Telecommunications Principles

Module Information

2022.01, Approved

Summary Information

Module Code	4505ICBTEL
Formal Module Title	Telecommunications Principles
Owning School	Engineering
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	45
Practical	6
Tutorial	12

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks

JAN-PAR	PAR	January	12 Weeks
SEP_NS-PAR	PAR	September (Non-standard start date)	12 Weeks

Aims and Outcomes

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.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Identify the main properties, the basic concepts and principles consist in telecommunication systems.
MLO2	2	Identify and describe the characteristics of communication channels.
MLO3	3	Identify and describe the modulation techniques used for analogue and digital signals.
MLO4	4	Identify and describe the multiplexing techniques used for analogue and digital signals

Module Content

Outline Syllabus	Elements of analogue and digital communication systems: the transmitter, channel and the receiverE.g.: 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. e.g. 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 e.g. internal/external, natural/man-made; types e.g.: Johnson, Shott, Partition; cumulative effects in cascaded/sequential systems; signal-to-noise ratio; noise figure and noise factor; noise temperature.Noise calculations: e.g. thermal/Johnson noise, signal-to-noise ratio, noise figure, noise FactorBandwidth and information capacity: Shannon-Hartley theorem e.g.: 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 signalsChannel 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 e.g. pulse amplitude (PAM), pulse position (PPM), pulse duration/width (PDM/PWM)Modulation methods for digital signals over analogue networks: e.g. 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; wavelengthDivision
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Report	Coursework	30	0	MLO2
Exam	Exam	70	2	MLO1, MLO3, MLO4

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings