



Written submission: Consultation on the draft Leaving Certificate Engineering specification

NCCA is redeveloping Leaving Certificate Engineering. The aim of this consultation is to obtain the open and honest views of all stakeholders: students, teachers, parents, and other interested parties. The feedback gained from the consultation will inform the work of the development group in preparing the final specification.

NCCA would greatly appreciate your feedback on the draft specification which can be found here: [Leaving Certificate Engineering](#)

When providing feedback, observations or comments, please reference the specific section and / or relevant learning outcomes.

The closing date for this consultation is 2nd May 2025 at 5pm.

Data protection and open data section

NCCA is committed to protecting your privacy and does not collect any personal information about you through this written submission, other than information that you provide by your own consent. Where a respondent selects 'yes' to the question: *Are you consenting to be listed as a respondent to this consultation*, respondents are consenting to having their name / organisation's name published in the final report as respondents to the consultation.

Where a respondent selects 'yes' to the question: *Are you consenting for your submission to be published*, respondents are consenting to having their submission published on ncca.ie.

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Respondent's details

What organisation are you submitting on behalf of?

Penn Engineering

Are you consenting to be listed as a respondent to this consultation?

☐ **Yes**

If yes, please enter the name you wish to have published in the final report.

Ian Murphy

Are you consenting to have the submission published on ncca.ie?

☐ **Yes**



Rationale, Aim, and Key Competencies [Pages 2,3 and 5]

Rationale: The rationale (P.2) outlines the nature of Engineering and the role and importance of Engineering in realising the purpose and vision of senior cycle.

Aim: The Aim (P.3) outlines the over-arching purpose of the subject and the relevance and expected impact of the subject on student learning.

In your opinion, do the rationale and aim capture the overarching purpose and nature of Engineering; the importance of the subject in realising the vision of senior cycle and the relevance and expected impact of this subject on student learning. Please provide specific feedback / observations / comments.

Yes, we believe that they do.

Key Competencies: Key competencies is an umbrella term which refers to the knowledge, skills, values and dispositions students develop in an integrated way during senior cycle. These competencies are linked and can be combined; can improve students' overall learning; can help students and teachers to make meaningful connections between and across different areas of learning; and are important across the curriculum.

The draft specification sets out examples of how key competencies can be developed in Leaving Certificate Engineering (P.5 – 8)

In your opinion, does this section effectively capture the development of student key competencies in Leaving Certificate Engineering? Please provide specific feedback / observations / comments.

Yes, we believe so.



Strands of study and learning outcomes [ADD PAGE NUMBERS]

Course overview: The course overview sets out the knowledge, skills, values and dispositions for students in four strands. The specification emphasises a non-linear, integrated approach to learning across the strands. The details of the strands are described on pages 8 - 22 of the specification.

The details of the cross-cutting themes are described on pages 8 – 9 of the specification.

In your opinion, does the structure illustrate the connected nature of the strands and the development of student knowledge, skills, values and dispositions in an appropriate way? Please provide specific feedback / observations / comments.

Yes, the strands are clearly cross linked and refer to each other. There is a clear connection between outcomes from different strands being achieved simultaneously. However, we do note that the general and non-specific nature of the learning outcomes leave a lot open to the interpretation of the teacher, student and State Examinations Commission.

Strand 1: Engineering Processes (P.12 – 14)

Please provide your views on the learning set out in this strand with reference to

- clarity for planning for teaching and learning
- alignment with the rationale and aims
- opportunities for the development of key competencies and
- access and challenge for all students.

Please provide specific feedback / observations / comments.

While we welcome the learning outcomes, and the breadth of some of them, in Strand 1, as several of them directly relate to the operations of our member companies, we would have some concerns.

Clarity for Planning for Teaching and Learning

We are concerned that the Learning Outcomes lack clarity, with no indication of how they will be delivered upon. The lack of detail regarding the delivery of these Learning Outcomes remains a concern. We constantly develop upskilling courses for our members, either as stand-alone programmes or in conjunction with third level institutions. As part of this process, we develop a set of Learning Outcomes, but back these up with syllabus content to ensure that these Learning Outcomes are met, and to ensure consistency of delivery across all our members. The lack of a guiding syllabus is a notable absence.

**Alignment with Rationale and Aims**

In our experience, the rationale clearly sets out what Engineering is about, especially the first paragraph – referring to the dynamic nature of the industry, as well as the blend of theory, practical and creativity. The aims also align with our aims in industry, especially Aims 2, 3, 4 and 7. We operate based on developing our own pool of talented and skilled workers, as opposed to head hunting. It is our experience that we develop a more skilled workforce, experience less staff turnover, greater job satisfaction and greater staff loyalty. We are concerned that the nature of these Learning Outcomes does not fully address the needs of our industry. Most of our recruits join us straight from second level and continue their education through their involvement in our companies – be that through apprenticeship programmes/third level programmes/further education. We are concerned that Aim 7: “provide a broad educational experience that prepares students for future studies and the workforce as well as developing awareness of future careers and opportunities” isn’t fulfilled. We query where it’s envisaged that students will have the opportunity to demonstrate Learning Outcomes 1.7, 1.11, 1.12, 1.19 and 1.20 in an examination situation. While they can demonstrate these in their normal classes, the opportunity to do so for state certification purposes isn’t there. We believe that students currently have this opportunity as part of the Engineering Day Practical Examination, but this opportunity will not be afforded to them in the future, as per this draft specification.

Opportunities for the development of key competencies

We are delighted to see the inclusion of Learning Outcomes 1.13, 1.14, 1.15, 1.16 and fully support the inclusion of CNC Machining in the draft specification. This is the core of our business, and we have supported schools in this to date. We have arranged for member companies to sponsor the installation of 3-axis CNC Milling Machines, and associated training, for a few schools in our region, including St. Clements, Limerick, St. Caimins, Shannon, and CBS Sexton Street, Limerick. We have actively supported teachers and students to experience CNC machining and develop an interest, competency and understanding of the sector – with the aim of increasing the number and improving the quality of our recruits. We would like to see an added emphasis on these learning outcomes, with these reflected further in learning outcomes in Strands 2, 3, and 4. These outcomes will help students develop the key competencies required for industry, and for our member companies.

The inclusion of “fundamental concepts of reliability” is a welcome addition, as it is a core part of the daily running of our members businesses. We aim to minimise machine downtime and is a value we instil in our new recruits from day 1. Being exposed to this as part of their Leaving Certificate studies is welcomed.

Practical work, and the completion of same, affords students the opportunity to develop the competencies of Thinking and Solving Problems, Being Creative, Cultivating Wellbeing and Managing Learning and Self. The sense of achievement of students upon completing a project cannot be underestimated and certainly adds to their Wellbeing. We would observe this among our machinists daily. The addition



of a Second Additional Assessment Component will help add to this and improve on these competencies.

Access and challenge for all students.

We see this strand as being very accessible to students. We see several Learning Outcomes being supported and achieved in the practical element of the course. We would be concerned that not all Engineering Rooms would be equally equipped – observed from school visits and discussions with our staff/past second level students. We strongly believe that students should be afforded the opportunity to experience and engage with CNC Machining at a young age. To ensure that this can happen, it is imperative that adequate funding (initial purchase and ongoing maintenance) is put in place, as well as proper training for teachers.

Strand 2: Automation and Control Systems (P.15-16)

Please provide your views on the learning set out in this strand with reference to

- clarity for planning for teaching and learning
- alignment with the rationale and aims
- opportunities for the development of key competencies and
- access and challenge for all students.

Please provide specific feedback / observations / comments.

Clarity for Planning for Teaching and Learning

Like Strand 1, we would have concerns around the broadness of the outcomes, and the lack of detail or how these outcomes will be delivered/achieved. The lack of detail in the Learning Outcomes means that they will be open to several interpretations and will be exam led as opposed to classroom led. While we would welcome the inclusion of several outcomes, such as 2.4, 2.5, 2.14, we remain concerned at the broadness of others, most notable the “approaches to designing HMI” learning outcomes. The use of the verb “appreciate” in outcome 2.10 lacks detail and direction. Learning outcome 2.11 will need ongoing financial support to ensure that students achieve it – is ongoing financial support planned for this? We would suggest the inclusion of “processes” in outcome 2.2 and the header for outcomes 2.4-2.6

Alignment with Rationale and Aims

This strand aligns with the Rationale and Aims of the specification. We have no further observations to make on this point.

**Opportunities for the development of key competencies**

This strand offers good opportunities for the development of key competencies. From our observation of Second Level, Wellbeing is interwoven across all subjects, as well as a stand-alone offering. Some of the Learning Outcomes in this strand specifically relate to this competency – 2.13 for example. Students successfully debugging a faulty system, and completing the task certainly improves wellbeing.

Access and challenge for all students

This strand would help challenge students, especially in the areas of problem solving, critical thinking and design. We strongly believe that this strand will benefit from real world examples to make it relatable to students e.g. 2.4 and 2.5 refer to sensors and calibration of same in CNC machining – which is our core business. We welcome this strand, and, despite the general vagueness around the language and outcomes, we can see the practical application of it in industry. We hope that this will transfer to the classroom and examination experience.

Strand 3: Design Capability (P.17 – 19)

Please provide your views on the learning set out in this strand with reference to

- clarity for planning for teaching and learning
- alignment with the rationale and aims
- opportunities for the development of key competencies and
- access and challenge for all students.

Please provide specific feedback / observations / comments.

Clarity for Planning for Teaching and Learning

As per the previous 2 strands, we remain concerned at the general nature of the learning outcomes, the openness to interpretation, and how that will be experienced by students in the different classrooms and workshops across the country. To improve the clarity of some of the learning outcomes, we propose the following changes:

LO 3.6: change to “describe and apply the steps involved in the engineering design and manufacturing processes” – the inclusion of manufacturing will strengthen this outcome and encourage students to consider manufacturing as well as design.

LO 3.7: change to “create a design folio to document and evaluate the design and manufacturing processes” – this will not only encourage students to evaluate their design, but also how they manufactured the design, the processes they used, the skills they developed and how they can improve on them in future.

**Alignment with Rationale and Aims**

We find that these learning outcomes align with the rationale and aims. We see the opportunity that the inclusion of a second additional assessment component will present to students to allow them to be accurately assessed on Learning Outcome 3.15, with the existing day practical addressing this already. The inclusion of a second additional assessment component, with a working drawing as part of this assessment, will motivate and ensure that the students will be able to apply tolerances, limits and fits in their project work, and this will stand to them as they progress into engineering careers, be that directly into industry or through education.

Opportunities for the development of key competencies

Again, this strand offers students to develop key engineering and Senior Cycle competencies. Communicating is a key competency that is developed in this strand, from understanding technical sketches to creating drawings and a folio. Communication can also be through a physical artefact, such as a project/piece/prototype, and this is accounted for in LO 3.16

Access and challenge for all students

This strand allows students to develop creativity, technical know-how and critical thinking. However, it would be aimed at the higher achieving student, using calculations in LO 3.14 (lack of detail/prescribed formula a concern here) along with LO 3.11. This outcome is very broad and requires the ability of a student to engage in higher order thinking. There are some high expectations from this strand, and we would hope that, with more detail, students will be able to achieve all learning outcomes.

Strand 4: Engineering Principles and Energy (P.19 – 22)

Please provide your views on the learning set out in this strand with reference to

- clarity for planning for teaching and learning
- alignment with the rationale and aims
- opportunities for the development of key competencies
- access and challenge for all students.

Please provide specific feedback / observations / comments.

Clarity for Planning for Teaching and Learning

In line with our observations on the previous 3 strands, we remain concerned at the lack of detail associated with these learning outcomes. The use of the verb analyse, without clear guidance, leaves some of the learning outcomes wide open to misinterpretation and misunderstanding. There is a few learning outcomes that refer



to calculations – but no further detail on these calculations. From our reading of this, and interpretation of the document, we would see this as being geared towards the high achieving student, who may be considering an Engineering course at 3rd level, as opposed to a student who is considering progressing directly into industry or an apprenticeship. We would urge that the following learning outcomes be further refined, or prescribed calculations/expectations specified:

4.11, 4.13, 4.14, 4.17, 4.20, 4.21, 4.22, 4.26.

We welcome the inclusion of the study of the microstructure and micro-properties of engineering materials. We would deem an understanding and achievement of Learning Outcomes 4.7, 4.8 and 4.9 to be crucial in the Engineering industry.

Alignment with Rationale and Aims

It is our view that this strand aligns with the rational and aims of the subject.

Opportunities for the development of key competencies

This strand will ensure the development of the key competencies, especially for the higher achieving student. We would have concern at the level of achievement for the weaker or more practically focussed student, especially in wellbeing.

Access and challenge for all students

This strand will offer students the ability to learn in a hands-on environment and develop some key engineering principles. The continuing theme of environmental awareness is to be commended and is welcome. It is a challenge in the metal removal manufacturing, and one that we are addressing in industry. We do note, with concern, that students who have difficulty in the areas of maths and physics, will find this strand challenging. Some of the technical vocabulary will prove challenging as well, but the motivated student should be able to overcome this challenge.

Additional Assessment Component (AAC)

The design and manufacture project provides an opportunity for students to display evidence of their learning across all strands of the specification. The senior cycle key competencies of thinking and solving problems, being creative, communicating, working with others, and managing learning and self, developed through working with learning outcomes across the specification, will be applied through the student's engagement with the project.

A Design and Manufacture Project brief will be issued annually by the SEC. The brief will set out the requirements for the Design and Manufacture Project and will:

- set a context for the project
- provide guidance to students in the development of their project work



- allow students to develop their knowledge and understanding in areas related to the brief
- facilitate teachers and students in their planning.

This experience will allow students to demonstrate their creativity, showcase the breadth and depth of their practical and manufacturing ability, and refine their communication techniques as they develop, implement, and document their progress through the design and manufacturing process.

Please provide specific feedback / observations / comments on the AAC in Leaving Certificate Engineering with reference to how the AAC might motivate students, how it aligns to the learning outcomes in the specification and how it facilitates the development of key competencies.

We acknowledge and appreciate the importance of the practical element included in the study of Leaving Cert Engineering. It affords students the opportunity to experience the satisfaction of making something tangible and physical, by following a process from design to realisation. We are concerned that the proposed additional assessment component doesn't require students to demonstrate a standard of precision, as they will have the ability to edit drawings to ensure that they have the appearance of exercising precision. We recognise the importance of a design and make project, as this allows students to follow a project from inception to design to realisation. We also realise the importance of a student being able to reflect on their work, as well as evaluate it. The proposed additional assessment component allows students to experience this.

The inclusion of a second additional assessment component, similar to Construction Technology, will ensure that the skills of interpreting working drawings, accuracy, precision, high quality surface finish, applying tolerances, applying limits, applying fits, time management and safe working practices (both in terms of machining and benchwork) continue to be developed, assessed and rewarded as part of the final grade in Engineering. The lack of a second additional assessment will lead to a removal of one of the "doing" elements of LC Engineering, which will steer away from what our member companies in the PTMA and industry do. We strongly advocate for the inclusion of a second additional assessment component. We envision that it will ensure that students achieve Learning Outcomes 1.7, 1.11, 1.12, 1.19, 1.20 and 3.15, and allow them to receive state certification in recognition of achieving these. It will also serve to ingrain the skills of precision, as well as affording all Engineering students a level playing field when it comes to a practical assessment.



Supports for Successful Enactment

Please provide specific feedback / observations / comments on supports that might be needed for successful enactment of this subject specification.

In line with our mission, we would like to see LC Engineering students exposed to high-quality manufacturing standards, as well as technical innovation. We strongly advocate for an updated machinery list for Engineering Rooms, to include additional CNC Machining resources – namely a CNC Milling Machine along with a CNC lathe. A benchtop 3-axis CNC Milling Machine wouldn't be cost prohibitive, easy to maintain and allow students to engage with CNC programming – from design to manufacture. Students would also be able to engage with CNC programming, explore the programme, and develop the skills and know-how to make changes within the programme.