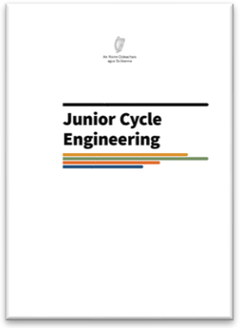
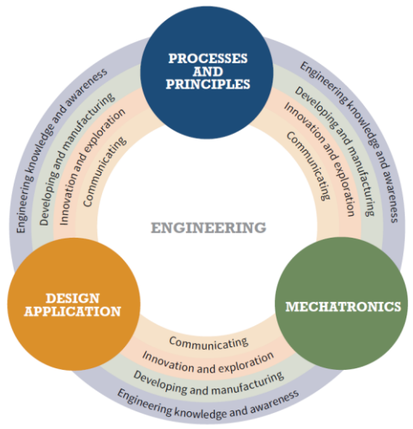
Oide
Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí
Supporting the Professional Learning of School Leaders and Teachers

Junior Cycle Engineering – Learning Outcomes





Strand 1: Processes and principles	Strand 2: Design application	Strand 3: Mechatronics
In this strand, students employ the fundamental processes and principles of engineering by applying their knowledge of materials and processes to manufacture and design products. Students develop an engineering mindset as they appreciate that accuracy and precision, together with the use of established engineering principles and processes lead to the production of innovative and efficient solutions of high quality and finish.	In this strand, as they develop an engineering mindset, students learn about the key stages of the engineering design and manufacture process. They learn about the importance of design for both the end-user experience and the economic and social impact of the product. They discover how the combination of informed choice of materials and correct processes produces a solution that is functional and efficient. Students come to appreciate the value of good project management and learn how to manage themselves and the process of product development from design to manufacture.	In this strand, students may work with a combination of mechanical, manufacturing, electronic and computing systems and software to explore relationships between simple inputs, processes and outputs. They will learn about systems, and how they can be coordinated to ensure the desired output. Students develop the mindset to appreciate how control systems operate on a larger scale, and how the design of control systems can impact on the environment and sustainability. They appreciate the role that engineers have in employing 'systems thinking' to design products and services that contribute to a better future.
Students should be able to:	*Students should be able to:*	*Students should be able to:*
Engineering knowledge and awareness The learning outcomes in this element are designed to raise student awareness and develop knowledge of relevant engineering principles and developments. Students will learn how to use the materials and equipment available to them in Engineering to inform their decisions about material and resource selection to engineer a product or solution.	1.1 **understand** the concepts and approaches that are required when solving an engineering problem 1.2 **demonstrate** a range of manufacturing processes 1.3 **recognise** and adhere to health and safety standards 1.4 **understand** the properties associated with a range of engineered materials	2.1 **understand** the key stages of the engineering design process 2.2 **evaluate** the factors that influence design 2.3 **choose** a suitable material to **engineer** a product	3.1 **explain** the operation of basic mechatronic systems 3.2 **investigate** relationships between inputs, processes and outputs for basic control systems 3.3 **appreciate** the application of mechanisms in a controlled system
Innovation and exploration In this element, the learning outcomes encourage students to explore the applications of engineering in the world around them. Students research existing and emerging developments and gain an appreciation of their impact and potential application to an engineered product.	1.5 **research** applications of existing and emerging technological developments 1.6 **engage** with the various engineering disciplines by relating them to everyday application	2.4 **explore** how design impacts on the function and quality of a product including ergonomic considerations 2.5 **apply** appropriate engineering concepts and approaches in the execution of their design solutions 2.6 **use** relevant information to enhance design and function	3.4 **explore** the application of systems in an engineering setting such as the classroom, home and industry 3.5 **investigate** the impact of mechatronics on the environment and society 3.6 **configure** and **program** basic mechatronic systems using appropriate software 3.7 **design** a basic mechatronic system either individually or collaboratively
Developing and manufacturing In this element, the learning outcomes develop the student's abilities to produce products and solutions through various materials. Students combine their learning from other elements to engineer products to a high, functional standard. The key focus is on efficiency, accuracy, precision and high-quality finish.	1.7 **develop** engineered solutions to various challenges 1.8 **identify** appropriate tools and equipment specific to a task 1.9 **apply** suitable manufacturing processes to **engineer** a product 1.10 **demonstrate** high-quality work, to include accuracy and surface finish	2.7 **apply** their knowledge of the properties associated with a range of engineering materials 2.8 **manufacture** a product from a working drawing 2.9 **modify** an existing product/design 2.10 **incorporate** basic project management techniques	3.8 **build** and **test** a basic mechatronic system with specific inputs or outputs 3.9 **incorporate** basic mechatronics into their engineered products
Communicating Throughout this element, the learning outcomes encourage students to communicate, through appropriate media, to relay technical information, design ideas and the impact engineering has on the environment around them.	1.11 **create** sketches, models and working drawings 1.12 **interpret** working drawings 1.13 **use** appropriate technical language and notations	2.11 **present** ideas through modelling and prototyping, using appropriate media 2.12 **communicate** their design decisions using suitable media	3.10 **represent** key information using appropriate media 3.11 **justify** their choice of the most appropriate system or systems for a specified purpose

Apply: select and use information and/or knowledge and understanding to explain a given situation or real circumstances

Appreciate: recognise the meaning of, have a practical understanding of

Build: construct by putting parts or material together

Choose: pick out as being the best or most appropriate of two or more alternatives

Configure: arrange or put together in a particular form or configuration

Communicate: use visual, gestural, verbal or other signs to share meaning or exchange information; interaction between sender and recipient; both work together to understand

Create: process and give form to the topic that is to be created using selected methods and material and/or to give the material used a new form

Demonstrate: prove or make clear by reasoning or evidence, illustrating with examples or practical application

Design: planning the features of a solution that solves a perceived user problem

Develop: advance a piece of work or an idea from an initial state to a more advanced state

Engage: enter into or become occupied by an activity or interest; to attract or hold interest and attention

Engineer: develop/build an item for a specific purpose that includes critical-to function components

Evaluate: collect and examine evidence to make judgements and appraisals; describe how evidence supports or does not support a judgement; identify the limitations of evidence in conclusions; make judgements about the ideas, solutions or methods

Explain: give a detailed account including reasons or causes

Explore: to think or talk about something in order to find out more about it

Identify: recognise patterns, facts, or details; provide an answer from a number of possibilities; recognise and state briefly a distinguishing fact or feature

Incorporate: take in or contain something as part of a whole

Interpret: use knowledge and understanding to recognise trends and draw conclusions from given information

Investigate: observe, study, or make a detailed and systematic examination, to establish facts and reach new conclusions

Justify: give valid reasons or evidence to support an answer or conclusion

Manufacture: something made from raw materials by hand or by machinery

Modify: to alter one or more particulars of an object/product

Present: make objects perceivable for others

Program: to instruct a device or system to operate in a particular way or at a particular time

Recognise: identify facts, characteristics or concepts that are critical (relevant/ appropriate) to the understanding of a situation, event, process or phenomenon

Represent: bringing clearly and distinctly to mind by use of description or imagination

Research: the study of materials and sources in order to establish facts and reach new conclusions; revision of accepted theories or laws in the light of new facts

Test: establish the quality, performance, or reliability of something

Understand: have and apply a well-organised body of knowledge

Use: apply knowledge or rules to put theory into practice; employ something in a targeted way

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