please notify me as quickly as possible if the material being presented in class is not accessible (e.g., instructional videos need captioning, course packets are not readable for proper alternative text conversion, etc.).
- Please notify me as early in the semester as possible if disability-related accommodations for field trips are required. Advanced notice will permit the arrangement of accommodations on the given day (e.g., transportation, site accessibility, etc.).
- Contact Services for Students with Disabilities at 471-6259 (voice) or 1-866-329-3986 (video phone) or reference SSD's website for more disability-related information: [http://www.utexas.edu/diversity/ddce/ssd/for\\_cstudents.php](http://www.utexas.edu/diversity/ddce/ssd/for_cstudents.php)

*Behavior Concerns Advice Line (BCAL):*

If you are worried about someone who is acting differently, you may use the Behavior Concerns Advice Line to discuss by phone your concerns about another individual's behavior. This service is provided through a partnership among the Office of the Dean of Students, the Counseling and Mental Health Center (CMHC), the Employee Assistance Program (EAP), and The University of Texas Police Department (UTPD). Call 512-232-5050 or visit <http://www.utexas.edu/safety/bcal>.

*Q drop Policy:*

The State of Texas has enacted a law that limits the number of course drops for academic reasons to six (6). As stated in Senate Bill 1231:

“Beginning with the fall 2007 academic term, an institution of higher education may not permit an undergraduate student a total of more than six dropped courses, including any course a transfer student has dropped at another institution of higher education, unless the student shows good cause for dropping more than that number.”

*Emergency Evacuation Policy:*

Occupants of buildings on the UT Austin campus are required to evacuate and assemble outside when a fire alarm is activated or an announcement is made. Please be aware of the following policies regarding evacuation:

- Familiarize yourself with all exit doors of the classroom and the building. Remember that the nearest exit door may not be the one you used when you entered the building.
- If you require assistance to evacuate, inform me in writing during the first week of class.
- In the event of an evacuation, follow my instructions or those of class instructors.

Do not re-enter a building unless you're given instructions by the Austin Fire Department, the UT Austin Police Department, or the Fire Prevention Services office.