Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Micro-Credentials

Information Sheet and Descriptor

Definition (working)

A micro-credential *is a proof of the learning outcomes that a learner has acquired following a short learning experience. These learning outcomes have been assessed against transparent standards. The proof is contained in a certified document that lists the name of the holder, the achieved learning outcomes, the assessment method, the awarding body and, where applicable, the qualifications framework level and the credits gained. Micro-credentials are owned by the learner, can be shared, are portable and may be combined into larger credentials or qualifications. They are underpinned by quality assurance following agreed standards* ***(working definition approved by HCI Steering, 11 February 2021).***

Micro-credentials – range of credits from 2.5* ECTS, 5 ECTS, 10 ECTS.

*Note: for the 2021/22 academic year micro-credentials will consist of 5 ECTS or 10 ECTS.

Micro-credentials:

- Consist of credit offered for continuing/professional development purposes.
- Are specifically designed to upskill the workforce.
- May be stackable.
- Offer flexible delivery to meet the needs of industry, business and employees.

MC = Micro-Credential

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HCI Pillar 3

Micro-Credentials: Descriptor

HCI Cluster and Work Package for the proposed micro-credential:	Cluster 1: Work-package 1
To whom will the micro-credential be offered?	Specify the *specific industry/profession targeted:* This micro-credential has been developed to benefit engineers, who are interested in learning more solar energy conversion processes and applications of solar energy systems, architects interested in building integrated solar energy technologies, professionals in local authorities and in NGOs, who are interested in the growing solar industry in Ireland. These learners will advance their professional competencies through an in-depth focus on how solar cells work up to balance of system components and the design of large solar farms. By completing the module, professional learners will be facilitated to identify and to address these topics and will be enabled to progress their individual career goals in the solar energy industry.
Micro-credential title:	Solar Energy Conversion and Applications
Is the proposed micro-credential a new or existing module (repurposed)?	Existing module to be repurposed
(For Existing Modules Only)	
Existing module detail	***If this is an existing module to be repurposed as a micro-credential, please respond to the questions below.*** ***If not, proceed to the next section.*** State the name of the module and programme *(and enclose module descriptor if available)*: Module: Solar Energy Conversion and Applications. Programmes: MAI Engineering and MSc in Engineering (Civil) Is the module shared with another discipline/School? If so, name the discipline/School: No **Existing Module details:**

	PG Y5 MAI and Y1 MSc No. of ECTS of module: 5 NFQ level: 9 School (owner and discipline): School of Engineering Module coordinator: Prof. Sarah McCormack Code in SITS: CE7J02 *If changes are required to the existing module so that it can exist coherently as a micro-credential please give details (please also outline how the existing module will meet the criteria of a micro-credential in terms of meeting the needs of industry and, providing flexible delivery):* This module will have blended delivery which is different from Pre COVID face to face only delivery.

Micro-credential information		
NFQ level (if applicable)	9	PG
ECTS	*Note: 5 ECTS: 100–125 hrs student effort (PG: 1 ECT: 25 hrs student effort)* 5	
School (owner) and discipline	School of Engineering	
MC Coordinator (name) *(Must be academic / teaching staff)*	Prof. Sarah McCormack	
State other Schools/external organisations involved in the delivery of the micro-credential (if applicable)	n/a	
Industry/profession	**Specify the industry/profession targeted by the micro-credential:**	

	Engineers interested in solar energy engineering, architects interested in building integrated solar energy technologies, local authorities and NGOs interested in the growing solar industry in Ireland. Those professionals interested in technical and material aspects in solar, applications of solar technologies and policies and their implications and requirements for the solar industry. **What market need is addressed by the micro-credential?** The solar industry is a relatively new sector in Ireland with recent policies such as Climate Action and Low Carbon Development Bill 2021 and the recent Programme for Government – our shared future specifying solar as becoming a larger contributor towards our renewable energy and greenhouse gas targets. Due to this there is a lack of knowledge around the technical details of solar cells and other balance of system components as well as the design of domestic systems and for larger solar farm installations. **State the industry/employer-related skills addressed by the micro-credential:** • Advanced fundamental knowledge on solar cell technologies, as well as of novel advances in the field. • Design of balance of system components for domestic and solar farm installations. • Analysis of issues and solutions associated with domestic solar and solar farm integration with the grid. **How will the delivery of this micro-credential facilitate industry/professional staff participation (flexible delivery – online/blended/face-to-face – evenings/weekends etc)?** There will be blended delivery with all lectures recorded 'live' while also giving the option for face-to-face lectures. Timetabling currently has 2-hour slot for lectures and 1 hour slot for groupwork. Group work can be facilitated online or face to face to suit the cohort.
Teaching staff & if appropriate institutional/industry affiliation	Name all teaching staff involved and if external, the name of the organisation. Professor Sarah McCormack and Professor Laurence Gill, Discipline of Civil, Structural and Environmental Engineering
Min./max. number of students	Min. number of students: 0 Max. number of students: 8
Mode of delivery	Face-to-face

<table>
<tr><td></td><td colspan="3">Any further details:

Lectures will be recorded</td></tr>
<tr><td>MC entry & admission requirements/pre-requisites (if applicable)</td><td colspan="3">Level 8 award. 2.1 grade Engineering or Cognate Discipline</td></tr>
<tr><td>Proposed commencement date</td><td colspan="3">September 2021</td></tr>
<tr><td>Micro-credential frequency, duration and term</td><td>Frequency of delivery during the academic year:

Once per academic year</td><td>Duration of the MC (e.g. 6 weeks). If block delivery applies provide details:

Semester one – 12 weeks</td><td>Indicate term(s):
Michaelmas ☒
Hilary ☐
Trinity ☐</td></tr>
<tr><td>Contact and independent study hours (include total)</td><td colspan="3">(1 ECTS = 25 hrs) Note: contact hours also relate to online delivery.

Contact hours: 33

Independent study hours: 92

Total: 125 hrs</td></tr>
<tr><td>Micro-credential aims</td><td colspan="3">The aim of this module is to give the students an extended foundation of the main concepts of solar energy conversion and applications and to enable them to practically apply their knowledge in the field as well as in research and development.</td></tr>
<tr><td>Micro-credential learning outcomes (approx. 5)</td><td colspan="3">Resources: Academic Practice and QQI

Note: Learning outcomes should stem from and align with the MC aims and start with an explicit and assessable verb.

On successful completion of this micro-credential, learners will be able to:

LO1. Describe the function and design of difference system types of (i) solar thermal including the flat plate, evacuated tube, thermosiphon and integrated collector store systems and (ii) photovoltaic including monocrystalline silicon, amorphous, thin film and multijunction modules and emerging technologies.

LO2. Calculate optical properties of material for solar energy systems based on spectral measurements.

LO3. Explain how the performance of solar energy systems varies annually and diurnally, depending on location, sky conditions, device and application type and load/user behaviour.</td></tr>
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<table>
<tr><td></td><td>LO4. Assess which materials are best suited for use in solar panels as well as explain what surface treatments can be used to enhance thermal and electrical performance.

LO5. Design of the most important components necessary in a solar energy system.

LO6. Evaluate the state of the art in thermal and photovoltaic technologies as well as show an insight into future trends and advances.</td></tr>
<tr><td>MC content areas. (Bullet points can be used)

If the MC (or components) will be delivered in a blended format, identify the content that will be delivered online.</td><td>This module introduces a range of topics in the advanced physics and technology of solar energy conversion and materials, devices and applications. Participants will gain an in-depth knowledge of current advances in solar energy, principles of operation of solar thermal and photovoltaic devices, technological challenges and their applications. The module also provides an introduction into next generation technologies. The aim of this module is to give the students an extended foundation of the main concepts of solar energy and to enable them to practically apply their knowledge in research and development of solar energy technologies as well as in the design of domestic and solar farm installations.

This content will be delivered in lecture format face to face with lectures live streamed and recorded.</td></tr>
<tr><td>Teaching and Learning Methods (state pedagogical approach).

Include the online environment(s) to deliver the MC e.g. Blackboard/Zoom, if appropriate.</td><td>Resources: Academic Practice

Weekly lectures (2hr) will be given from Week 1 to Week 12. These lectures will be live streamed and recorded.

Weekly one hour slot will be dedicated to groupwork, where groups of 3-4 will work to design a solar photovoltaic and thermal installation for different geographic locations.

The VLE (BlackBoard) will be used to host lectures and groupwork if requested including Collaborate Ultra and discussion boards. It will also be used to provide structured access to all resources. Lecture recordings will be automatically published on the VLE. The assignments tool in BlackBoard will be used to collect and give feedback on assessments.</td></tr>
<tr><td>MC assessment components

Please include the following…

How will the MC be assessed?

Indicate the LO assessed for each assessment (e.g. LO1 etc.)

Indicate the % of overall mark each assessment is worth.</td><td>
<table>
<tr><th>Assessment Component</th><th>Assessment Description</th><th>LO addressed</th><th>% of total</th><th>Week due</th></tr>
<tr><td>Continuous assessment</td><td>Group work – Report & Presentation
Groups of 3-4 pax will design solar PV and thermal systems for a specified global location.</td><td>LO1, LO3, LO5</td><td>50%</td><td>6</td></tr>
</table>
</td></tr>
</table>

Indicate if summative/formative (e.g. essay/research paper)	<table><tr><td></td><td>The scale of the installation is to be decided (whether individual domestic level, at community scale or whether a solar farm). Design specifics and software to be decided whether Tracepro, PVsyst etc.. The design will require the acquisition of solar resource data and the thermal and electrical demand profiles of the users. Optimization of the solar systems will be undertaken to maximize self-sufficiency. An economic evaluation will be determined Assessment of local policy will be undertaken to determine the impact on energy costs and payback. At least 10,000 words required for the report A 20 minute presentation after report submission</td><td></td><td></td><td></td></tr><tr><td>Examination</td><td>Examination (3 hrs)</td><td>All</td><td>50%</td><td>-</td></tr></table>
State how the MC will be reassessed if failed	100% examination (3 hrs)
Pass standard & any special requirements for passing the MC	Resources: Calendar II and Calendar III Pass mark 50%
Penalties for late submission	We do not have formal regulations on this. No marks are awarded if deadlines are not met.
Core reading (if applicable)	Photovoltaic solar energy conversion. G. H. Bauer, (2015) Springer.
Are there subject experts in other Schools/disciplines?	No If yes, name of School and discipline Click or tap here to enter text. Has the MC been discussed with the School/discipline and DUTL/DTLP? Choose Yes/No
Proposed student fee	External student fee €1,500

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Faculty Dean and School Executive Approval:

Date of approval of the proposed micro-credential by the School Executive: 13/04/2021

Date of approval of financial information by Faculty Dean:

Signed by Head of School: Henry Rice Faculty Dean:

Date: 15/04/2021 Date: 11/06/21