

Module Title:	Software Defined Radio
Language of Instruction:	English
Credits:	5
NFQ Level:	7
Module Delivered In	5 programme(s)
Teaching & Learning Strategies:	Teaching & Learning Strategies: (a) Lectures will present radio system theory with an emphasis on in-field implementation of SDR systems. (b) System simulation and development software will be used to realise working radio systems through practical tutorials. (c) Projects will require students to develop their own radio receivers and transmitters using SDR techniques.
Module Aim:	To give students the specialised knowledge, technical competencies and conceptual skills to: (a) Evaluate the effects of transceiver specifications on radio link performance. (b) Implement and analyse a variety of wireless modulation and coding standards. (c) Analyse and design typical SDR transceiver architectures. (d) Select and design basic antennas for commonly used frequency bands.
Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Evaluate the effects of transceiver specifications on radio link performance.
LO2	Implement and analyse a variety of wireless modulation and coding standards.
LO3	Analyse and design typical SDR transceiver architectures.
LO4	Select and design basic antennas for commonly used frequency bands.
Pre-requisite learning	
Module Recommendations	
<i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
Incompatible Modules	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
Digital Communications, Mathematics 3, Computer Programming	

Module Content & Assessment

Indicative Content

Software Radio Transceiver Performance:

Noise & Link Budgets; Non-Linear Elements; Sensitivity & Dynamic Range; FFT; IQ Sampling & Multirate Sampling.

Wireless Communication Concepts:

Analogue/Digital Modulation; Channel Coding; Pulse-Shaping; Wireless Standards; Synchronisation.

SDR Transceiver Architectures:

Receivers – Heterodyne, Direct-Conversion, Image Reject and Low-IF. Transmitters – Direct-Conversion, Heterodyne and other architectures.

Antennas & Propagation:

Antenna Parameters & Radiation Patterns; HF, VHF & Satellite Antennas; Fading and Propagation Fundamentals.

Assessment Breakdown

	%
Continuous Assessment	20.00%
Project	40.00%
End of Module Formal Examination	40.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Written Report	Students will be required to submit a set of reports on selected SDR topics.	1,2,3,4	20.00	n/a

Project

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	Each student will complete a set of mini-projects, for which a maximum total mark of 40% will be awarded. Each project will test the ability of the student to apply the module theory to a practical task.	1,2,3,4	40.00	n/a

No Practical

End of Module Formal Examination

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	A final written examination will test the student's ability to demonstrate the learning outcomes.	1,2,3,4	40.00	End-of-Semester

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

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Every Week	3.00
Practicals	Every Week	3.00
Independent Learning	Every Week	2.00
Total Hours		8.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EEBEE_B	Bachelor of Engineering (Honours) in Biomedical Electronics	6	Elective
CW_EESYS_B	Bachelor of Engineering (Honours) in Electronic Engineering	6	Elective
CW_EEROB_B	Bachelor of Engineering (Honours) in Robotics and Automated Systems	6	Elective
CW_EEBEE_D	Bachelor of Engineering in Biomedical Electronics	6	Mandatory
CW_EEROO_D	Bachelor of Engineering in Robotics and Automated Systems	6	Mandatory