Micro-credentials

Information Sheet and Descriptor

Definition

'Micro-credential' means the record of the learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes have been assessed against transparent and clearly defined standards. Courses leading to micro-credentials are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural, or labour market needs. Micro-credentials are owned by the learner, can be shared and are portable. They may be standalone or combined into larger credentials. They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity.

<div align="right">European Council, December 2021</div>

Micro-credentials – range of credits from 5 ECTS to 10 ECTS. Note: 2.5 ECTS do not apply for the academic year 2022/23.

Micro-credentials:

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

MC = micro-credential

HCI Pillar 3

Micro-Credentials: Descriptor

<mark>Please complete the Proposal Template in full. Incomplete proposal templates will not progress to the Micro-credential subcommittee for consideration.</mark>

Resources to support micro-credential development are available from the:

Academic Affairs website
 Academic Practice website
MC exemplar
Micro-credentials: Pedagogic Considerations (link to follow)

HCI Cluster and Work Package for the proposed micro-credential	Cluster 1: Work-package 1 – Micro-credential Pilot Programme
MC title:	**Measuring Environmental Impact: Life Cycle Assessment for Engineers**
MC title:	
School:	**Engineering**
To whom will the MC be offered?	**Specify the *specific industry/profession targeted:*** The MC has been developed to provide professionals with current and best-practice methods in life cycle assessment (LCA) and complementary methods, which can be applied to evaluate and improve the sustainable performance of engineering products, systems or processes. This programme offers individuals with backgrounds in engineering, applied sciences, and cognate disciplines the opportunity to develop fundamental, critical appraisal and applied life cycle skills. Learners will take away the knowledge and skills to effectively apply life cycle methods to products, systems or processes across all key economic sectors, to inform more sustainable decision marking within society. This will be reflected through their attainment of learning outcomes and evidenced by their applied and critical review skills in their coursework.
MC aims	The module aims to provide students with the critical skills to undertake life cycle assessments (LCAs) and complementary methods that can be used to evaluate the sustainable and circular performance of engineering products, systems or processes within an organisation and its extended value chain. Students will learn how to apply the principles and complete each stage of the process to produce a robust and critical assessment that can inform decision-making in relation to carbon, resources, energy and other impacts on the environment and society.
Is the proposed MC new or adapted from an existing	Existing module to be repurposed

Updated August 2022

(repurposed) module?	
(For existing modules only)	
Existing module detail	(If this is an existing module to be repurposed as a MC, please respond to the questions below. If not, proceed to the next section.) **Name of existing programme:** Engineering for Climate Action **Name of existing module:** CEPCA002 **Is the existing module shared with another discipline/School? If so, name the discipline/School:** Engineering **Existing module details:** PG Cert/Dip **No. of ECTS of existing module:** 5 ECTS **Existing module NFQ level:** Level 9 **School (owner and discipline):** Engineering, Civil, Structural & Environmental Engineering **Module coordinator:** John Gallagher **Code in SITS:** CEPCA002 **Outline the <u>existing module </u>learning outcomes:** LO1.Explain key concepts relation to evaluating the sustainable performance of engineering products, systems, or processes such as carbon footprinting, life cycle assessment, and the circular economy. LO2. Describe and evaluate the breakdown of contributions within a carbon footprint of given engineering product, system, or process. LO3. Demonstrate an understanding of the life cycle analysis process by outlining the principles, procedures, and tools to support LCA and complementary assessment methods. LO4. Produce a complete LCA to appraise the environmental impacts of an engineering product, system, or process. LO5. Differentiate between methodological approaches and decision-making in the LCA process and its impacts on the perceived performance of engineering product, systems, or processes. LO6. Identify opportunities for design improvements in engineering products, systems, or processes to achieve trade-offs or win-wins in terms of environmental (LCA), economic (LCC), social (S-LCA) and holistic sustainability (LCSA) priorities.

	LO7. Compare and evaluate the similarities and differences between life cycle assessment and more nuanced methods such as circularity measurement and assessment. **If changes are required to the existing module so that it can exist coherently as a MC please give details**. No
NFQ level (if applicable)	**NFQ level 9**
ECTS	*Note: 5 ECTS = 125 hrs student effort (1 ECT = 25 hrs student effort)* 5 ECTS
School (owner) and discipline	Engineering, Civil, Structural & Environmental Engineering
MC Coordinator *(member of academic / teaching staff)*	John Gallagher
State other Schools/external organisations involved in the delivery of the micro-credential (if applicable)	N/A
Industry/Profession Connection	**Specify the industry/profession targeted by the MC:** Professionals working in all facets of engineering or applied sciences, architecture or urban planning, that wishes to evaluate and improve the sustainable performance of their products, systems or processes. The application of life cycle thinking in the delivery or management of assets can lead to economic and environmental win-wins for an individual organisation and its extended value chain. **What market need is addressed by the MC (provide evidence of demand):** The need for organisations to quantify the embodied and operational environmental impacts of products, systems and processes is becoming a mainstream requirement for organisations to demonstrate their green credentials. In parallel, addressing climate action and supporting a circular economy transition requires quantitative evidence in relation to carbon and resource flows, whilst also evaluating the impact on the environment, human health and society. This module can provide engineers and scientists, architects and urban planners, and other individuals with roles in supporting sustainable initiatives to address the existing knowledge gap relating to undertaking life cycle assessments. Furthermore, a broader awareness of complementary life cycle and circular methods will support more advanced

Updated August 2022

decision-making in relation to the economic, environmental, and social trade-offs when addressing sustainability.

State the specific industry/employer-related skills addressed by the MC:
- Practical knowledge of the LCA process according to the ISO 14000 family of standards, and a capacity to undertake a LCA for any existing product, system, or process in line with these best-practice standards.

- Apply critical evaluation skills to review other life cycle studies to ensure quality assurance of the conclusions and recommendations.

- Capacity to produce practical guidance from LCA study findings to inform more sustainable engineering products, systems, and processes.

- Ability to undertake an advanced circular measurement and assessment in line the new ISO 59000 family of standards to further enhance the sustainability of new products, systems, or processes.

How will the delivery of this MC facilitate industry/professional staff participation (flexible delivery – online/blended/in-person, evenings/weekends etc)?
Online modules, with 3 hours per week of active learning, over a 12-week semester. Self-directed or synchronous learning is flexible in nature through a combination of suggested reading and pre-recorded online learning sessions. Live (and recorded) online tutorials / discussion sessions take place on alternating weeks to address and reflect upon key learning outcomes. A discussion board supports online discussion sessions, as students share their opinions and experience based on personal and professional knowledge.

Teaching staff & if appropriate institutional/industry affiliation	**Name all teaching staff involved and if external, the name of the organisation.** Asst Prof John Gallagher, from the Discipline of Civil, Structural and Environmental Engineering.
Min./Max. number of students	Min. number of students: 0 Max. number of students: 10
Mode of delivery	Consider the mode of delivery that will best suit your learner needs. Fully Online - all online (six asynchronous sessions each with a complementary six synchronous tutorial/discussion group sessions). We can also provide a flexible delivery approach to accommodate in-house delivery of the micro-credential for a group of students, including recorded discussion group sessions to allow students to catch up on missed sessions.
MC entry & admission requirements/pre-requisites (if applicable)	Level 8 programme. 2.1 grade in a STEM, Architecture, Urban Planning, or a cognate discipline.

Updated August 2022

Proposed commencement date	January 2024		
MC frequency, duration, and term	*Frequency of delivery during the academic year:* Once per academic year	*Duration (e.g. 6 weeks). If block delivery applies provide details:* One semester – 12 weeks	*Indicate term(s):* Michaelmas ☐ Hilary ☒ Trinity ☐

Contact and independent study hours (note: 5 ECTS is equivalent to 125 student learning hours)	Learner contact and independent study hours	No. of Hours	
	Contact Hours such as Lecturer/tutorial contact hours	12	
	Self-directed/independent study	24	
	Assessment	89	
	Total	125	

MC learning outcomes (approx. 5)	**What are learners expected to do, know, and understand at the end of the course?** • Refer to the QQI framework for the Knowledge and Competencies required at NFQ level 9 (Addendum 1). On successful completion of this micro-credential, learners will be able to: LO1. Explain key concepts relation to evaluating the sustainable performance of engineering products, systems, or processes such as carbon footprinting, life cycle assessment, and the circular economy. LO2. Describe and evaluate the breakdown of contributions within a carbon footprint of given engineering product, system, or process. LO3. Demonstrate an understanding of the life cycle analysis process by outlining the principles, procedures, and tools to support LCA and complementary assessment methods. LO4. Produce a complete LCA to appraise the environmental impacts of an engineering product, system, or process. LO5. LO6. Identify opportunities for design improvements in engineering products, systems, or processes to achieve trade-offs or win-wins in terms of environmental (LCA), economic (LCC), social (S-LCA) and holistic sustainability (LCSA) priorities. LO6. Differentiate between methodological approaches and decision-making in the LCA process and its impacts on the perceived performance of engineering product, systems, or processes. LO7. Compare and evaluate the similarities and differences between life cycle assessment and more nuanced methods such as circularity measurement and assessment.

MC content areas. *(Bullet points can be used)*
 	
If the MC (or components) will be
	Thematic areas covered in the module include:
	  • Carbon-footprinting: A 1-dimensional Life Cycle Assessment (LOs 1-2)
	  • Systematic literature Reviews: A Tool to Critically Evaluate LCA Research (LOs 2-6)
	  • Life Cycle Assessment: ISO 14040: Principles and Framework (LOs 1&3)

Updated August 2022

delivered in a blended format, identify the content that will be delivered online.	• Life Cycle Assessment: ISO 14044: Requirements and Guidelines (LOs 1&3) • Economic, Social and Sustainability Life Cycle Considerations (LCs 1&5) • Going beyond LCA: Circularity Measurement & Assessment (LOs 1&7)
Teaching and Learning Methods (state pedagogical approach). Include the online environment(s) to deliver the MC e.g. Blackboard/ZOOM, if appropriate.	**What types of teaching and learning methods will be used to support learners in achieving the learning outcomes?** The module content is driven by self-directed online learning content providing a flipped classroom experience for students. The pre-recorded sessions are released fortnightly, with supplementary reading and questions to be responded to within the online discussion board. A complementary tutorial or discussion group session takes place 10 days after the release of each session, with further reflection questions to be addressed and an in-class dialogue encouraged to share knowledge and experience of those within the class. The self-directed learning components and their accompanying tutorials / discussion groups will take place fortnightly and out-of-work hours, a weekday evenings from 7.00-8.30pm. **A p**roblem-based learning approach is applied within this module for assessment, as the module learning outcomes requires knowledge development thoroughly (i) directly applying the LCA methodology to evaluate a product, system or process for its sustainable credentials, or (ii) undertaking an independent critical appraisal of other LCA studies to evaluate the integrity of the LCA methodology by other practitioners. The virtual learning environment (VLE) is Blackboard Collaborate and student will be provided with access to all module content (online sessions, lecture notes, suggested reading, and other resources). Discussion boards will be provided for all students to provide a space for students to post responses to questions posed during the asynchronous sessions. This will encourage engagement prior to the synchronous sessions and support peer-to-peer learning through sharing valuable information between the class identified during independent study. Key comments will be drawn from the discussion board to shape the thematic discussions of synchronous live tutorials / discussion groups. Coursework provides opportunity to demonstrate independent learning through developing new critical thinking (reviewing literature and evaluating the quality in LCA studies) procedural (undertaking an LCA) and presentation (summary of LCA review) skills, as well as using new tools (ecoinvent LCA database) and applying new methods (apply ISO 14040 and ISO14044 LCA standards). The Feedback will be provided using a grading rubric through Blackboard which will offer further opportunity to evaluate and reflect upon performance. **What is the rationale behind the selection of these strategies?** • How do they support the learning required to achieve each LO? The self-directed learning sessions introduces the different thematic sessions, with live discussion and tutorial sessions providing complementary practical knowledge and supporting students working through their coursework. • How do they support students in successfully completing the assessments?

Updated August 2022

	The use on Blackboard tools to provide discussion boards and other in-person interactive sessions will ensure students are supported as they progress through the module.
	• How do they fit in with the mode of delivery and with the contact and independent study hours outlined above?
	Each LO is addressed in one or multiple dedicated sessions, and the order of delivery, independent study, contact hours, and submission of coursework ensures a clear pathway for students to navigate the module.
MC assessment components *How will the MC be assessed?*	**How will the MC be assessed? (***Use assessments that are known to be effective in measuring the types of LOs used).* Access the Academic Practice online resource for guidance on selecting appropriate assessment strategies. 100% Coursework, made up of three components: (i) a systematic literature review of LCA studies (50%); (ii) a presentation of your findings from the critical LCA review; (iii) an LCA case study or an engineering product/system/process. **Briefly outline the rationale for your assessment choices, indicating how they assess the achievement of the relevant learning outcome.** The coursework is designed to give students a unique experience of life cycle assessment (LCA), through the product, system, or service they independently evaluate through a quantitative analysis, an in-depth review of existing LCA literature, and a reflective presentation. The LCA case study allows each student to quantitative undertaking a LCA for a unique product, system or process, and the quality of the work relies of their ability to follow the stages of the LCA and provide individual interpretation and discussion to the results founds. The systematic literature review subsequently helps students to decipher LCA best-practice from other's work, and to reflect upon it based on their own experiences. Finally, the presentation provides an opportunity to reflect and share their experiences on their LCA experience from literature and practice. Fortnightly synchronous discussion groups are shaped by information added to the discussion forum and reflective diaries, which are as a response to reviewing asynchronous materials and reviewing suggested reading in each session. This prompts students to share experiences and individual learnings based on experience, enhancing the overall learning experience.

Assessment Component (state assessment type)	Formative / Summative	Group/ Individual	% Weighting	Learning Outcome(s)
1. LCA Case Study	Undertake an LCA of an Engineering Product, System or Process. (2,000-word limit)	Individual	40%	LOs 1-5
2. Systematic Literature Review	Critical Evaluation of LCA Research through a brief systematic literature review. (2,000-word limit)	Individual	50%	LOs 1-3,5-7

3. Presentation	Oral presentation of critical LCA Review highlighting key learnings. (8-10 minute, in-class)	Individual	10%	LOs 1-7

An individual rubric is provided for each element of coursework, and the following reflects the criteria considered in grading each assessment:

1. Case study: presentation (10%), 4 stages of LCA (goal & scope (10%), inventory (10%), impact assessment (20%), interpretation (40%)) and conclusions (10%).
2. Review: presentation (10%), protocol (20%), 3 figures (20%), evaluation of each of 4 stages of LCA (4x10%), conclusions (10%).
3. Presentation: quality of presentation (10%), organisation (10%), and content (10%).

Feedback will be provided individually to each student, within 1-month of coursework submissions, and via Blackboard where the assignment is submitted.

Micro-credential Specific learning environment(s) required to deliver the micro-credential.	**What specific learning environment(s), technologies and /or software are required to deliver/participate in the micro-credential?** (e.g. laboratory practice, clinical placement, reliable broadband, laptop/PC and headset for online sessions. Additional specific software applications may also be required.) A laptop/PC and headset is required for online sessions. MS office (Word and Excel) will be required for your coursework. Your computer will also be required to access the LCA database via an online browser and access Trinity's online library resources to review required literature for coursework.
Learner supports provided.	**What specific learner supports will be put in place to accommodate diverse learner needs? Consult:** Trinity Inclusive Project and Trinity Disability Service Individual modifications as required by individual students and to link in with appropriate services such as Trinity Disability Service. We also intend to use Blackboard Ally and ensure all presentations (where possible) have a pdf and that (where possible) lectures are recorded. This may not always be possible if discussing confidential or sensitive topics.
State how the MC will be reassessed if failed (include timelines for reassessment)	Resubmission of failed coursework components. A two-month timeframe is provided to resubmit failed coursework components.
Pass standard & any special requirements for passing the MC	Resources: Calendar III To successfully complete an MC all requirements of the MC must be fulfilled. 50% Pass Mark

Penalties for late submission	Late submissions without permissions for an extension will be capped at 50%.
Core reading / Library resources	A range of standards in ISO 14000 and ISO 59000 families of standards, which can be accessed as licenced electronic resources, through the Trinity library website. All other suggested reading lists are provided as part of the self-directed online learning, which will be made available through Trinity Library's offsite e-collections or online open resources.
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 micro-credential been discussed with the other School/discipline and their DUTL/DTLP?** **Select option below…**
Proposed student fee	**EU/NEU 1530**

Faculty Dean and School Executive Approval:

Date of approval of the proposed MC by the School Executive: 30/09/2022

Date of approval of financial information by the Faculty Dean: 13/10/2022

Signed by Head of School: Signed by Faculty Dean:

See memo

Date: 23/03/2023   Date: 13/10/2022

Checklist

Is the following attached with the micro-credential descriptor:	Yes (tick if applies)
Financial template	☒
Scheduling spreadsheet	☒
Signature of Head of School	☒
Signature of Faculty Dean	☒

Have you consulted with:	Yes (tick if applies)

Updated August 2022

The Micro-credentials Team ☒

Other Schools/Disciplines where there may be related disciplinary expertise ☒

Have you notified Academic Registry regarding new micro-credentials ☒

Have you checked if there are similar MCs on offer in the School ☒

or in another School participating in the pilot (www.tcd.ie/courses/micro-credentials)

Submission of completed form: **Upload to your School folder on SharePoint (Micro-credentials)**

Updated August 2022