

**Year 11 Engineering design: Curriculum Intent**

During year 11 students will have the opportunity to gain underpinning knowledge and understanding relevant to the qualification and sector. The NEA units draw on and strengthen this learning with students applying their learning in a practical, skills-based way

**Year 11 Essential Knowledge Summary**

<b><u>R038: Principles of engineering design</u></b>	<b><u>R039: Communicating designs</u></b>	<b><u>R040: Design, evaluation and modelling</u></b>
<p><b><u>Composite Knowledge:</u></b> This is assessed by an exam. In this unit students will learn about the design process, and all of the stages that are involved. Topics include:</p> <ul style="list-style-type: none"> <li>o Understanding how to execute a range of design processes independently.</li> <li>o Designing requirements are established with the use of ACCESS FM and a specification is developed that is linked through design and evaluation.</li> <li>o Communicating design outcomes with a range of mediums with confidence and understanding of their need in a range of scenarios.</li> <li>o Evaluating design ideas to develop an understanding of how to investigate potential modifications, improvements and developments as well as critique a range of feedback from their target market group.</li> </ul> <p><b><u>Component Knowledge:</u></b> <b><u>Foundational Knowledge:</u></b> <i>Declarative Knowledge:</i> Be able to identify or recognise a given item, for example on a diagram</p> <ul style="list-style-type: none"> <li>• Use direct recall to answer a question, for example the definition of a term.</li> <li>• The context in which each design strategy might be applied</li> <li>• The relative advantages and disadvantages of each strategy</li> <li>• Relative advantages and disadvantages of primary and secondary research for product requirements</li> <li>• How the information obtained from each method contributes to the design process</li> <li>• Generation of design ideas may refer to the creation of the initial design or to the modification/ improvement of the existing design</li> </ul> <p><b><u>Procedural Knowledge:</u></b> The reasons for the use of modelling to test proportions to test scale to test function</p> <ul style="list-style-type: none"> <li>• Virtual modelling of the design idea</li> <li>• Physical modelling of the design idea</li> </ul> <p>□ Manufacture or modification of the prototype comparison of the model or prototype against the requirements of the design brief and specification</p> <ul style="list-style-type: none"> <li>• The difference between needs and wants</li> <li>• The difference between quantitative data and qualitative data</li> </ul> <p><b><u>Upper Hierarchical Knowledge:</u></b> Can create their own opinion on their own designs and provide robust and clear feedback linking to ACCESS FM Able to work independently in the workshop and share their knowledge with others verbally. Can improve or make suggestions of how the product can be modified. Be able to solve issues and evaluate their own idea with modifications or improvements •Students will need to be able to describe the influences on engineering product design</p>	<p><b><u>Composite Knowledge:</u></b> This is assessed by a set assignment. In this unit students will learn how to use sketching and engineering drawings to communicate ideas. Topics include:</p> <ul style="list-style-type: none"> <li>o Manual production of freehand sketches using a range of CAD software.</li> <li>o Manual production of engineering drawings.</li> <li>o Use of computer aided design (CAD)</li> </ul> <p>Design using regular solids: cube, rectangular block, hollow object and a cylinder</p> <ul style="list-style-type: none"> <li>•Compound shapes</li> </ul> <p>To include:</p> <ul style="list-style-type: none"> <li>• Exploded view</li> <li>• Sectional view</li> </ul> <p>Produce a 3D CAD model of a design proposal to include compound 3D shapes 2 Produce 3D CAD assemblies of components</p> <p><b><u>Component Knowledge:</u></b> <b><u>Foundational Knowledge:</u></b> <i>Declarative Knowledge:</i> Understand how to produces a wide range of creative and innovative freehand design proposals. Fully considering the design specification. Uses a comprehensive range of techniques. Justification demonstrating a detailed understanding of needs and wants of the client/user</p> <p><b><u>Procedural Knowledge:</u></b> Extensive evidence of analysis of design proposals that are fully annotated. Produces comprehensive freehand sketches of design proposal. Detailed explanation of the key features of a design proposal that is fully annotated. Fully considers the design specification. Ideas are justified and linked through the project against the specification. Students understands how to apply their knowledge and can justify points and provide feedback for improvements and modifications.</p> <p><b><u>Upper Hierarchical Knowledge:</u></b> Form their own opinions and articulate this within their feedback and justifications. Name and function of components and link to their use in the product and provide improvements, modifications and developments independently. Work independently and transfer their skills to others. Explain and link how their outcomes are suitable or not to their target market group and provide robust and detailed evaluation strategies to show this.</p>	<p><b><u>Composite Knowledge:</u></b> This is assessed by a set assignment. In this unit you will learn how to create and test models of your design. Topics include:</p> <ul style="list-style-type: none"> <li>o Product evaluation</li> <li>o Modelling design ideas</li> </ul> <p>Students should use ACCESS FM to analyse the specified product and compare products using an appropriate customer driven engineering matrix. •Both primary and secondary research should be undertaken to identify the strengths and weaknesses of existing products.</p> <p><b><u>Component Knowledge:</u></b> <b><u>Foundational Knowledge:</u></b> <i>Declarative Knowledge:</i> Understand how to carry out product disassembly carefully, under close supervision, and following safety guidelines, in order to analyse how it is made and assembled. Understand how to use 3D CAD software in order to produce a virtual 3D model from the product specification provided. Students should understand how to plan the production of a prototype, and will need to identify and plan the different stages required to manufacture the it.</p> <p><b><u>Procedural Knowledge:</u></b> Extensive evidence of analysis of design proposals that are fully annotated. Produces comprehensive freehand sketches of design proposal. Detailed explanation of the key features of a design proposal that is fully annotated. Fully considers primary and secondary knowledge. Students understands how to apply their knowledge and can justify points and provide feedback for improvements and modifications.</p> <p><b><u>Upper Hierarchical Knowledge:</u></b> Form their own opinions and articulate this within their feedback and justifications. Name and function of components and link to their use in the product and provide improvements, modifications and developments independently. Work independently and transfer their skills to others. Be able to evaluate their manufactured prototype against the product specification, and suggest a range of potential design improvements.</p>