

EE3008: PRINCIPLES OF COMMUNICATIONS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Principles of Communications

Subject Code

EE - Electrical Engineering

Course Number

3008

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

MA2001 Multi-variable Calculus and Linear Algebra

Precursors

Nil

Equivalent Courses

EE4940

Exclusive Courses

Nil

Additional Information

Co-requisites: EE3210 Signals and Systems

Part II Course Details

Abstract

In this course, students will gain knowledge about the principles of point-to-point communication. Students will learn to understand various modulation schemes for both analog and digital signal transmission. Additionally, students will develop the skills to analyze the performance of these schemes in terms of signal-to-noise ratio, bandwidth requirements, and error performance.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Evaluate analogue AM systems in both the time and frequency domains.		x	x	
2	Describe the FM system in terms of its working principle and implementation. Evaluate a single-tone FM signal in terms of its spectrum lines, bandwidth, and modulation index.		x	x	
3	Explain the working principle of PCM and PAM systems in analogue-to-digital signal conversion, and evaluate their performance in terms of quantization level to SQNR, signal bandwidth, and system data rate.		x	x	
4	Evaluate coherent BPSK, BFSK and QPSK schemes in terms of signal constellation, system bandwidth, and bit error performance.		x	x	
5	Identify different types of transmission media.		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 involve in lectures to gain knowledge about key concepts of communications. These concpets are worked out based on problems.	1, 2, 3, 4, 5	3 hrs/wk

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Tests (min.: 2)	1, 2, 3, 4, 5	40	-	No
2	#Assignments (min.: 3)	1, 2, 3, 4, 5	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. # 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 SyllabusSpectrum Analysis

Fourier transform; bandwidth requirement; basic frequency properties of digital signals.

Digital Baseband Transmission for Analogue Signal

Formatting analogue information : sampling process, aliasing; pulse amplitude modulation and time division multiplexing; waveform representation of binary digits; Amplitude quantization : quantization noise, uniform and non-uniform quantizing; pulse code modulation (PCM), μ -law companding; Differential PCM.

Analog Modulation-AM

Amplitude modulation (AM) : generation and detection, signal to noise ratio; modulation index; spectral analysis; system bandwidth requirement; single-sideband modulation.

Analog Modulation-FM

Frequency Modulation (FM) : narrowband and wideband FM, FM signal generation; spectral analysis of single-tone FM signals; average power and bandwidth; FM receivers.

Digital Modulation/Demodulation

Phase shift keying, frequency shift keying: generation, differential encoding, coherent & non-coherent detection, error performance in an additive Gaussian channel, bandwidth requirement.

Transmission Media

Metallic cable: data rate and bandwidth limitation;
Optical fibre: light propagation, optical sources and detectors;
Satellite: orbit & subsystems, multiple access techniques;
Wireless Network: cellular phone, wireless LAN.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	H. Stern and S. Mahmoud, Communication Systems Analysis and Design, (Pearson Prentice Hall 2004)
2	S Haykin: Communication Systems, (John Wiley & Sons, 4th Edition, 2001)

3	F G Stremler: Introduction to Communication Systems, (Addison-Wesley, 3rd Edition, 1990)
4	B Sklar: Digital Communications, Fundamentals and Applications, (Prentice-Hall, 2nd edition 2001)