

# VOCATIONAL AWARD IN ENGINEERING

In Key Stage 4 Engineering lessons students have 5 lessons a week, one triple lesson and a double lesson. For the most part the triple lesson will focus on project based work (a combination of design, practical and project tasks) the double will cover theory work and prepare students for the terminal written exam paper. This reflects

the 60/40 assessment split for the qualification between NEA and exam. Knowledge, understanding and skills are delivered as part of projects and theory units. Whilst a distinction is helpful for summary in actuality theory content is planned in projects and design/making in theory schemes.

## YEAR 10

Project/NEA	Theory
<p><b>ENGINEERING DESIGN</b> Students complete exercises to understand and interpret the information contained in engineering drawings. Students produce orthographic drawings and other engineering drawings following conventions including the relevant British Standards.</p> <p><b>SKILLS BUILDER: DRILL GAUGE</b> Students produce a drill gauge using mild steel, developing independent practice in the workshop and use of a range of workshop processes including marking out, hand tools and pillar drill.</p> <p><b>SKILLS BUILDER: TAP GAUGE</b> Developing on skills from the drill gauge project students work with increasing independence. Additional skills include use of tap and die sets, marking and cutting angles and radiuses.</p> <p><b>SKILLS BUILDER: LATHE KEY RING</b> Students apply skills previously developed with the addition of centre lathe work including facing off, turning down, knurling and centre drilling.</p> <p><b>MANUFACTURING PROJECT: TOOLMAKERS CLAMP/PARALLEL CLAMP</b> The project is a practical task. Students will start with a design context and pack of drawings of parts. The drawings will be interpreted and a production plan produced. In addition, students will produce a risk assessment and justify the choice of materials used. Parts will be manufactured with increasing independence using a range of tools and equipment. Students will also use the milling machine. The final outcome will be evaluated.</p> <p><b>DESIGN PROJECT</b> The project is a design task. Students will start with a design brief and specification, the brief builds upon the practical project produced for the manufacturing project. Students will analyse existing products, and produce a range of design ideas that satisfy the brief. Ideas will be modelled and evaluated against the specification. Designs will be further developed before orthographic drawings are produced.</p>	<p><b>METALS</b> Students begin studying metals. This links with the Skill Builder projects and also allows students to cover properties, sourcing and classification and stock forms. Students will study the theoretical aspects of wasting metal using a range of tools and equipment.</p> <p><b>POLYMERS</b> Students study classification, properties and use of a range of common polymers. Manufacturing processes are also covered. A series of focussed practical tasks incl. vacuum forming and heat work.</p> <p><b>SMART &amp; MODERN MATERIALS</b> A further material area that links with technological developments. Develops on materials properties knowledge and understanding of materials and processes e.g. use of TS polymers when moulding GRP</p> <p><b>SAFETY &amp; RISK ASSESSMENT</b> Students will learn about the H&amp;S legislation relevant to engineering practices and how to conduct a risk assessment. This will be put into practice as part of the manufacturing project.</p> <p><b>MATERIALS TESTING</b> Developing on materials properties work, students will study how materials can be tested and common test, including hardness and strength tests. They will learn how products can be tested, including the use of workshop tests.</p> <p><b>SUSTAINABILITY</b> Builds upon issues covered in metals and polymers to consider wider sustainability issues, incl. 6Rs to consider designers and manufacturers wider impact and responsibilities and sustainable energy sources.</p> <p><b>METALS JOINING &amp; HEAT</b> Students consider a range of temporary and permanent methods of joining materials. This includes brazing, soldering and welding; being able to try some of these processes. Heat and chemical treatments of metals and finishes are also studied.</p> <p><b>MOCK EXAM</b> Students sit a mock exam covering materials covered in year 10 to date. Knowledge and understanding sufficient to cover range of question types.</p> <p><b>MECHANICAL SYSTEMS &amp; MATHS SKILLS</b> The final year 10 unit of study is largely maths based. Students further practice maths based questions as covered throughout the course. Mechanical systems covers topics incl. forces, levers, MA and gear ratios.</p>

Term	Project/NEA Focus	Theory Focus
1	Engineering Design Skills Builder Projects	Metals Material Properties
2	Skills Builder Projects	Polymers
3	Skills Builder Projects Manufacturing Project	Smart and Modern Materials Safety and risk assessments
4	Manufacturing Project	Materials Testing Sustainability
5	Design Project	Metals: Joining Metals: Heat & Chemical Treatments
6	Design Project	Mock Exam Mechanical Systems

## YEAR 11

Project/NEA	Theory
<p><b>UNIT 1 NEA: MANUFACTURING PROJECT</b> The manufacturing project is set by the exam board each year. Students manufacture an engineered outcome using information supplied. The project takes approximately 20hours and consists of the following main components:</p> <ul style="list-style-type: none"> <li>• Identification of main parts and their function</li> <li>• Identification of suitable materials</li> <li>• Risk assessment for processes and materials</li> <li>• Production Plan</li> <li>• Manufacture of components</li> <li>• Evaluation of project</li> </ul> <p><b>UNIT 2 NEA: DESIGN PROJECT</b> The design project is set by the exam board each year. Students design an engineered outcome, developing an aspect of the project manufactured in unit 1. The project takes approximately 10hours and consists of the following main components:</p> <ul style="list-style-type: none"> <li>• Identification of main parts and their function</li> <li>• Evaluation and analysis of relevant existing products</li> <li>• Generation of a range of design ideas</li> <li>• Modelling of design ideas</li> <li>• Evaluation of design ideas</li> <li>• Engineering drawings of chosen design solution</li> <li>• Manufacturing specification</li> <li>• Identifying of materials and costs</li> </ul>	<p><b>CAD &amp; CAM</b> Students consider range of different CAD software and CAM equipment including laser cutting, milling and 3D printing. The advantages and disadvantages of CAD and CAM are explored.</p> <p><b>ELECTRICAL COMPONENTS</b> Students learn about electronic components and systems. They consider how electronics are used in used in engineering applications.</p> <p><b>ENGINEERING DEVELOPMENTS</b> Students explore significant engineering developments, considering the evolution of three products:</p> <ul style="list-style-type: none"> <li>• Structural Design: The Bicycle</li> <li>• Mechanical Design: Rollercoaster</li> <li>• Electronic Design: Mobile Phone &amp; Smart technologies</li> </ul> <p><b>MOCK EXAM</b> Students sit a mock exam covering materials covered in year 10 and 11 to date. Knowledge and understanding sufficient to cover range of question types.</p> <p><b>EXAM PREPARATION</b> Upon completion of NEA focus will be on exam preparation.</p>

Term	Project/NEA Focus	Theory Focus
1	Unit 1	CAD & CAM Electrical Components
2	Unit 1	Engineering Developments Mock Exam Revision
3	Unit 1 Unit 2	Mock Exam
4	Unit 2	Revision and review of topics
5		Revision and review of topics Exam
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