

<b>Module Title:</b>	Prototyping
<b>Language of Instruction:</b>	English
<b>Credits:</b>	5
<b>NFQ Level:</b>	6
<b>Module Delivered In</b>	<a href="#">2 programme(s)</a>
<b>Teaching &amp; Learning Strategies:</b>	<p>(a) Teaching will be conducted using lectures, technology demonstrations and practical laboratory sessions. (b) The Institute's VLE will be used to evaluate the students understanding of the basic concepts during each section using online quizzes. (d) At various stages of the module students will be directed to online materials and resources and will also have to conduct independent research on specific topics for purpose of completing practical exercises and assignments. (e) The practical laboratory sessions will offer the students hands on laboratory experience using real measurement and test equipment, experimental instruments, apparatus, and computational software environments.</p>
<b>Module Aim:</b>	<p>The aim of this module is to provide the student with circuit prototyping, design, and practical fabrication skills. The module focuses on electronics workshop/laboratory practices and procedures, and environmental considerations when prototyping/fabricating, designing layouts from circuit schematics, construction of prototype boards and troubleshooting circuits using test and measurement equipment, ECAD tools, simulation, analysis and investigation of circuit operation, rapid prototyping of physical parts and scaled models, and finally, knowledge of user-centric design approaches.</p>
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Operate in an electronics workshop laboratory with due regard for health and safety (H&S) and environmental considerations.
LO2	Design of electronic circuit layouts from schematics, construct prototype boards and troubleshoot using test and measurement equipment.
LO3	Employ ECAD software to layout, simulate, analyse and investigate the operation of electronic circuits.
LO4	Practice methods and techniques for rapid prototyping of physical parts and scaled models.
LO5	Knowledge of user-centric design approaches such as 'design thinking' principles and 'user experience' (UX) design.
<b>Pre-requisite learning</b>	
<b>Module Recommendations</b>	
<i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
<b>Incompatible Modules</b>	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b>	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
No requirements listed	

**Module Content & Assessment**
**Indicative Content**
**Safe working laboratory practices and environmental considerations:**

(i) Demonstrate excellent laboratory practice, implement proper safety precautions, understand risk assessments and standard operating procedures (SOPs), eliminating electrical hazards, electrostatic discharge (ESD), burns, eye protection, and respiratory irritants. (ii) Implement excellent environmental practice measures to reduce waste, reuse components and recycle materials.

**Design and circuit layout:**

(i) Form factor and design constraints, (ii) Layout planning sheets, (iii) Software tools and packages for layout.

**Prototype board assembly:**

(i) Breadboard, (ii) Stripboard, (iii) PCB (through-hole), (iv) PCB (SMD 805, 603), (v) IPC Standards.

**Test and measurement equipment:**

(i) Power Supply, (ii) Signal Generator, (iii) Digital Multi-meter (DMM), (iv) Mixed signal oscilloscope, (v) Spectrum analyser.

**Electronic CAD software:**

(i) Application of ECAD software to design, analyse and model the operation of circuits, and systems (SPICE simulators). (ii) Printed Circuit Board design process (through-hole and surface mount devices SMD).

**Rapid prototyping:**

(i) 3D CAD design software, (ii) Additive manufacturing (3D printing), (iii) ISO Standards.

**User-centric approaches to design:**

(i) 'Design thinking' principles, (ii) 'User experience' (UX) design.

**Assessment Breakdown**

	%
Continuous Assessment	20.00%
Project	80.00%

**Continuous Assessment**

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Examination	Class assessment.	1	10.00	Week 4
Examination	Class assessment.	5	10.00	Week 13

**Project**

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	Project deliverable and report	1,2,3,4,5	25.00	Week 5
Project	Project deliverable and report.	1,2,3,4,5	25.00	Week 9
Project	Project deliverable and report.	1,2,3,4,5	30.00	Week 13

No Practical

No End of Module Formal Examination

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

**Module Workload**

<b>Workload: Full Time</b>		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Every Week	1.00
Laboratory	Every Week	3.00
Independent Learning	Every Week	2.00
Total Hours		6.00

**Module Delivered In**

Programme Code	Programme	Semester	Delivery
CW_EEBEE_B	<a href="#">Bachelor of Engineering (Honours) in Biomedical Electronics</a>	2	Mandatory
CW_EEBEE_D	<a href="#">Bachelor of Engineering in Biomedical Electronics</a>	2	Mandatory