

MODULE SPECIFICATION FORM*

Module Title:	Communication Systems Engineering	Level:	6	Credit Value:	10
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Module code: (if known)	ENG681	Cost Centre:	GAEE	JACS2 code:	H640
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Semester(s) in which to be offered:	1	With effect from:	July 2015
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Office use only: To be completed by AQSU:	Date approved:	July 2015
	Date revised:	
	Version No:	1

Existing/New:	New	Title of module being replaced (if any):	
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Originating Academic area:	Engineering and Applied Physics	Module Leader:	B. Klaveness
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Module duration (total hours)	100	Status: core/option/elective (identify programme where appropriate):	Free-standing 10-credit component comprising half of ENG638 (Communications Engineering).
Scheduled learning and teaching hours	36		
Independent study hours	64		
Placement hours	0		

Percentage taught by Subjects other than originating Subject (please name other Subjects):	0%
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Programme(s) in which to be offered: Engineering European Programme (Non Award Bearing)	Pre-requisites per programme (between levels):	None
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Module Aims: To review digital communication techniques based on satellite, optical, mobile and wired technologies and relate these to current communications systems – both discrete and integrated;

<p>Expected Learning Outcomes</p> <p><u>Knowledge and Understanding:</u> At the completion of this module, the student should be able to:</p> <ol style="list-style-type: none"> Analyse the operating principles and structures of different communication networks; Evaluate the performance of digital communication systems, including satellite, optical, mobile and wired systems, using standard criteria and international standards; (KS 5) Synthesise the range digital communications techniques in order to produce integrated system structures which will support the range of applications anticipated in the future. (KS 9) <p><u>Key skills for employability</u></p> <table style="width: 100%;"> <tr> <td style="vertical-align: top;"> <ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills </td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy </td> </tr> </table>	<ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills 	<ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy
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Assessment: Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%).

Assessment is by means of an examination covering all outcomes. It is an unseen time-constrained exam. (This corresponds to assessment 2 – examination - of ENG638.)

Assessment number (use as appropriate)	Learning Outcomes met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3	Examination	100%	2 hr	

Learning and Teaching Strategies:

The module will be presented to the learner through a series of lectures and tutorials. A case study will be used as part of an investigative exercise to support learning. Students will also be required to support these studies with further reading and Internet searches.

Syllabus outline:

Overview: Discrete and Integrated Applications Systems: Mobile, internet, broadcast, cable, terrestrial, satellite, point-to-point, public and local area networks.

Voice communication, audio and video transfer, industrial and commercial data transfer. Trends and future developments.

Satellite communication: Earth station. Satellite orbit and systems. Design and analysis of up-link and down-link systems. DBS and basic satellite receiver design principles. Satellite TV, types of modulation systems, PAL, MAC, MPEG, JPEG. Compare different scrambling, compression, decoding, and error correction systems.

Optical Fibre Communication: System components. Modulation and demodulation of light. Operating frequency. Ray theory transmission (T.I.R., critical angle, acceptance angle, numerical aperture, skew rays). Material absorption (extrinsic, intrinsic). Scattering Losses (linear - Mie, Rayleigh; non-linear - Raman, Brillouin). Intramodal and intermodal dispersion. Types of optical fibre cable, R.I. profile, relative cost of Step index fibres (multimode, monomode), Graded index fibres. Optical sources and detectors, L.E.D. (types, principle of operation, limitations). Laser (basic concept, semiconductor injection laser, characteristics). Photodiode, APD, phototransistor (principle of operation, characteristics, advantages and disadvantages). Choice of fibre type and operating frequency, compatibility with source and detector for optimal performance. Alignment and joint loss. Coupling efficiency. Power budget calculations.

Bibliography:

Essential reading:

Roddy, D. (2006) *Satellite Communications*, McGraw-Hill.

Senior, J. (2008) *Optical Fiber Communications: Principles and Practice*, 3rd Edn., Prentice-Hall.

Recommended reading:

Othman, M. (2008) *Principles of mobile computing and communications*, Boca Raton.