

| | |
|--|---|
| 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 |