EE3101: COMMUNICATION ENGINEERING

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Communication Engineering

Subject Code
EE - Electrical Engineering
Course Number
3101

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
EE3008 Principles of Communications

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The course aims to present various techniques for transmitting/receiving digital data and the performance analysis of digital communication systems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Recognize the concepts of digital baseband transmission, optimum reception analysis and bandlimited transmission		x	x	
2	Characterize and analyze various passband modulation techniques		x	x	
3	Describe the importance of synchronization in digital communication systems and the basic techniques for carrier and symbol synchronization		x	x	
4	Explain the basic concepts of error detection/ correction coding and perform error analysis		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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Key concepts are described and illustrated. Key concepts are worked out based on problems.	1, 2, 3, 4	3 hr/wk
2	Laboratory	Use Matlab to simulate the performance of communication systems	1, 2	3 hr/wk (3 weeks)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min.: 2)	1, 2, 3, 4	40	
2	#Assignments (min.: 3)	1, 2, 3, 4	10	
3	Lab Exercises/Reports	1, 2	10	

Continuous Assessment (%)
60

Examination (%)
40

Examination Duration (Hours)
2

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

Baseband Transmission

Waveform representation of baseband signals; Line coding --- spectral analysis, binary and multilevel codes, Detection of signals in Gaussian noise, matched filter & correlation detector; Bandlimited systems --- Nyquist theorem, intersymbol interference, eye diagram.

Multi-level Bandpass Modulation and Demodulation

Multi-level digital bandpass modulation techniques & their bandwidth efficiency --- M-ASK M-FSK, M-PSK, M-QAM, offset transmission; Coherent and non-coherent demodulation techniques for M-ASK, M-FSK, M-PSK and M-QAM; Spectral analysis and error performance in an AWGN channel.

Synchronization

Synchronization issues; Basic principle of Phase Locked Loop (PLL); Carrier Synchronization --- raised-power loops and Costas loop; Symbol timing recovery --- open-loop and closed-loop.

Error correction coding

Block codes --- parity check matrix & syndrome testing; Hamming distance, encoding and decoding, error detection and correction.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	B Sklar: Digital Communications: Fundamentals and Applications, (2nd Edition, Prentice-Hall, 2001)