Course Syllabus

Edit

University of North Carolina at Charlotte

College of Computing and Informatics

Department of Software and Information Systems and School of Data Science

DSBA 6326, ITIS 6520/8520: Network Science

Fall 2025

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Contact Information

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Office Hours: Upon request

Credits, Days/Time, Location

3 Graduate Credits, Tuesdays, 17:30pm - 20:15pm, Online and Dubois Campus, Downtown, Room 1101.

Catalog Description

Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. This course integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing.

Prerequisites

Consent of the Instructor

Course Objectives

Networks are all around us, including natural and man-made systems. Examples include rivers, trees, arteries, highways, brain, economy, social connections, military, energy distribution, cyber attacks, terrorist networks, epidemics, Internet, and Facebook. Students will learn (a) the basic principles, concepts, and principles of networks; (b) how and why network structures and properties determine the performance and sustainability of any system; (c) how to measure and evaluate network-based systems; (d) how to utilize networks for the benefit of their organizations and society; and (e) how to utilize and design tools for understanding, visualizing, and applying the principles of networks.

Teaching Strategies

Materials presented in this course will be covered through lectures, projects, and in-class exercises. Every topic will be covered in the following: class, class preparations, in-class conversations among students, and project-based hands-on experience. In the end, students will have both the theoretical understanding of network concepts and concrete experience of putting such concepts and principles into practice.

Textbook

Mark Newman, “Networks,” 2nd edition, 2018, Oxford

eBook availability: Newman, Mark. *Networks*. Second edition., Oxford University Press, 2018.

https://charlotte.primo.exlibrisgroup.com/permalink/01UNCC_INST/13ttfn3/alma991011259788904091 (https://charlotte.primo.exlibrisgroup.com/permalink/01UNCC_INST/13ttfn3/alma991011259788904091)

Course Outline

1. The empirical study of networks
    1. Technological networks
    2. Networks of information
    3. Social networks
    4. Biological networks
2. Fundamentals of network theory
    1. Mathematics of networks
    2. Measures and metrics
    3. The structure of real-world networks
3. Network models
    1. Random graphs
    2. The configuration model
    3. Models of network formation
4. Applications
    1. Community structures
    2. Percolation and network resilience
    3. Epidemics on networks
    4. Dynamical systems on networks
    5. Network search

Course Requirements and Grading Policy

Project: 30%

Midterm Exam:	30%
Final Exam (Second Half of Class):	30%
In-Class Quizzes:	10%

Project

The project component of the course is devised to help students apply network science concepts learned in the class. The project consists of the following elements:

- problem definition,
- description of nodes and edges in the project,
- description of the data and data sources needed for the successful implementation of the project,
- selection of the tool chosen for network implementation,
- network analysis covering concepts presented in the class, including: network visualization, centrality measures, clustering, homophily, network components, distributions of various network metrics, randomness, and principles of network formation,
- in-class presentation,
- PowerPoint presentation, and
- programming code and data.

Students can choose a project of their own, or ask the instructor for help with the project selection.

A project team may include up-to two students. Project deliverables include an in-class presentation, a PowerPoint description of all aspects of the projects, programming code, and data used in the project. All students must participate in the project definition, network and data preparation, network analysis, PowerPoint preparation, and in-class presentation. In-class presentations must identify each student’s contribution to the project.

There will be two project presentations in-class, one mid-term and one in the final week of the class. The midterm presentation will not be graded. Its purpose is to help students with the network definition and analysis.

Students will be graded on:

- The clarity of project definition (10% of the project grade)
- Appropriateness of data and data sources for the project (20%)
- Extent of network analysis (30%)
- PowerPoint presentation (20%)
- Clarity of in-class presentation (20%)

Use of AI

Use of AI is allowed and encouraged.

Attendance

Students are expected to attend all class meetings online or in person and to arrive before the class starts. Class topics are integrated, with each week building on prior weeks. Failure to attend or to arrive on time can adversely affect both individual performance, ability to contribute to the group project, and the earned letter grade. If a student misses a class due to work or other reasons, it is their responsibility to get notes from peers; instructors do not hold extra repeat class sessions.

Students will be allowed to miss no more than 3 classes without affecting their final grade. For every 3 absences the final grade will be lowered by one letter grade.

UNIVERSITY, COLLEGE AND DEPARTMENTAL POLICIES

University Policies

Code of Student Responsibility: “The UNC Charlotte Code of Student Responsibility (the Code) sets forth certain rights and responsibilities in matters of student discipline. The Code defines these responsibilities and guarantees you certain rights that ensure your protection from unjust imposition of disciplinary penalties. You should familiarize yourself with the provisions and procedures of the Code” (Introductory statement from the UNC Charlotte brochure about the Code of Student Responsibility). The entire document may be found at this Internet address: http://legal.uncc.edu/policies/ps-104.html

Academic Integrity

All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Students are expected to submit their own work, either as individuals or contributors to a group assignment. Definitions and examples of plagiarism and other violations are set forth in the Code. The Code is available from the Dean of Students Office or online at: http://www.legal.uncc.edu/policies/ps-105.html.

Faculty may ask students to produce identification at examinations and may require students to demonstrate that graded assignments completed outside of class are their own work.

Course Credit Workload

This 3-credit course requires 3 hours of classroom or direct faculty instruction and 6-7 hours of out-of-class student work each week for approximately 15 weeks. Out-of-class work may include but is not limited to: required reading, library research, written assignments, programming/project based assignments, and studying for quizzes and exams.

Special Needs

If you have a documented disability and require accommodation in this course, contact Disability Services, Fretwell 230, phone: 687 4355 voice/TDD) the first week of the semester. Information about available services may be found at http://legal.uncc.edu/policies/ps-51.html. Accommodations for learning will be arranged by that office and communicated to the Instructor. If you speak English as a second language, please inform the instructor.

Diversity Statement

UNC Charlotte strives to create an academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status. All students are required to abide by the UNC Charlotte Sexual Harassment Policy (http://www.legal.uncc.edu/policies/ps-61.html) and the policy on Responsible Use of University Computing and Electronic Communication Resources (http://www.legal.uncc.edu/policies/ps-66.html). Sexual harassment, as defined in the UNC Charlotte Sexual Harassment Policy, is prohibited, even when carried out through computers or other electronic communications systems, including course-based chat rooms or message boards.

Religious Accommodation

It is the obligation of students to provide faculty with reasonable notice of the dates of religious observances on which they will be absent by submitting a Request for Religious Accommodation Form to their instructor prior to the census date for enrollment for a given semester http://legal.uncc.edu/policies/ps-134.html . The census date for each semester (typically the tenth day of instruction) can be found in UNC Charlotte's Academic Calendar (http://registrar.uncc.edu/calendars/calendar.htm).

Inclement Weather

The University Policy Statement #13 states the University is open unless the Chancellor announces that the University is closed. The inclement weather hotline number to call is 704-786-2877. In the event of inclement weather, check your email the morning of class. The instructors will use their best judgment as to whether class should be held understanding that some of you commute from far away and the instructors will notify you by email if class is cancelled. Of course, we always have the online option to circumvent these issues as well.