# 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.

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## 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.

Any personal information you volunteer to the NCCA will be respected and NCCA will apply the highest standards of security and confidentiality in accordance with GDPR (2016) and the Data Protection Acts (1998 - 2018). Further information on the NCCA's Data Protection Policy can be found at https://ncca.ie/en/legal-disclaimer-and-data-protection/.

NCCA, as a public body operating under the Open Data and Public Service Information Directive (2021), is required to publish publicly funded research. In accordance with this Directive, any data from this will be anonymised and aggregated and only made available after the final report is published. This is expected to be in June 20254. All open data is made available alongside the report itself on the website www.ncca.ie

NCCA may use the data you provide in the form of quotations. Where this happens, the quote will be anonymised.

## Respondent's details

What organisation are you submitting on behalf of?

Engineering Industries Ireland, an Ibec Trade Association.
About Engineering Industries Ireland
As Ireland's engineering business representative group, Engineering Industries Ireland, an Ibec Trade Association represents over 155 industrial engineering manufacturing and services companies in Ireland. The engineering sectors we represent have exports at €8.8 billion or 3.6% of national exports, 10,800 enterprises employing 50,751 people and 65% indigenous companies.
Our members are involved in industrial automation, precision engineering, agriculture machinery, material handling, packaging, energy and environment, process engineering, automotive, metal fabrication and processing, renewables and engineering services.
We represent engineering businesses, both homegrown and multinationals, big and small, to advocate for a supportive business environment, as well as provide expert employer relations, industry insight and incomparable networking opportunities for our members.

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

- Yes Yes
- No

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

Engineering Industries Ireland, Ibec

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

- Yes Yes
- No

## 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.

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| Yes, the rationale is well-articulated. The emphasis on enhancing creativity, problem-solving skills, design, and critical thinking through practical applications to engineering challenges is expected to cultivate an engineering mindset, enabling the effective application of scientific principles to real-world scenarios. The aims are suitably ambitious and appropriately chosen. It captures the essence of engineering and its importance to society, providing a solid foundation for student learning and future success. |

**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.

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| In engineering, competencies such as critical thinking and problem-solving are important for success in developing innovative solutions to complex challenges in technical fields. Creativity drives innovation, enabling engineers to design and improve systems efficiently. Effective communication ensures ideas are conveyed clearly, facilitating collaboration and knowledge sharing. Working with others fosters teamwork, which is critical in multidisciplinary projects. Active participation in society allows engineers to address real-world needs and contribute to technological advancements. Cultivating well-being promotes resilience and productivity, while |

managing learning and self-development and developing of project plans with defined goals, timelines and resource management is integral to the study of Engineering. These competencies collectively shape well-rounded engineers equipped for success.

## 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.

Overall, the learning outcomes are well articulated and appropriate for the study of engineering at both lower and higher level with well-chosen cross cutting themes for a modern engineering field of study. Addition areas for inclusion in a now more regulated world of engineering are “industry standards and regulation” e.g. health and safety and CE marking as most common in use. Other cross- cutting themes that may be considered are Project Management, Presentation Skills, Coaching and Mentoring.

## 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.

Overall, the Engineering Processes strand is a very important. It is well planned and aligned with key competencies and challenge consideration evident in the specification, we are proposing some further changes. Preventative maintenance, quality management, and lean thinking are fundamental to efficient and sustainable engineering processes and should be integrated in this Strand 1. In addition, narrow the focus of the learning outcome 1.8 by specifying a core set machines e.g. 3D printers for additive manufacturing and basic CNC machines or manual tools for subtractive processes. The inclusion of digital technologies is of critical importance in the context of current trends within engineering.
The emphasis on sustainable practices and the right to repair aligns with the broader goals of fostering ethical responsibility and environmental awareness. Potential to also introduce the idea of circular economies here.
Encouraging students to work in cooperation with others and reflect on their contributions promotes teamwork and critical self-assessment. This is of critical importance but is well represented all throughout the curriculum specification.
Overall, Strand 1 is well-structured and aligns with the overall rationale and aims. It should be both accessible and challenging for most students. It provides a solid foundation for learning and future success in the field of engineering.

## 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.

There are clear and well written learning outcomes for Automation and Control systems as part of the Engineering specification. Strand 2 covers a wide range of topics, from system analysis and control to autonomous systems and energy efficiency. This is a comprehensive curriculum that should allow students to gain a well-rounded understanding of automation and control systems.

This strand is largely hands on which is appropriate for this level of automation and control.
This strand sets out reasonably challenging and ambitious learning outcomes however will provide students with a good base knowledge of Automation and Control Systems. Accessibility may be a challenge here. In Learning Outcome 2.7 to 2.9. It is rare that an engineer can select the energy source for a specific control system.
There is a missed opportunity to reference regulatory standards related to the construction and safety of automated systems within this strand.

## 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.

This strand is essential, emphasizing the application of design principles and engineering tools to develop solutions for real-world challenges, culminating in a fully realized design ready for manufacturing within the engineering classroom. However, it currently lacks a structured project management framework to support the achievement of its objectives. Key stages such as comprehensive planning, design specifications, peer design review, prototyping, testing, reporting, risk management, and cost control are not explicitly addressed. Integrating these elements into the learning outcomes would provide a more complete understanding of the engineering design process within the engineering field.

Example Learning Outcome: Develop project planning skills by navigating primary stage gates and understanding the rationale behind structured project progression.

## 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.

Please find comments below on learning outcomes within Strand 4 Engineering Principles and Energy

Overall, Strand 4: Engineering Principles and Energy is well-structured, aligns with the overall rationale and aims, supports the development of key competencies, and is designed to be accessible and challenging for students. It provides a solid foundation for learning and future success in the field of engineering. Strand 4 covers a wide range of topics, from the SI system of units and material properties to energy management and mechanical and electrical principles. This is a comprehensive selection of basic engineering fundamentals which can be applied across disciplines.
The emphasis on energy management, efficiency and renewable energy sources is of particular relevance here. The learning outcomes defined around energy conversions and energy efficiency is well defined however there could be a more ambitious set of learning outcomes defined around AC & DC Electrical Systems.

Section 4.5. Understand the differences between destructive and non-destructive testing – with specific examples and use cases.

Section 4.6. Material selection would often be tied into the parameters identified in a design requirements survey. Where purely interested in mechanical properties then material selection charts are consulted. See “Materials Selection in Mechanical Design” by Michael F. Ashby. ISBN 978-0443160288. The actual use and calculation of these charts is likely beyond the desired standard for senior cycle however it would be useful for students to be aware of their existence and basic usage.
In the energy section – 4.11. through 4.15. It would be good to have an exploration of the costs of mechanical services provision in a manufacturing facility. Often the provision of compressed air is one of the highest energy costs for a manufacturing business and this would be a good thing to include in energy efficiency.
Key techniques here – leak identification, flow and pressure requirements (can these be reduced??), energy efficient compressors, soft start VFD driven equipment vs hard start, etc.

## 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.

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| The design and manufacture project is welcomed by the Engineering industry and some members proposed a higher proportion of the marks should be assigned to the AAC. Specific emphasis should be placed on the quality and completeness of the documentary evidence and the application of the scientific method at all stages. The project should demonstrate the student's ability to plan, critically assess, and execute the project. However, the key components of the student's success should be considered in the planning, critical assessment, and excellence in documentation. |

## Supports for Successful Enactment

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

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| Enhanced Engagement: Incorporating more opportunities for students to engage with industry professionals or visit real-world engineering sites could further enhance the relevance and motivation of the project.<br><br>Feedback Mechanisms: Providing structured feedback mechanisms throughout the project could help students refine their work and develop their skills more effectively. |

Diverse Project Options: Offering a range of project options that cater to different interests and strengths could ensure that all students find the AAC engaging and rewarding.

Continuous Professional Development: Ongoing upskilling of teaching staff is essential to ensure they can confidently deliver all aspects of the engineering curriculum. Given the rapid advancements in manufacturing technology, particularly in additive manufacturing, AI automation continuous training and revision may be necessary. Opportunity for Engineering teachers to take up industry placements should be encouraged and funded.

Resource and Equipment Support: Sustained investment is needed to cover the costs associated with machinery, consumable materials for projects, equipment maintenance, and essential PPE to facilitate hands-on learning.

IT Infrastructure and Modernization: Engineering software often requires high-performance hardware to operate effectively. Regular IT support and hardware upgrades are essential to keep pace with evolving technological demands.

Software Licensing: Continued support in providing software licences is necessary to ensure students have access to industry-standard tools for design and manufacturing.