Module Code	MEU11E17
Module Name	Engineering Practice 2
ECTS Weighting	5 ECTS
Semester taught	Semester 1
Module Coordinator and lecturers	Professor Kevin O'Kelly (okellyk@tcd.ie) - coordinator Professor Muhammad Ali (Muhammad.ali@tcd.ie) Professor Khurshid Ahmad (khurshid.ahmad@scss.tcd.ie) Assistant Prof. Enda Bates (ebates@tcd.ie)
Module Learning Outcomes (LOs) with reference to the Graduate Attributes and how they are developed in the discipline	LO1. Understand the wider role of the professional engineer in society; LO2. Learn to articulate the ethical, economic, social, regulatory and political issues that also arise in the context of a technical project; LO3. Organise a team project by defining team roles and planning a set of tasks and actions; LO4. Manage a team project by defining a programme, milestones and deliverables and checking progress and monitoring results LO5. Self-structure a work programme around a set of open ended questions LO6. Apply structured design processes to achieve design outcomes LO7. Provide evidence for ideas, concepts and suggestions; LO8. define quantitative and qualitative design objectives LO9. Write a well-structured data-supported report based addressing a large loosely defined engineering challenge, and make an oral presentation matched to a target audience. LO10. Apply principles of sustainability in engineering design LO11. Understand professional ethics and the ethical use of AI in design and report writing. **Graduate Attributes: levels of attainment** • To act responsibly - Introduced • To think independently - Introduced • To develop continuously - Introduced • To communicate effectively - Introduced **Note on GenAI:** *Some of the content in this module will address the use of Generative AI (GenAI) in engineering practice. It is inevitable that the use of GenAI will continue and increase in the future so it is important for engineers to know how to use it ethically, maintaining integrity and accuracy in the work we do. It is also*

	important for engineers to understand the need to verify and validate engineering work (i.e. designs, analyses, results). This is something the profession always required but with the power and ease of GenAI, it is more important then ever. *While learning about the use of GenAI in engineering practice is important, it is essential that students understand our School's policy that GenAI cannot be used to create work submitted for assessment unless directives are given by the specific module coordinator. This constitutes plagiarism in the same way as unacknowledged use of published material.*
Module Content	Like any professional person, engineers make technical decisions that impact people, societies and the environment. This module introduces students to professional engineering with emphasis on evaluating emerging technologies that will impact the engineering profession at all levels. Part A introduces topics that are universal to engineering projects and Part B requires the students to carry out a group project that puts those topics into practice. Part A1: Relevant Topics for Engineering Design 1. Sustainability and Environmental Considerations in Engineering Design/Projects 2. Professional Engineering Ethics Part A2: Professional Behaviour in Engineering Projects 1. Generative AI in Engineering work. 2. Project Management, Report Writing & Presentation skills Part B: Group Design Project (7 weeks)
Detailed Syllabus	**Part A: Topics for Engineering Design** 1. Sustainability and Environmental Considerations in Engineering Design/Projects • Blue humanities technical, cultural, historical, and social dimensions of human-water interactions. • Blue Circularity and Zero Liquid Discharge • Carbon Footprint and Energy Usage • Quantitative Climate Change

2. Professional Engineering Ethics
   - General ethics (issues of plagiarism, data manipulation etc.)
   - Professional Engineering ethics (Engineers Ireland code of ethics, case studies in failures and responsible design)

3. Generative AI and Engineering.
   - Generative AI terminology and core concepts – large language models, large vision models, generative (pre-trained) transformer(GPT) technology.
   - Generative AI and its uses in product design, bridge design, and aerodynamic optimization, and design of exoskeletons
   - Demonstration of publicly available generative AI-based software tools for engineering design
   - Ethical use of generative pre-trained transformers (GPT for example ChatGPT and Deep Seek) for report writing and project presentation

4. Professional skills: Project Management, Report Writing and Presentation
   - Technical PM elements (scope, work breakdown structure, PERT analysis, Gantt charts, Risk registers, human factors)
   - PM Case studies (1 large EU research project and 1 construction project)
   - Engineering report writing
     - Use of data and evidence in report writing
   - Presentation Skills

Part B: Group Design Project (7 weeks)

Engineers are often expected to deal with vague design objectives, multivariate problems, multidisciplinary teams, time, work and cost management and communication to non-technical audience

In order to give students experience, they are placed in groups of 5-6 and tasked with developing and presenting a design addressing a high level challenge over a 6 week period. The students are expected to:

- brainstorm possible solutions
- critically evaluate each option against measurable targets
- select an option and define the scope and deliverables
- break down the project into workpackages and tasks
- define the quantifiable objectives of each task
- agree on roles and tasks for each team member
- prepare a final report and presentation

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<tr><td>Teaching and Learning Methods</td><td>This module is taught using lectures in the first 4 weeks and group project sessions for 6 weeks. The project sessions are a combination of timetable sessions and self-structured sessions overseen by Teaching Assistants.

Learning is achieved using primarily formative methods.</td></tr>
<tr><td>Assessment Details</td><td>
<table>
<tr><th>Assessment Component</th><th>Assessment Description</th><th>% of total</th><th>Week due</th></tr>
<tr><td>A. Written report</td><td>Long technical report</td><td>40%</td><td>Week 12</td></tr>
<tr><td>B. Oral presentation</td><td>Oral presentation by all group members</td><td>60%</td><td>Week 13</td></tr>
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IMPORTANT: Students must attend all scheduled sessions and attendance will be used to moderate the final mark.
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<tr><td>Reassessment</td><td>Written assignment (100%)</td></tr>
<tr><td>Contact Hours and Indicative Student Workload</td><td>Contact hours: 44 (16 lectures + 28 project sessions)

Self-scheduled individual and group work): 80 hours</td></tr>
<tr><td>Recommended Reading List</td><td>None</td></tr>
<tr><td>Module Pre-requisites</td><td>None</td></tr>
<tr><td>Module Co-requisite</td><td>None</td></tr>
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