



National University of Sciences & Technology (NUST)  
School of Electrical Engineering and Computer Science (SEecs)  
Department of Electrical Engineering

### Computer Networks

<b>Course Code:</b>	EE353	<b>Semester:</b>	Spring 2016
<b>Credit Hours:</b>	3+1	<b>Prerequisite Codes:</b>	
<b>Instructor:</b>	Dr. Arsalan Ahmad	<b>Discipline:</b>	BESE5-AB
<b>Office:</b>	Room # A-206, SEecs	<b>Telephone:</b>	051-9085 2192
<b>Lecture Days:</b>	Monday, Wednesday, Friday	<b>E-mail:</b>	<a href="mailto:arsalan.ahmad@seecs.edu.pk">arsalan.ahmad@seecs.edu.pk</a>
<b>Class Room:</b>	As per timetable	<b>Consulting Hours:</b>	Tuesday 1600-1650; also, through appointment via e-mail
<b>Knowledge Group:</b>	Networks	<b>Updates on LMS:</b>	After every lecture

#### Course Description:

The area of computer networking is undergoing rapid development; it's important to focus not only on what computer networks are today, but also on *why* and *how* they are designed as they are. The aim of this course is to provide a conceptual introduction to fundamentals of computer networks and the design principles. The lab component of this course is aimed at providing the students with an understanding of practical aspects of networking through hands-on labs.

In this course, we will also study the fundamentals of building *scalable* computer networks. We will go through the thought-process that went into designing the Internet---which is the best example of a computer network that has adapted and scaled to the changing user demands.

#### Course Learning Outcomes (CLOs):

At the end of the course the students will be able to:	PLO	BT Level*
1. Understand the fundamental Building blocks of Computer Networks i.e., Layered approach and protocols that make networking possible	1	C-2
2. Apply the knowledge of Computer networking to understand contemporary networking issues	2	C-3
3. Investigate and analyze the behavior of network traffic	4	C-4
4. Design and implement solutions to overcome network unreliability (through hands on programming)	3	P-7
* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain		

#### Mapping of CLOs to Program Learning Outcomes

PLOs/CLOs	CLO1	CLO2	CLO3	CLO4
PLO 1 (Engineering Knowledge)	√			
PLO 2 (Problem Analysis)		√		
PLO 3 (Design/Development of Solutions)				√
PLO 4 (Investigation)			√	
PLO 5 (Modern tool usage)				
PLO 6 (The Engineer and Society)				
PLO 7 (Environment and Sustainability)				
PLO 8 (Ethics)				
PLO 9 (Individual and Team Work)				
PLO 10 (Communication)				



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PLO 11 (Project Management)				
PLO 12 (Lifelong Learning)				

**Mapping of CLOs to Assessment Modules and Weightages (In accordance with NUST statutes)**

To be filled in at the end of the course.

Assessments/CLOs	CLO1	CLO2	CLO3	CLO4
Quizzes: 7.5%				
Assignments: 7.5%				
OHT-1: 15%				
OHT-2: 15%				
Labs: 25% (Lab deliverables 15 marks, Project: 10 marks)				
End Semester Exam: 30%				
Total : 100 %				

**Books:**

**Text Book:** "Computer Networking, A Top Down Approach" (6th edition) by Kurose and Ross [K&R]

**Reference Books:**

- 1) "Computer Networks" (5<sup>th</sup> Edition) by Andrew S. Tanenbaum and David Wetherall [T&W]
- 2) "TCP/IP Protocol Suite" (4<sup>th</sup> Edition) by Behrouz A. Forouzan [BF]
- 3) Relevant resources/ references will be highlighted (wherever relevant) during the lecture and at the end of lecture slides which will be uploaded to LMS.

**Main Topics to be Covered:**

The course spans over a number of different topics as under:

**Topic 0: Course Introduction; Motivations of studying Computer Networking**

**Topic 1: Internet as a Black box, Standardization and Layering**

- Network Edges and Core
- Why layering?
- TCP/IP Model

**Topic 2: Applications**

- DNS
- HTTP
- FTP
- SMTP, IMAP & POP3

**Topic 3: Transport Layer Protocols**

- UDP
- TCP
- Flow Control
- Congestion Control

**Topic 4: Network Layer**

- Internet Protocol
- IP addressing, CIDR, sub-netting, super-netting
- NAT, VPN



- Routing Algorithms (DV, LS)
- Routing Protocols (RIP, OSPF)
- Error control with ICMP

**Topic 5: Data Link Layer**

- Framing
- Error and Flow Control
- Ethernet
- ARP and RARP
- Wireless

**Lecture Breakdown:**

Week	Topics	Text Book Chapter	Remarks
1	Topic 0 and 1: Introduction	Chapter 1	
2	Topic 1: Standardization and Layering	Chapter 1	Chap.1 [T&W]
3	Topic 2: Application Layer [DNS & HTTP]	Chapter 2	Chap.7 [T&W]
4	Topic 2: Application Layer [HTTP & FTP]	Chapter 2	Chap. 7[T&W]
5	Topic 3: Application Layer [SMTP]	Chapter 2	Chap. 7[T&W]
6	OHT-1		
7	Topic 3: Transport Layer [UDP]	Chapter 3	Chap. 6[T&W]
8	Topic 3: Transport Layer [TCP, Flow Control]	Chapter 3	Chap. 6[T&W]
9	Topic 3: Transport layer [Congestion Control]	Chapter 3	Chap. 6[T&W]
10	Topic 4: Network Layer [IP addressing, Sub-netting, Super-netting, CIDR]	Chapter 4	Chap. 5[T&W]
11	Topic 4: Network Layer [NAT, Routing Algorithms]	Chapter 4	Chap. 5[T&W]
12	OHT-2		
13	Topic 4: Network Layer [Routing Algorithms, Routing Protocols, ICMP]	Chapter 4	Chap. 5[T&W]
14	Topic 5: Data Link Layer [Framing, Addressing, ARP]	Chapter 5	Chap. 3[T&W]
15	Topic 5: Data Link Layer [Error and Flow Control]	Chapter 5	Chap. 3[T&W]
16	Topic 5: Data Link Layer [MAC sub layer]	Chapter 5	Chap. 4[T&W]



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17	Revision
18	Final Exam

**Lab Experiments:**

Lab 01:	<a href="#">Intro to Python</a>
Lab 02:	<a href="#">Network Programming</a>
Lab 03:	<a href="#">Intro to WireShark</a>
Lab 04:	<a href="#">DNS</a>
Lab 05:	<a href="#">HTTP</a>
Lab 06:	<a href="#">UDP</a>
Lab 07:	<a href="#">TCP</a>
Lab 08:	<a href="#">IP</a>
Lab 09:	<a href="#">ICMP</a>
Lab 10:	<a href="#">ARP</a>
Lab 11:	<a href="#">Ethernet &amp; Wireless</a>
Lab 12:	<a href="#">Lab Exam</a>
Lab 13:	<a href="#">Project Viva</a>

**Tools / Software Requirement:**

Wireshark and TCPDump software

**Grading Policy:**

<b>Quiz Policy:</b>	The quizzes may be announced or unannounced and will normally last for ten minutes. The questions would test the concepts involved in last few lectures. Number of quizzes that will be used for evaluation is at the instructor's discretion. Grading for quizzes will be on a fixed scale of 0 to 10. All quizzes will count towards the total (No 'best-of' policy).
<b>Assignment Policy:</b>	<p>In order to develop comprehensive understanding of the subject, assignments will be given. Late assignments (by up to 2 days) will be accepted but penalized as per the following formula:</p> <p>Less than a day late: 15% penalty More than 1 day late but less than 2 days late: 30% penalty More than 2 days late: <b>not accepted</b>.</p> <p>All assignments will count towards the total (No 'best-of' policy). The students are expected to submit assignments that are their own work. Students may collaborate by discussing general concepts and approach but not the specific answer/ technique that is asked for. In no circumstances should a student present someone else's work as their own work. Copying of assignments will be dealt with severely by awarding ZERO marks for the whole evaluation component and referring any occurrences to the disciplinary committee.</p>
<b>Plagiarism:</b>	SEECs maintains a zero tolerance policy towards plagiarism. While collaboration in this course is highly encouraged, you must ensure that you do not claim other people's work/ ideas as your own. Plagiarism occurs when the words, ideas, assertions, theories, figures, images,



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programming codes of others are presented as your own work. You must cite and acknowledge all sources of information in your assignments. Failing to comply with the SEECs plagiarism policy will lead to strict penalties including zero marks and referral for disciplinary action.