

Module Specification

Module Summary Information

1	Module Title	Communication Systems and Networks
2	Module Credits	20
3	Module Level	6
4	Module Code	ENG6068

5	Module Overview
<p>Rationale</p> <p>The module provides you with an understanding and knowledge in the principles and applications of telecommunications and information networks. The module will focus on case studies of particular applications in wired and wireless communications systems and in high speed networking. Telecommunication and networking technologies are key components of modern revolutionary technologies. This module provides you with the knowledge to understand modern communication systems and the functions of the Internet. In addition, you will gain related analytical skills that can be applied in designing modern communication systems and information networks.</p> <p>Alignment with Programme Philosophy and Aims</p> <p>The module assists the main programme philosophy of fulfilling the academic component of the MEng Electronic Engineering by introducing you to three important processing stages of modern communication systems which are transmission structure for quality of robust transmission, wireless communication for efficient modulation of signal transmission and telecommunication networks architectures for providing comprehensive knowledge of different architectural and technical aspects of current and future interworking techniques.</p> <p>A key feature is the balanced approach between fundamental theory of communications system, wireless communications and networks: modelling point-to-point communications; elements of optical communication systems; elements of satellite communications which include fundamental problems of multiple access channel, broadcast channel and two-way channel.</p> <p>On successful completion of this module, you will be able to:</p> <ol style="list-style-type: none"> 1. To develop a solid understanding of typical point-to-point communication systems, the function of individual subsystems and the interactions among them; 2. To build a clear and good knowledge information networking technologies and protocols that used in the modern internet. <p>This introduces methods of creating, implementing and testing of telecommunications and information networks concentrating on a systems approach. Emphasis will be on understanding modern communication systems and the functions of the Internet. In addition, you will gain related analytical skills that can be applied in designing modern communication systems and information networks.</p>	

6	Indicative Content
	<p>Communications Channel Signals and spectra. The communications channel and standard models for the channel. Modulation techniques</p> <p>Radio Waves Propagation Characteristics of radio wave propagation – losses, reflection, refraction, diffraction, Fresnel zones and tropospheric scatter. Direct, ground and sky wave. System engineering – frequency allocation, link budget and diversity. Maximum usable frequency</p> <p>Aerials Electromagnetic wave propagation. Aerials – basic properties, radiation resistance, polarisation, gain, beam width. Aerial types, dipoles, Yagi and reflector aerials and their properties. Linear aerials. Aerial arrays.</p> <p>Transmission Lines Primary line constants, secondary, coefficient, velocity of propagation, characteristic impedance. Smith charts. Impedance matching. Stubs. Guided waves. Transmission impairments</p> <p>Satellite Systems Satellite orbits, Kepler elements. Link budget, figure of merit, Satellite Networks, multiple access, FDMA, TDMA, CDMA and OFDM, Line of sight. Microwave circuit techniques. Cellular Mobile communications techniques.</p> <p>Noise Noise sources, noise in the frequency and time domains. Signal-to-noise ratio, noise figure, noise temperature. Errors in digital systems, error correction and coding. BER calculation.</p> <p>Data transmission Pulse detection. Line codes and their desirable properties. Effect of bandwidth limitation, ISI. Multiplexing and de-multiplexing techniques. Pulse code modulation, principles, sampling, quantisation, A law and μ law encoding. Delta modulation, principles, adaptive systems, PCM comparison. Data and Computer communications standards. The OSI model: Data link layer protocol.</p> <p>Networks Introduction to networks: Network topologies. Wire and wireless network configuration. LAN, WAN, MAN. Interconnects and gateways, Networking structures: topologies and transmission media. Ethernet. Broadband Multi-Services Networks: Asynchronous Transfer Mode (ATM). Principles & Applications. Higher Order Multiplexing: Principle of Add & Drop, PDH and SDH. Inverse Multiplexing</p>

7	Module Learning Outcomes
	On successful completion of the module, students will be able to:
	1 Apply and critically evaluate the characteristics of radio wave propagation.
	2 Identify, categorise and discuss the characteristics of electrical communication techniques and media.
	3 Critically evaluate the performance of various wireless communication systems
	4 Discuss, compare and contrast the design, implementation and characteristics use of a number of networking systems.

8	Module Assessment		
Learning Outcome			
	Coursework	Exam	In-Person
1-4	30%	70%	

9	Breakdown Learning and Teaching Activities	
Learning Activities	Hours	
Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	48	
Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	0	
Private Study (PS) includes preparation for exams	152	
Total Study Hours:	200	