

## Engineering Design (Cambridge National – certificate) Year 11

	Topic / Theme	Knowledge and Skills	Assessment	Cultural Capital Independent Learning
Autumn – Term One	<p><b>The R106 coursework unit</b> 60 marks (25%) (disassembly &amp; analysis of a product)</p> <p><b>R106 - LO1:</b> <i>Know how commercial production methods, quality and legislation impact on the design of products and components</i></p> <p><u>LO1</u> <b>Commercial production methods that impact on product /component design,</b> Production: one-off, batch, mass, automation <b>Impact of manufacturing processes on product design,</b> Moulding, pressing, forming, material shaping, CNC</p>	<p><b>R106 coursework unit</b> This unit will enable learners to gain knowledge in order to perform effective product analysis. They will research existing solutions and assess the development of engineered products. Students will develop dextrous skills and gain practical experience of product assembly and disassembly to appreciate manufacturing processes, design features and materials used. This unit develops students' creativity and critical analysis through an understanding of the principles behind good design.</p>	<p><b>R106 LO1a assessment criteria</b> <b>Band (2)</b> Demonstrates some knowledge of how commercial production methods and manufacturing processes impact on product/component design. Describes in some detail how product end of life considerations can influence product/component design. Demonstrates a sound knowledge of the importance of conformity to legislation and standards 5-8 marks</p> <p><b>Band (3)</b> Demonstrates detailed knowledge of how commercial production methods and manufacturing processes impact on product/component design. Comprehensively describes how product end of life considerations can influence product/component design. Demonstrates detailed knowledge of the importance of conformity legislation and standards 9-12 marks</p>	<p>Students are provided with opportunities to experience and gain skills in the use of power tools, machinery and specialist hand tools used in many areas of employment to disassemble and discover an understanding of how everyday products are manufactured in industry, and the diverse range of job-related skills required in this sector of the economy. Students will gain insight on the impact that manufacturing and product design has on the environment and society, and the differences in various cultures and social-economic groups. Specific tasks within the curriculum encourage the use of a wide array of</p>

	<p>applications, CAM, machining Finishing, assembly <b>Considerations for product end of life</b> - recycling materials, reusing components, safe disposal of toxic and hazardous materials <b>Importance of conformity to legislation, quality and safety standards</b>, British Standards (BS), European Conformity (CE), Waste Electrical and Electronic Equipment Directive (WEEE), patents, copyrights</p> <p><b>R105 examination unit</b></p> <p><b>LO3c – Sustainable design</b> The following criteria / areas of study will be explored to in the topic ‘sustainable design’ <b>Renewable versus non-renewable material and energy sources</b> Impacts of extracting non-renewable resources, i.e. resource depletion, transportation from source,</p>	<p><b>R105 examination unit</b> LO3c – ‘Sustainable design’ is a pivotal topic that covers a wide broad of content. It will develop students’ knowledge and understanding of how products, systems and designs may cause harm to the environment and measures that designers use to address issues caused by designs. Students will develop understanding of the key areas of sustainability and how each area contributes to</p>	<p><b>R106 LO1b assessment criteria</b> <b>Band (2)</b> Provides an adequate description of strengths and weaknesses of existing products. Uses some appropriate methods to provide a detailed summary of research of existing products. 7-12 marks <b>Band (3)</b> Provides a comprehensive description of strengths and weaknesses of existing products. Uses appropriate methods to provide a comprehensive and detailed summary of research of existing products. 13-18 marks</p> <p><b>R105 assessment</b> Home learning marking Class assessments Mock examinations External Examination</p>	<p>practical skills and experiences, which are designed to appeal to girls in particular to address issues of gender stereotyping and encourage future pathways and employment in areas with gender disparity. In <b>Engineering</b>, enrichment of knowledge in a practical analytical context is achieved using a variety of equipment and materials, including laser cutters, CNC vinyl cutters, centre lathes, industrial machinery and specialist tools linked to trades. Students are encouraged to understand how other cultures, and the beliefs and views of others, affect the way products and services are designed and used. They are taught to reflect on the users of products and how users’ views, beliefs and social-economic status often determine the type of product conceptualised, and why.</p>
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	<p>waste from conversion to usable form.</p> <p><b>Types of renewable resources,</b> i.e. energy sourcing, eco-materials, recycled materials.</p> <p><b>Energy efficiency</b></p> <p><b>Consideration of 6R's,</b> i.e. recycle, reuse, repair, refuse, reduce, rethink.</p> <p><b>Use of materials at end of life,</b> i.e. recycling, reusing, upcycling</p>	<p>environmental damage. Students will develop further understanding of the wider issues relating to how product design influences and affects the environment, such as renewable energy / materials, sustainability initiatives and environmental pressures.</p>		<p>Students will develop knowledge of environmental issues associated with product design, and how the sector has changed as a result.</p> <p>Students will gain insights into the world beyond school, and their geographical location through contacts with employers, industries, and organisations such as the design council.</p>
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Autumn – Term Two	<p><b>The R106 coursework unit</b> 60 marks (25%) (disassembly &amp; analysis of a product)</p> <p><b>LO2:</b> Be able to research existing products</p>	<p><b>R106 coursework unit</b> Students will gain knowledge of how research methods are used to inform product analysis, including primary research such as the physical analysis of products, questioning and surveying users. A study of secondary research sources such as the internet and online sources, books, literature and manuals. Students will gain skills in analysing the strengths and weaknesses of existing products with a view to finish, aesthetics, suitability to meet user needs, materials used, durability, sustainability, life cycle analysis, energy use, power and power sources.</p>	<p><b>R106 LO2 assessment criteria</b></p> <p><b>Band (1)</b> Provides a basic description of strengths and weaknesses of existing products. Uses few appropriate methods to provide a brief summary of research of existing products. 1 – 6 marks</p> <p><b>Band (2)</b> Provides an adequate description of strengths and weaknesses of existing products. Uses some appropriate methods to provide a detailed summary of research of existing products. 7 – 12 marks</p> <p><b>Band (3)</b> Provides a comprehensive description of strengths and weaknesses of existing products. Uses appropriate methods to provide a comprehensive and detailed summary of research of existing products. 13 – 18 marks</p>	<p>Students will develop knowledge &amp; experience of world &amp; society issues in and beyond their local environment in terms of new and emerging technologies &amp; materials and how these issues affect their lives, responsibilities and employment &amp; training opportunities. Students are provided with opportunities to experience and gain skills used in many areas of employment to disassemble and discover an understanding of how everyday products and services are manufactured in industry, and the diverse range of job-related skills required in this sector of the economy. Students will gain insight on the impact that manufacturing and product</p>

	<p><b>R105 examination unit</b></p> <p><b>LO3c – New and emerging technologies &amp; materials</b> The following criteria / areas of study will be explored to in the topic.</p> <p><b>New and emerging materials,</b> i.e. modern materials, smart materials, composite materials</p> <p><b>New and emerging technologies,</b> i.e. design/production technologies, artificial intelligence (AI), additive manufacturing, robotic manufacturing and</p> <p>assembly cloud computing technologies, Laser technology, 3d printing / 4D printing, Robotics</p> <p><b>Summary of R105 Topics</b></p>	<p><b>R105 examination unit</b></p> <p>LO3d – ‘New and emerging technologies &amp; materials’ is a key topic with a broad level of content. It is intended to develop knowledge and understanding of how products, systems of today, and in the future, are designed with modern materials and technologies. Students will develop understanding of the key new and emerging technologies and materials, and how new technologies and materials are being used to address other issues such as environmental damage and safety. The unit also focuses on areas of artificial intelligence and computer aided manufacture in terms of modern and future production methods.</p>	<p><b>R105 assessment</b></p> <p>Home learning marking Class assessments Mock examinations External Examination</p>	<p>design has on the environment and society, and the differences in various cultures and social-economic groups.</p> <p>Specific tasks within the curriculum encourage the use of a wide array of practical skills and experiences, which are designed to appeal to girls in particular to address issues of gender stereotyping and encourage future pathways and employment in areas with gender disparity. Students are encouraged to understand how other cultures, and the beliefs and views of others, affect the way products and services are designed and used. They are taught to reflect on the users of products and how users’ views, beliefs and social-economic status often determine the type of product conceptualised, and why.</p>
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<b>Spring – Term Three</b>	<p><b>The R106 coursework unit</b> 60 marks (25%) (disassembly &amp; analysis of a product)</p> <p><b>LO3a:</b> <i>Be able to analyse an existing product through disassembly</i></p> <p><i>Students will disassemble a product in a workshop setting using hand tools, conduct an analysis of key features and functions, and record/present their findings.</i></p>	<p><b>R106 coursework unit</b> Students will develop knowledge in the use of sources and procedures for disassembly, including the use of manufacturer’s maintenance instructions/manuals to follow structured procedures for disassembly. Students will gain skills in disassembly procedures using appropriate tools and instruments safely such as screwdrivers, pliers, cutters, spanners and measuring equipment. Students will develop knowledge through the analysis of an existing product through disassembly, with focus on component parts and their functions, assembly methods, materials, production methods and maintenance considerations.</p>	<p><b>R106 LO1b assessment criteria</b> <b>Band (2)</b> Works competently with occasional assistance to follow manufacturer’s instructions/manual/disassembly procedure, mostly adhering to special instructions. Uses tools and equipment effectively and shows some understanding of potential hazards and safety considerations. Draws upon some relevant skills/knowledge/ understanding from other units in the specification (Unit R105). 7 – 12 marks <b>Band (3)</b> Works independently and competently to follow manufacturer’s instructions/manual /disassembly procedure, adhering to special instructions. Uses tools and equipment effectively and shows a well-developed understanding of potential hazards and safety considerations. Clearly draws upon relevant skills/knowledge/ understanding from other units in the specification (Unit R105).</p>	<p>Students are provided with opportunities to experience and gain skills used in many areas of employment to disassemble and discover an understanding of how everyday products and services are manufactured in industry, and the diverse range of job-related skills required in this sector of the economy. Students will gain insight on the impact that manufacturing and product design has on the environment and society, and the differences in various cultures and social-economic groups. Students will develop knowledge &amp; experience of</p>

	<p><b>R105 examination unit</b>  <b>External Examination –</b>  <b>January series</b></p>		<p>13 – 18 marks</p> <p><b>R105 assessment</b>          Externally marked</p>	<p>world &amp; society issues in and beyond their local environment in terms of new and emerging technologies &amp; materials and how these issues affect their lives, responsibilities and employment &amp; training opportunities.</p> <p>Specific tasks within the curriculum encourage the use of a wide array of practical skills and experiences, which are designed to appeal to girls in particular to address issues of gender stereotyping and encourage future pathways and employment in areas with gender disparity.</p>
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	Topic / Theme	Knowledge and Skills	Assessment	Cultural Capital Independent Learning
Spring – Term Four	<p><b>The R106 coursework unit</b> 60 marks (25%) (disassembly &amp; analysis of a product)</p> <p><b>LO3b:</b> <i>Be able to analyse an existing product through disassembly</i></p> <p>Coursework completion / enhancement of units <b>R107</b> – design</p>	<p><b>R106 coursework unit</b> Students will develop key knowledge through carrying out an analysis of an existing product showing a well-developed understanding of components, assembly methods, materials, production methods and maintenance through written analysis.</p> <p><b>Coursework units</b> Students will develop skills &amp; knowledge through enhancement to all coursework units.</p>	<p><b>R106 LO1b assessment criteria</b></p> <p><b>Band (1)</b> Carries out a limited analysis of an existing product showing a basic understanding of some components, assembly methods, materials, production methods and maintenance. 1 – 4 marks</p> <p><b>Band (2)</b> Carries out a detailed analysis of an existing product showing an adequate understanding of components, assembly methods, materials, production methods and maintenance. 5 – 8 marks</p> <p><b>Band (3)</b> Carries out a comprehensive analysis of an existing product showing a well-developed understanding of components, assembly methods, materials, production methods and maintenance. 9 – 12 marks</p>	<p>Students are provided with opportunities to experience and gain skills used in many areas of employment to disassemble and discover an understanding of how everyday products and services are manufactured in industry, and the diverse range of job-related skills required in this sector of the economy. Students will gain insight on the impact that manufacturing and product design has on the environment and society, and the differences in various cultures and social-economic groups.</p> <p>Students will develop knowledge &amp; experience of world &amp; society issues in and beyond their local environment in terms of new and emerging technologies &amp;</p>



	<p><b>R108</b> – Manufacture <b>R106</b> – Disassembly / Analysis</p> <p><b>R105 examination unit</b> Recap on all units in preparation for May / June series examination <b>LO1a</b> Design cycle <b>LO1b</b> design needs &amp; design brief <b>LO1c</b> - The 'relationship between the design brief &amp; design specification <b>LO2a</b> - The 'understanding the requirements of a product specification <b>LO3a</b> - 'Know about the wider influences on the design of new products <b>LO3b</b> - 'Life Cycle Analysis (LCA) <b>LO3d</b> – 'New and emerging technologies &amp; materials</p>	<p><b>R107</b> – design <b>R108</b> – Manufacture <b>R106</b> – Disassembly / Analysis</p> <p><b>R105 examination unit</b> Students will recap on all knowledge from the R105 examination content.</p>	<p><b>R105 assessment</b> Home learning marking Class assessments Mock examinations External Examination</p>	<p>materials and how these issues affect their lives, responsibilities and employment &amp; training opportunities.</p>
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Summer – Term Five	<p>Coursework completion / enhancement of units</p> <p><b>R107</b> – design</p> <p><b>R108</b> – Manufacture</p> <p><b>R106</b> – Disassembly / Analysis</p> <p><b>R105 examination unit</b> Recap on all units in preparation for <b>May / June series</b> examination</p> <p><b>LO1a</b> Design cycle</p> <p><b>LO1b</b> design needs &amp; design brief</p> <p><b>LO1c</b> - The 'relationship between the design brief &amp; design specification</p> <p><b>LO2a</b> - The 'understanding the requirements of a product specification</p> <p><b>LO3a</b> - 'Know about the wider influences on the design of new products</p> <p><b>LO3b</b> - 'Life Cycle Analysis (LCA)</p> <p><b>LO3d</b> – 'New and emerging technologies &amp; materials</p>	<p><b>Coursework units</b> Students will develop skills &amp; knowledge through enhancement to all coursework units.</p> <p><b>R107</b> – design</p> <p><b>R108</b> – Manufacture</p> <p><b>R106</b> – Disassembly / Analysis</p> <p><b>R105 examination unit</b> Students will recap on all knowledge from the R105 examination content.</p>	<p><b>R105 assessment</b> Home learning marking Class assessments Mock examinations External Examination</p>	As above

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