



TELE 5350: TELECOM & NETWORK INFRASTRUCTURE FALL 2024

Course Information

Course Title: Telecom & Network Infrastructure
Course Number: TELE 5350
Term and Year: Fall 2024
Credit Hour: 4SH
CRN: 12789
Course Format: Lecture

Instructor Information

Full Name: Peter O'Reilly
Email Address: p.oreilly@northeastern.edu
Office Hours: Wed 3-4pm or by request

Instructor Biography

Ph.D. in electrical engineering from the Georgia Institute of Technology, M.S. degrees in Applied Mathematics and Electrical Engineering from Georgia Tech and Colorado State University, respectively, and B.E. degree (First Hons) in electrical engineering from University College Dublin. Dr O'Reilly worked at GTE Laboratories and Verizon Communications from 1983 to 2001, where he was a Member of Technical Staff, Department Manager and Director, responsible for carrying out and directing R&D in of telecommunications technology, architecture and services. He joined Northeastern as a Program Director in 2002 to develop and lead a new MS program in telecommunications. He is currently a Teaching Professor in the MGEN department at Northeastern. Dr O'Reilly is a Life Senior Member of the IEEE.

Teaching Assistant Information

Full Name: Arun Verma
Email Address: verma.anu@northeastern.edu
Office Hours: TBD

Course Prerequisites

TELE 5330, Data Networking

Course Description

Provides in-depth treatment of the wireline and wireless infrastructure of the network supporting all telecommunication, internet, and enterprise applications. Covers the basics of communications—source coding, baseband and broadband modulation and transmission, channel coding, spread-spectrum, multiuser radio communications, radio link analysis, and propagation. Also covers the wireline core

network—digital and optical transmission, framing, network synchronization, asynchronous and synchronous multiplexing, cross connects, SONET/SDH, DWDM, OTN, protection switching, and network availability. Addresses wireline (DSL, digital cable, FTTx, PONs) and wireless access (cellular, Wi-Fi), frequency reuse, and handoff. Also addresses support of data transport (switched Ethernet, VLAN, IP, MPLS) and application networks (PSTN, mobile core, internet, IPTV, and virtual networks).

Course Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems.
2. An ability to explain and apply engineering design principles, as appropriate to the program's educational objectives.
3. An ability to produce solutions that meet specified end-user needs with consideration of economic factors, and, where relevant, factors related to public policy, safety, and the environment.
4. An ability to design and analyze communications networks (at all levels from optical to IP) to ensure the core infrastructure provides high performance and high availability
5. An ability to design, and manage complex physical and virtual network environments using a range of network protocols

Required Tools and Course Textbooks.

There is no required textbook for this course. Detailed class notes are provided on Canvas.

Course Schedule/Topics Covered.

- ❖ **Course Overview** – overview of network infrastructure; layers, course methodology (~1 class)
- ❖ **Introductory Topics** – review of basic concepts of communications & networking; GPS and network clocks; availability & protection switching (~2 classes)
- ❖ **Digital Communications Layer** – review of waveform coding, baseband & bandpass digital communications; basics of OFDM; optical communications & networks; optical layer protection; terrestrial radio communications, propagation models; cells and spectrum reuse, wireless multiaccess (~9 classes)
- ❖ **Transmission Layer** – synchronous & asynchronous transmission, framing in synchronous networks, plesiochronous systems, network synchronization, SyncE, 1588v2; SONET/SDH & OTN transmission networks; protection in transmission networks (~6 classes)
- ❖ **Data Convergence Layer** – payload framing & mapping, GFP; rate adaptation, data link protocols (~1 class)
- ❖ **Forwarding Layer** – tunneling, forwarding technologies: Ethernet, MPLS, Segment Routing (SR-MPLS & SRv6), VPNs; Forwarding layer protection: FRR protection in MPLS & SR-MPLS, Ethernet ring protection (~5 classes)

Assignment Grading

Please insert all assignment grades and weights for the course. Example below:

- Assignments & Class Participation – 10%
- Student Presentations – 15%
- Midterm Exam – 35%
- Final Exam – 40%

Grading Scale

	60-69.9% B+	30-39.9% C+	9.9% or below F
80-100% A	50-59.9% B	20-29.9% C	
70-79.9% A-	40-49.9% B-	10-19.9% C-	

Attendance/Late Work Policy

Attendance Policy

Students are expected to inform their instructors of any absences in advance of the class; if a student is sick long-term or experiences a medical issue that prevents class attendance, it is strongly encouraged that they speak with their Academic Advisor (coe-mgen-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. Should a student anticipate being unable to attend 3 or more classes, they should discuss their situation with their Academic Advisor to explore other types of leave in accordance with the University's academic and global entry expectations. International students should review the Office of Global Services webpage to understand their visa compliance requirements.

Late Work Policy

Students must submit assignments by the deadline. Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late. Work submitted late without prior communication with faculty will not be graded.

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Engineering. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at <https://neu.evaluationkit.com>. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Northeastern University Mail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Please note: Any student who is found cheating in an exam or test will receive an automatic F for this course.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> to access the full academic integrity policy.

MGEN Student Feedback

Students who would like to provide the MGEN unit with anonymous feedback on this particular course, Teaching Assistants, Instructional Assistants, professors, or to provide general feedback regarding their program, may do so using this survey: https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaw0Ki

University Health and Counseling Services

As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit <https://www.northeastern.edu/uhrs>.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit <https://drc.sites.northeastern.edu>.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit <https://library.northeastern.edu>
Network Campus Library Services: [Northeastern University Library Global Campus Portals](#)

24/7 Canvas Technical Help

For immediate technical support for Canvas, call 617-373-4357 or email help@northeastern.edu

Canvas Student Resources: <https://canvas.northeastern.edu/student-resources/>

For assistance with my Northeastern e-mail, and basic technical support:

Visit ITS at <https://its.northeastern.edu>

Email: help@northeastern.edu

ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion

Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit <http://www.northeastern.edu/oidi/> for complete information on Diversity and Inclusion

Title IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty, and staff.

In case of an emergency, please call 911.

Please visit <https://www.northeastern.edu/ouec> for a complete list of reporting options and resources both on- and off-campus.