# ECE 6383: High Speed Networks

2023 Fall

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# Course Content

| Week | Date | Contents |
|------|------|----------|
| 1 | 9/6 | Introduction |
| 2 | 9/13 | Backbone Networks and MPLS |
| 3 + Quiz | 9/20 | Segment Routing, VXLAN, SD-WAN |
| 4 + Quiz | 9/27 | Software Defined Networking (Basics, use cases, issues) |
| 5 + Quiz | 10/4 | Advanced Congestion Control (Vegas, CUBIC, BBR) |
| 6 + Quiz | 10/11 | Traffic Engineering Routing (by Minghao Ye) |
| 7 + Quiz | 10/18 | MPTCP, MPQUIC, Multi-path Scheduling, CC with ML (by Chen-yu Yen) |
| 8 | 10/25 | Midterm: Paper or project proposal presentation |
| 9 + Quiz | 11/1 | Flow Table Management  (packet classification, Flow cache, DIFIAN, CAB) |
| 10 + Quiz | 11/8 | Packet Switching I (Switch fabrics) |
| 11 + Quiz | 11/15 | Packet Switching II (Buffering strategies, input/output matching) |
| 12 + Quiz | 11/29 | Buffer Management (buffer bloat, buffer sizing, AQM: RED, CoDel) |
| 13 + Quiz | 12/6 | Packet Scheduling I (RR, WRR, Max-Min, GPS, WFQ) |
| 14 + Quiz | 12/13 | Packet Scheduling II (WFQ, SCFQ, SFQ, Sequencer, DRR, PIFO) |
| 15 | 12/20 | Final: Paper or final project presentation |

# Course Info

- Instructor: H. Jonathan Chao
  - Office: 370 Jay St, Room 955
  - Email: chao@nyu.edu
- Course Assistant: Minghao Ye
  - Email: my1706@nyu.edu
- Class time: Wed 11:00AM - 1:30PM
- Classroom: Jacobs Academic 674
- Office hour: Wed 9:45AM - 10:45AM
- Lab hour: Wed 4-6PM
- Pre-requisites: ECE 6353 (IAP), or equivalent

# Books & Materials

- No textbook
- Slides and reading materials will be uploaded to Brightspace
- Reference books:
  - High Performance Switches and Routers,
    - Authors: H. Jonathan Chao and B. Liu
    - ISBN: 978-0-470-05367-6
    - Publisher: John Wiley & Sons, Inc
    - April 2007
  - Quality of Service Control in High-Speed Networks
    - Authors: H. Jonathan Chao and Xiaolei Guo
    - ISBN: 0-471-00397-2
    - Publisher: John Wiley & Sons, Inc
    - November 2001

# Grading

- Homework: 10%
- Assignments: 10%
- 10 quizzes: 30%
  - Quizzes are held at the beginning of the class for 10-15 minutes
  - Close books, close notes
  - Choose the top 10 from a total of 11 quizzes
- Paper or project presentations for midterm and final: 10% x 2
- 6 lab reports: 30%

# □ Homework: 10%

- Design a question with an answer for each quiz. It can be true/false, multiple choice, or a short answer question.
- Grades are based on the question's complexity and creativity
- Due on the Sunday midnight before each quiz
- Some quiz questions will be taken from your designed questions

# □ Assignments: 10%

1. Find information on the state-of-the-art of a technology and prepare a few Power-Point slides to summarize the technology. It can be in optical transmission, switches/routers, computer servers, GPU board, network interface cards, datacenter architectures, machine learning training architectures, autonomous vehicle networks, 5G/6G, AR/VR, or any other area in communication or computation.   (Submit the PPT slides and the articles by 9/19 midnight.)
2. Read a paper related to Segment Routing or SD-WAN and summarize it with PPT slides. (Submit the PPT slides and the paper by 10/3 midnight.)
3. Read a paper related to advanced congestion control or MPTCP (not covered in the class) and summarize it with PPT slides. (Submit the PPT slides and the paper by 11/7 midnight.)

- ❑ Paper presentation
  - Each presentation is conducted by two people in a group
  - Submit the paper to be presented for approval 3 weeks before the presentation (i.e., 10/3 and 11/28)
  - Present the paper for 20 minutes with 5 minutes for questions
  - Papers must be from Sigcomm, NSDI, or CoNEXT in 2021-23
- ❑ Project presentation
  - Each presentation is conducted by two people in a group
  - The first presentation is about the project proposal
  - Submit a one-page project proposal for approval 3 weeks before its presentation (i.e., 10/3)
  - Present the paper for 20 minutes with 5 minutes for questions
  - Project presentations will receive higher scores than the paper presentations if the project is completed with good results

# Moses Center Statement of Disability

- If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu.  You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect.   It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit.  If this standard is not being upheld, please feel free to speak with me.

- *If you are experiencing an illness or any other situation that might affect your academic performance in a class, please email Deanna Rayment, Coordinator of Student Advocacy, Compliance and Student Affairs. Deanna can reach out to your instructors on your behalf when warranted.*
- *deanna.rayment@nyu.edu*
- *https://engineering.nyu.edu/staff/deanna-rayment*