

ECE 636 Computer Networking Laboratory

Prerequisites: ECE 637 or CS 656.

Course description and learning outcomes:

This course provides students with hands on training regarding the design, troubleshooting, modeling and evaluation of computer networks. In this course, students conduct experiments in a real test-bed networking environment, and learn about network design and troubleshooting topics and tools such as: network addressing, Address Resolution Protocol (ARP), basic troubleshooting tools (e.g., ping, ICMP), IP routing (e.g., RIP), route discovery (e.g., traceroute), TCP and UDP, IP fragmentation and others. Students are also introduced to network modeling and simulation, and they have the opportunity to build some simple networking models using the OPNET modeling tool and perform simulations that help them evaluate their design approaches and expected network performance.

Textbook:

1. Lab Manual for ECE636
2. Richard Stevens, "TCP/IP Illustrated, Vol. 1: The Protocols," Publisher: Addison-Wesley Professional (US Ed edition - 1994), ISBN: 0201633469
3. Larry L. Peterson and Bruce S. Davie, "Network Simulation Experiments Manual: Computer Networks, A System Approach," Publisher: Morgan Kaufmann (2nd Edition – October 2007), ISBN: 0123739748

OR

Larry L. Peterson and Bruce S. Davie, "Network Simulation Experiments Manual: Computer Networks, A System Approach," Publisher: Morgan Kaufmann (1st Edition – May 2003), ISBN: 0120421712

Course Coordinator: Professor Nirwan Ansari, ECEEC343

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Office Hour: Vary every semester

The NJIT Academic Honor Code will be strictly followed and any violations will be brought to the immediate attention of the Dean of Students.

Term project: Each student is required to simulate his/her own network topology with multiple application traffics consisting of the following components: 1) design his/her own network using

OPNET Modeler, 2) configure the appropriate applications and profiles, and 3) obtain and analyze the network's performance statistics via simulations to study how different designs can respond to the need of services as well as resources provided by a company. The simulations can also show students how various designs of a network can affect the performance of the network.

Grading:

Lab reports:	82%
- Lab 1:	13%
- Lab 2 :	13%
- Lab 3:	13%
- Lab 4:	11%
- Lab 5:	15%
- Lab 6:	17%
Project:	15%
Attendance:	3%
Total:	100%

Schedule (may be updated every year):

Week	Date	Experiments	Reading assignment ¹	Report(s) Due
1		Introduction (Part I) Lab 1: Experiment with ARP	Ch.4 & 7 [1] ²	
2		Lab 2: IP addressing and subnet masking Lab 3: Troubleshooting Experiments with ICMP	Ch.3& 6 [1]	
3		Lab 3: Troubleshooting Experiments with ICMP (Continued, if needed) Lab 4: IP routing Lab 5: Experiments with UDP	Ch.9 & 11 [1]	Lab 1
4		Lab 5: Experiments with UDP (Continued)		Lab 2
5		Lab 6: TCP experiments	Ch.18 -20 [1]	Lab 3
6		Lab 6: TCP experiments (Continued)	Ch.21 [1]	Lab 4
7		Lab 7: Introduction to OPNET Modeler & Modeling and simulation Small Internetworks & M/M/1 Queue	Lab. 0 & 1 [2] ³	Lab 5
8		Lab 8: OPNET-based experiment		
9		Lab 8: OPNET-based experiment (Continued)		Lab 6
10		Lab 8: (Continued) Lab 9 ⁴ : Exemplified Project: Modeling, Configuration and		Lab 9 - Report and

		Performance Analysis of the Exemplified Lab Network using OPNET Modeler		Presentation
11		Lab 9: Exemplified Project: Modeling, Configuration and Performance Analysis of the Exemplified Lab Network using OPNET Modeler (Continued)		
12		Lab 10: Project (Continued)		
13		Lab 10: Project (Continued)		
13		Lab 10: Project (Continued)		
14		The project report dues		
		Grade dues		

Notes:

1. Students are strongly encouraged to read the related materials for each class.
2. [1] denotes the 2nd reference textbook, Richard Stevens, "TCP/IP Illustrated, Vol. 1: The Protocols."
3. [2] denotes the 3rd reference textbook, Larry L. Peterson and Bruce S. Davie, "Network Simulation Experiments Manual: Computer Networks, A System Approach."
4. Please note that the topology shown in Lab 8 manual is only an example, but NOT the project topology. Every student is required to model and simulate using DIFFERENT topologies, which have to be approved by the instructor. Details will be further discussed in class.