

**DEPARTMENT OF COMPUTER  
SCIENCE**

**AHMADU BELLO UNIVERSITY, ZARIA**

**COSC407: Data Communication and Networks**

**Prerequisite:** COSC205: Digital Logic Design

**Required Reading:** Behrouz A. Forouzan, “*Data Communications and Networking*” 5<sup>th</sup> Edition  
McGraw-Hill, 2007

**Reference Textbook:** Andrew S. Tanenbaum and David J. Wetherall, “*Computer Networks*”  
5<sup>th</sup> Edition, Prentice Hall, 2011

**Handouts:** Lecture notes are available on the course website <https://dcs.abu.edu.ng/cosc407>

**Course Description:**

This course is to provide students with Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media. Network security: fundamentals of cryptography, secret and public key algorithms, authentication protocols and suggested lab work.

**GRADING**

Items (a) to (e) will be used in the calculation of the final score.

- a. **Quizzes:** Two CBT tests will be taken during this course. We shall agree on the exact date and time of the test at least two weeks before the planned date. There may be unannounced test so all students should be punctual in the class throughout the course. Tests are not open book and a calculator is not required.

- b. Final Exam:** Final exams will take place during the university examination period. The exact date and time for COSC407 examination will be determined by the faculty examinations officer. All students should take note of the exact exams date and time as there will be no make-up exams for those who missed the exams. The final exam is a two hours examination. You will be given six questions to answer any four.
- c. Homework:** assignments will be given every two weeks on the last day of the lecture. The assignment should be submitted one week after the date of release. Assignment will only be submitted through the course website <https://dcs.abu.edu.ng/cosc407>. All assignments will weight equally towards the final score.
- d. Practical Class:** There will be practical session for this course. The practical classes commence a week after the commencement of lectures. All students should be punctual.
- e. Attendance:** Attendance will be taken at every lecture. Only students with a minimum of 75% attendance will be allowed to sit for the final examination as stated in the University regulations.

The course grade will be established in consideration of the following factors:

CBT Test 1	5 % (March 30, 2019)
CBT Test 2	5 % (April 27, 2019)
Lecture Attendance	0 %
Practical	25 %
Practical attendance	5%
Final Exams	60%
Total	100%

### Course Objectives

At the end of the course, the students should be able to:

- a.** Understanding the fundamental concepts of computer networking.
- b.** Be familiar with the basic taxonomy and terminology of the computer networking area.
- c.** Be introduced to advanced networking concepts, preparing the student for entering advanced courses in computer networking.

- d. Be Allowed to gain expertise in some specific areas of networking such as the design and maintenance of individual networks

### **Measurable Course Outcomes**

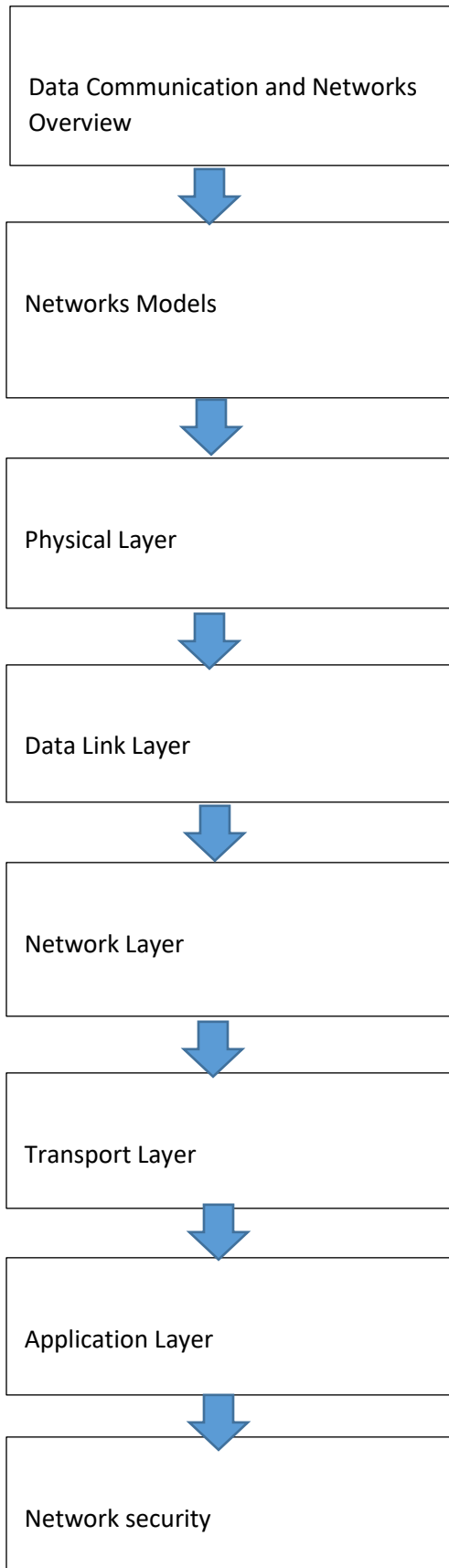
After completing this course the student ought to demonstrate the knowledge and ability to:

- a. Independently understand basic computer network technology.
- b. Understand and explain Data Communications System and its components.
- c. Identify the different types of network topologies and protocols.
- d. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- e. Identify the different types of network devices and their functions within a network
- f. Understand and building the skills of subnetting and routing mechanisms.
- g. Display familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

### **Take Away Message**

The students should be able to design and implement standard computer networks

## Lecture Plan



- Data Communication
- Networks
- The Internet
- Protocols and Standards

- The Layered Tasks
- The OSI Model
- Layers in the OSI Model
- TCP/IP Protocol Suite
- Addressing

- Data and signals
- Digital Transmission
- Analog Transmission
- Switching

- Error Detection
- Error Corrections
- Data Link Control

- Logical Addressing
- Internal Protocol
- Address Mapping, Error Reporting and Multicasting
- Delivery, Forwarding and Routing

- Process to Process Delivery
- Congestion control
- Quality of Service

- Domain Name System
- Remote Login, Electronic Mail and File Transfer
- WWW and HTTP

- Cryptography
- Network Security

## Lecture Schedule

Date	Lecture #	Lecture	Pre-class reading
	<b>Data Communication and Networks Overview</b>		
	Lecture 1	Data Communications and network Criteria: Components of a data communications system, Data Flow, Networks and Network Criteria	1.1-1.2
	Lecture 2	Networks: Physical Structures and Categories of Networks	1.2
	Lecture 3	Internet: Brief History, Organisation of the Internet and Internet Elements	1.3
	Lecture 4	Internet: Internet Architecture and Internet Service Providers (ISPs)	1.3
	Lecture 5	Protocols and Standards: Protocols, Elements of a Protocols, Standards, Standard organizations and Internet Standards.	1.4
	<b>Networks Models</b>		
	Lecture 6	Layered Tasks: Layered Tasks and the OSI model	2.1
	Lecture 7	Layers in the OSI Model: Introduction of Layers in the OSI Model	2.2
	Lecture 8	Layers in the OSI Model: Introduction of Layers in the OSI Model Continued	2.3
	Lecture 9	TCP/IP Protocol Suite: <i>Relationship of layers</i>	2.4
	Lecture 10	Addressing	2.5
	<b>Physical Layer</b>		
	Lecture 11	Data and Signals: Analog and Digital, Periodic Analog Signals	3.1-3.2
	Lecture 12	Data and Signals: Aperiodic Digital Signals	3.3
	Lecture 13	Data and Signals: Transmission Impairment, Data Rate Limits and Performance	3.4-3.6
	Lecture 14	Digital Transmission: Digital-to-Digital Conversion,	4.1
	Lecture 15	Digital Transmission: Analog-to-Digital Conversion and Transmission modes	4.2-4.3
	Lecture 16	Analog Transmission: Digital-to-Analog Conversion	5.1
	Lecture 17	Analog Transmission: Analog-to-Analog Conversion	5.2
	Lecture 18	Switching: Switching Taxonomy, Circuit Switched Networks and Datagram Networks	8.1-8.2
	Lecture 19	Switching: Virtual Circuit Networks and structure of a Switch	8.3-8.4
	<b>Data Link Layer</b>		
	Lecture 20	Error Detection and Correction: Prelude to Error Detection and Correction, Error Detection and Correction	10.1
	Lecture 21	Error Detection and Correction: Block coding and linear block codes	10.2-10.3

	Lecture 22	Error Detection and Correction: Cyclic codes and Checksum	10.4-10.5
	Lecture 23	Data Link Control: Framing, Flow and Error Control, Protocols and Noiseless Channels	11.1-11.4
	Lecture 24	Data Link Control: Noisy Channels, HDLC and Point-to-Point Protocol	11.5-11.7
<b>Network Layer</b>			
	Lecture 25	Logical addressing: Logical addressing and IPv4 Addressing	19.1
	Lecture 26	Logical addressing: IPv4 Addressing continued, Conversion from IPv4 to IPv6 and vice versa	19.1
	Lecture 27	Logical addressing: IPv6 Addressing	19.2
	Lecture 28	Internet Protocol: Internetworking and Transition from IPv4 to IPv6	20.1-20.4
	Lecture 29	Address Mapping, Error Reporting and Multicasting	21.1-21.4
	Lecture 30	Delivery, Forwarding and Routing	22.1-22.4
<b>Transport Layer</b>			
	Lecture 31	Process-to-Process Delivery: UDP, TCP and SCTP	23.1-23.5
	Lecture 32	Congestion: Data Traffic, Congestion and Congestion Control	24.1-24.4
	Lecture 33	Quality of Service: Technology to improve QoS, Integrated Services, Differentiated Services and QoS in Switched Networks	24.5-24.9
<b>Application Layer</b>			
	Lecture 34	Domain Name System: Name Space, Domain Name Space, Distribution of Name Space and DNS in the Internet	25.1-25.4
	Lecture 35	Domain Name System: Resolution, DNS Messages, Types of Records, Registrars, DDNS and Encapsulation	25.5-25.10
	Lecture 36	Remote Login, Electronic mail and File transfer	26.1-26.3
	Lecture 37	WWW and HTTP	27.1-27.3
<b>Network security</b>			
	Lecture 38	Cryptography: Terminologies, Symmetric-key Cryptography, Asymmetric-Key Cryptography	30.1-30.3
	Lecture 39	Security: IPSecurity, SSL/TLS, PGP, Firewall	32.1-32.4