

COURSE CONTENT

Course

Course code: EIE428

Course title: Data Communications and Computer Networks 3 Units

Course status: Compulsory

Course Duration

Three hours per week for 15 weeks (45hours)

Lecturer's Data

1. Engr. Oghogho Ikponmwosa

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Consultation Hours: Mondays, Tuesdays and Fridays (12:00noon-2:00pm)

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Course Content – Illustration below:

Interfacing: Interfaces for simple computer system and terminal to terminal. MODEM, terminal interfaces, CCITT V.24/RS-232, CCITT V.28, V.35, GPIB, EIA, RS-232C standard, speed and distance limitations for V.24, RS-232C, RS-449/422/423 interfaces and standards.

Channel Coding and Error Control: Forward Error Control; Error Detection Methods; Parity Checking; Linear Block Codes, Cyclic Redundancy Checking; Feedback Error Control.

Digitalisation: Sampling theorem, Shannon theorem, PCM and Quantisation Error; Multiplexing, FDM, TDM; Higher order multiplexing; Frame formatting, time-slot.

Digital Modulation Techniques: Line coding, intersymbol interference, Nyquist waveshaping, eye pattern, adaptive equalization. Transmission over bandpass channel. ASK, FSK, PSK, DPSK, M-ary modulation, continuous phase FSK, MSK, QAM, DSL Schemes.

Spread Spectrum Communications: Pseudo noise sequences, direct sequence spread spectrum, frequency hopping spread spectrum, CDMA, application examples.

Telephony: The telephone set and subscriber loop interface, basic function of the telephone set, cordless telephone, local loop, line characteristics and conditioning. Public switched telephone network, hybrids, echo suppression. Central office switching system.

Digital Switching: Digital Switching Systems, Space Switching, Time Switching Module; Time-Space-Time Switch Structure, Circuit switching networks; Packet switching networks; X.25 packet switched networks

ISDN interfaces and functions: Transmission structure, user-network interface configurations, ISDN protocol architecture, connections, addressing. Physical layer. Data link layer, network layer.

Frame Relay: Background, Protocols and service. Frame-mode protocol architecture, frame-mode call control, Frame relay congestion control: Traffic rate management, explicit congestion avoidance and implicit congestion control.

ATM: Virtual channels and virtual path. ATM protocols, transmission of ATM cells, ATM adaptation layer. AAL services. Traffic and congestion control. Latency/speed effect, cell delay variation. Network resource management, connection admission control, usage parameter control, priority control.

Cellular Mobile Network: Cellular network architectures; Frequency management; Channel types and assignment; types of hand-offs and hand-off management; Switching and transport; Wireline and microwave facilities and link design considerations. Call Processing and Signalling: Roaming and mobility management; Traffic engineering and performance issues, call set up and hand-offs; Capacity planning; Factors affecting economical network designs.

Course Description –:

The course teaches the students major data communications and computer networking techniques, design, standards etc. being used today in several telecommunications networks and systems. The students are taught network interfacing and standards, Channel Coding and Error Control, digitalization of signals from their analogue form origin of internet and various network topologies, Digital Modulation Techniques, Spread Spectrum Communications and techniques, Telephony, Digital Switching, ISDN interfaces and functions, Frame relay protocol and architecture, ATM networks and protocols and mobile cellular Networks are also covered.

Course Justification –:

This course offers the students the basic knowledge required for planning, design and implementation of various types of data networks. The students are made to understand the advantages and draw backs of different data communications networks. The course covers the details involved in transmission of data from source to receiver in numerous data communication and computer network systems which are used extensively today. Knowledge gained from this course will prepare our students to be able to both design and maintain existing telecommunications networks as well as contribute new knowledge in any area of their choice and able to be part of those who will design and create the next generation of data communication and computer network devices for our world.

Course objectives

At the end of this course, students would be able to:

- (i) Develop a deeper and rigorous understanding of the fundamental Principles of Data communication and Computer Networks.

- (ii) Understand and discuss Interfacing and their standards for different data networks:.
- (iii) Understand and discuss Channel Coding and Error Control techniques.
- (iv) Develop a deeper and rigorous understanding of Digitalisation of signals.
- (v) Understand and discuss the concept of Spread Spectrum Communications and their numerous applications.
- (vi) Understand and discuss the concept of Telephony and the processes involved in sending and receiving a telephone or voice signal.
- (vii) Understand and discuss Digital Switching and the numerous digital switching systems used in data communication and computer systems.
- (viii) Understand and discuss ISDN interfaces and functions.
- (ix) Understand and discuss the concept of Frame relay in data communication and computer network.
- (x) Understand and discuss the concept of ATM in data communication and computer systems.
- (xi) Understand and discuss Cellular mobile networks with respect to their numerous features.

Course Requirement – Illustration below:

To derive maximum benefits from the course and for fast grasping of many of the data communication and computer network principles and concepts, the course requires that the students be familiar with basic telecommunication systems covering signals transmission concepts, signal analysis methods, modulation and demodulation techniques, etc. The students should also have a good knowledge of basic mathematics like algebra, numerical methods and calculus. However, the course is structured to accommodate to some extent, students that do not fall into this category since some of these basics will be introduced. A good knowledge and understanding of the course requires that students carry out some laboratory practical. This is done in another practical course compulsory for all 400Level students in the department. The method of grading is shown in Table1. .

Table1: Method of Grading-

S/N	Grading	Score (%)
1.	1 st Test	5
2.	2 nd Test	10
3.	3 rd Test	10
4.	Assignment	5
5.	Final Examination	70
	Total	100

Course Delivery Strategies – Illustration below:

1. Lecture delivery with explanations using lecture notes, real life examples, diagrams and graphs.
2. The use of the University's Intranet e-platform for quizzes, assignments, group discussions, etc.
3. Giving off net assignments and classwork.
4. Uploading the lecture materials on the e-learning platform.
5. Giving online assignments.
6. Having practical discussion sections at the end of the lecture.

LECTURE CONTENT

For this section, the topic of each week, objectives, description, study question and other information are presented.

1. **Week 1:** Introduction of Data Communication and computer Networks.

➤ Objectives

The students at the end of the lectures for the week should be able to:

- (i) Develop a deeper and rigorous understanding of the fundamental Principles of Data communication and computer networks.
- (ii) List several data communication and computer networks available today.
- (iii) List different types of data that can be transmitted using data communication and computer networks.

➤ Description

First hour: Introduction of basic concepts of data communication and computer networks. Data communication and computer networks available today

Second hour: Types of data that can be transmitted using data communication and computer networks.

Third hour: Discussion and questions.

➤ Study Question:

1. What is a data communication network?
2. In sufficient details discuss the Internet as a global network.
3. What are involved in data communication?
4. Define and discuss the concept of Computer Networks.
5. In sufficient details give a brief history of Internet

➤ Reading List - Books and materials students can read. Illustration below:

1. Tao Jiang, Lingyang Song and Yan Zhang (2010) Orthogonal Frequency Division Multiple Access Fundamentals and Applications. ISBN 978-1-4200-8824-3.
2. William Stallings (2007) Data and Computer Communications 8th Edition. Pearson Prentice Hall, Pearson Education Inc. ISBN 0-13243310-9
3. Eugemo Lannone (2012) Telecommunications Networks. Taylor and Francis Group LLC. ISBN 978-1-4398-4636-0