Liverpool John Moores University

Title:	TELECOMMUNICATIONS PRINCIPLES
Status:	Definitive
Code:	**4505ICBTEL** (127016)
Version Start Date:	01-08-2021
Owning School/Faculty:	Engineering
Teaching School/Faculty:	ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level:	FHEQ4	**Credit Value:**	15	**Total Delivered Hours:**	65
Total Learning Hours:	150	**Private Study:**	85		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	45
Practical	6
Tutorial	12

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Coursework (1500 words)	30	
Exam	AS3	Exam	70	2

Aims

This module aims to describe the main components of a communication system and their purpose by underlying the principles of communication systems. Further this module introduces the modulation techniques, Signal transmission along with the transmission line. Later intend to introduce the antenna theory along with the wave propagation.

Learning Outcomes

After completing the module the student should be able to:

1 Identify the main properties, the basic concepts and principles consist in telecommunication systems.
2 Identify and describe the characteristics of communication channels.
3 Identify and describe the modulation techniques used for analogue and digital signals.
4 Identify and describe the multiplexing techniques used for analogue and digital signals

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Coursework	2		
Exam	1	3	4

Outline Syllabus

Elements of analogue and digital communication systems: the transmitter, channel and the receiver
Eg: wired and wireless systems; simplex, duplex and half-duplex methods.
Characteristics of electro-magnetic waves: frequency, wavelength and velocity and their interrelationship; the electro-magnetic spectrum and frequency/wavelength allocations.
Signal spectra: time and frequency domains; fundamental and harmonic frequencies; complex waveforms; digital signals. eg unipolar, bipolar, return-to-zero (RTZ), non-return to-zero (NRZ)
Logarithmic relationships: the need for logarithmic representation; the Decibel and its Common derivatives (dBm, dBW and dBR) and typical applications including link budgets.
Sources and effects of noise: sources eg internal/external, natural/man-made; types eg: Johnson, Shott, Partition; cumulative effects in cascaded/sequential systems; signal-to-noise ratio; noise figure and noise factor; noise temperature.
Noise calculations: eg thermal/Johnson noise, signal-to-noise ratio, noise figure, noise Factor
Bandwidth and information capacity: Shannon-Hartley theorem eg: relationship to the available bandwidth and the signal-to-noise ratio; bandwidth requirements for typical applications (voice, radio and television broadcasting); the implications for both analogue and digital signals
Channel impairments: attenuation and other losses; bandwidth limitation; phase delay; effects on complex signals; inter-symbol interference; bit error rates (typical examples)
Signal Modulation, Baseband and pass band modulation, Analogue and digital modulation.
Analogue modulation methods: amplitude/frequency/phase; pulse modulation

methods eg pulse amplitude (PAM), pulse position (PPM), pulse duration/width (PDM/PWM)
Modulation methods for digital signals over analogue networks: eg amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK), quaternary phase shift keying (QPSK), quaternary amplitude modulation (QAM)
Digital modulation methods: pulse code modulation (PCM)
Multiplexing techniques: space division; frequency division; time division; wavelength Division

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

By a series of lectures and tutorials and through participation within practical sessions for problem solving.

Self-managed investigative study to analyse cases related to the industry.

In-class participation and research studies are key features of this module.

A recommended resource list - indicating key reading, internet support and physical learning assistance, is provided to help enable students to undertake self-directed study.

Notes

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