ELEC H2605: Electronic Communications 2

Module Title:	Electronic Communications 2
Language of Instruction:	English

Credits:	5

NFQ Level:	6

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	Teaching will be conducted through lectures, practicals and problem-based learning. The practical sessions will be used to reinforce the concepts learned throughout the course.

Module Aim:	To give the students the ability to understand, describe and analyse the fundamental principles and systems of radio communications.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Describe the principle and modes of electromagnetic propagation.
LO2	Explain the concept of modulation with respect to AM and FM systems.
LO3	Use computer-based engineering tools to design and evaluate electronic circuits and systems for communication systems.
LO4	Describe the underlying principle and operation of a superheterodyne radio receiver.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
“Principles of Electricity” or equivalent; “Introduction to Electronics” or equivalent

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Module Content & Assessment

Indicative Content
Radio wave propagation: List the frequency bands for HF, VHF UHF and SHF communication systems. Sketch the layers of the ionosphere. Describe ground wave, sky wave and space wave propagation. Define general fading and selective fading.
Filter response Define a decibel. Describe the operation of a bandpass filter. Explain the operation of a series resonant bandpass filter. Explain the operation of a parallel resonant bandpass filter. Describe the operation of a band stop filter. Explain the operation of a series resonant bandstop filter. Explain the operation of a parallel resonant bandstop filter. Calculate the bandwidth for each type of filter. Define selectivity. List applications where such filters may be used.
Amplitude Modulation Describe the principles of amplitude modulation. Write an equation for a sinusoidally modulated wave. Given the instantaneous wave equations for the carrier and the modulating signal. Sketch a modulated wave in the time domain. Sketch a modulated wave in the frequency domain. Calculate the modulation index. Calculate the power in the carrier and side frequency components. Calculate the bandwidth. Contrast dsb, dsbsc and ssbsc. Describe the operation of a diode detector.
Frequency Modulation Describe the principles of frequency modulation. Define frequency deviation. Define modulator sensitivity, modulation index and deviation ratio. Give the instantaneous wave equations for the carrier and the modulating signal. Sketch a modulated wave in the time domain. Sketch a modulated wave in the frequency domain. Calculate the modulation index. Calculate the power in the carrier and side frequencies (using Bessel tables). Calculate the bandwidth. Explain the relationship between the noise at the output of an FM system and the rated system deviation. Describe the principles of pre-emphasis and de-emphasis.
Superheterodyne radio receiver Draw a block diagram of a superheterodyne radio receiver. Describe the function of each block. Describe ganging and tracking. Describe the purpose of automatic gain control. Explain why the LO frequency is higher than the IF frequency. Define selectivity, sensitivity and adjacent channel ratio.
Interference signals Define the following interference signals: co-channel, image channel, adjacent channel and IF breakthrough. Describe where and how each of these interference signals can be minimised. Define image channel response ratio.
Analogue communication systems Contrast AM and FM under the headings. Complexity. Spectrum efficiency. Fidelity of the received audio signal

Assessment Breakdown	%
Continuous Assessment	20.00%
Practical	20.00%
End of Module Formal Examination	60.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Other	Students will be assessed periodically to gauge their understanding and knowledge of the material.	1,2,4	20.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Students will complete a number of practical tasks and assignments during the module. Students will write a report or produce a portfolio of their work. Students may also complete a practical test during the module.	3	20.00	n/a

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	The final written examination will evaluate the extent of the student's knowledge of the learning outcomes	1,2,3,4	60.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	Every Week	2.00
Tutorial	Every Week	1.00
Practicals	Every Week	2.00
Independent Learning Time	Every Week	2.00
	Total Hours	7.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EESYS_B	Bachelor of Engineering (Honours) in Electronic Engineering	4	Mandatory