EE3009: DATA COMMUNICATIONS AND NETWORKING

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Data Communications and Networking

Subject Code
EE - Electrical Engineering
Course Number
3009

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
EE1001 Foundations of Digital Techniques (only applicable for EE students)
or
EE1002 Principles of Electrical Engineering (only applicable for ITME students)

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
Students will gain knowledge about the basic principles of data communications and IP networking.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the architecture of computer networks and explain how internetworking works.		x		
2	Explain how information can be represented and sent via communication interfaces and links.		x	x	
3	Explain how reliable data transfer can be achieved in the data link layer.		x	x	
4	Explain the principles and evaluate the performance of medium access control.		x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures to gain knowledge in computer networks and internetworking.	1, 2, 3, 4	3 hrs/wk
2	Laboratory	Students will participate in groups to build and configure small-scale IP networks.	1	3 hrs/wk (4 weeks)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Tests (min.: 2)	1, 2, 3, 4	30	-	No
2	#Assignments (min.: 3)	1, 2, 3, 4	10	-	Yes

3	Lab Exercises/ Reports	1	10	-	Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Remark: To pass the course, students are required to achieve at least 30% in course work and 30% in the examination. Also, 75% laboratory attendance rate must be obtained. # may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)

Assessment Task

Examination

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

Coursework

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Computer Networks and Internet
Components of a small network, circuit switching, packet switching, Internet architecture, access networks, ISP, routers, Internet exchange and backbone, performance measures, protocol layering, encapsulation/de-capsulation.

Data Transmission and Transmission Media
Digital representation of information, digital and analog transmission, transforming data to signals, transmission modes, multiplexing, asynchronous/synchronous communications, error detection and correction, transmission media: guided and wireless.

Data Link Layer
Reliable data transfer and ARQ: stop-and-wait, go-back-N, selective repeat; Data Link Controls: framing, point-to-point protocol, HDLC data link control.

Medium Access Control
Random access: ALOHA, slotted ALOHA, CSMA, Collision Detection and Avoidance; Scheduling; Channelization.

Local Area Networks
LAN Structure, interconnection using switches; LAN standards: Ethernet, VLAN and Wi-Fi.

Network Layer: Data Plane
Network data and control plane; Router: structure and design principles; Internet Protocol: IPv4, addressing, datagram fragmentation, NAT, IPv6; Address resolution; Generalized forwarding and SDN.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	James F. Kurose and Keith W. Ross: Computer Networking: a top-down approach, 7th Edition, Pearson Education Inc., 2016.
2	Alberto Leon-Garcia and Indra Widjaja: Communication Networks: fundamental concepts and key architectures, 2nd edition, McGraw Hill, 2004.
3	Douglas E Comer: Computer Networks and Internets, 5th Edition, Prentice Hall, 2009.
4	Mark Dye, Rick McDonald, Antoon Rufi: Networking Fundamentals, CCNA Exploration Companion Guide, Cisco Press 2008.