A-Level Design and Technology: Design Engineering

Entry Requirements 5 in a GCSE Technology, 6 in GCSE Maths and 5 in GCSE Physics
Exam Board: OCR
Subject Leader: Mr T Priest tpriest@taptonschool.co.uk

'The UK government has flagged a healthy engineering sector as being vital to its economic and environmental goals, making it absolutely crucial to the country as a whole. Unfortunately, there is currently a huge surplus of vacancies, over 173,000.' New Civil Engineer - 10 Jan 2023.

'Manufacturing is more than just putting parts together. It's coming up with ideas, testing principles and perfecting the engineering, as well as final assembly.' James Dyson

Main Syllabus Area:
Design Engineering is all about learning to be the person that designs the engineered product, be it a computer, satellite, phone, games console, washing machine, vehicle, aircraft, or any other engineered product. It is focused towards engineered mechanical and electronic products and systems. Students completing the course successfully will have taken design risks, gained technical understanding of programming, electronics, mechanics and structures and shown innovation whilst considering their role as responsible designers and citizens. They will have worked collaboratively through both CAD and with real life experimentation to develop and refine their ideas. They will gain an insight into engineering industries (particularly Electronic, Mechanical and Structural Engineering), developed the capacity to think logically and systematically, innovatively and critically and become independent and critical thinkers who can adapt their technical knowledge and understanding to different design situations.

Assessment:
Exam: 26.7% of A-Level (1hr 30 minutes - written paper)

Analyse existing products
Demonstrate their technical knowledge of materials, product functionality, manufacturing processes and techniques.
Demonstrate applied mathematical skills.
Demonstrate their understanding of wider social, moral and environmental issues that impact on design/manufacturing industries.

Problem Solving: 23.3% of A-level (1hr 45 minutes - written paper)
Apply their knowledge, understanding and skills of designing and manufacturing prototypes and products.

Demonstrate their higher thinking skills to solve problems and evaluate situations and suitability of design solutions.

Iterative Design Project: 50% of A-level (Approx. 65 hrs Non-Examined Assessment)

- The 'Iterative Design Project' requires learners to undertake a substantial design, make and evaluate project centred on the iterative processes of explore, create and evaluate.

- Learners identify a design opportunity or problem from a context of their own choice and create a portfolio of evidence in real time through the project to demonstrate their competence.

Method of Assessment

Exams: 50% Externally Assessed **Iterative Design Project: 50%** Internally Assessed

Qualities Required

A passion for solving problems and designing and making functional products or systems. An interest in electronics and/or mechanics is a huge advantage. This must be an interest that you are keen to take beyond merely theoretical knowledge that you could gain elsewhere, but to realise that knowledge into actual products that work. You should enjoy understanding how things work, taking things apart, building things, fixing them and analysing a problem.

Links with other subjects

Design Engineering, most obviously, is part of a suite with STEM subjects, Maths and Physics for anyone interested in the vast majority of strands of engineering and should be seriously considered by anyone looking to pursue engineering at a higher level after sixth form.

Career Prospects

A wide variety of possible careers stem from this course, that could include many kinds of engineering and technical careers such as electrical/electronic engineer, special effects, animatronics, computer programming, microcontroller programming, music technology, lighting engineer, games programmer, robotics, control engineer, motor vehicle engineering, aviation/aeronautical engineering or designing any electronic product from mobile phones to spacecraft etc. There is no shortage of jobs within Engineering. Destinations for A-Level Engineering students have, in the past, included Engineering degrees at Cambridge University, University of Sheffield, Leeds University other institutions, on courses including Engineering, Electrical and Electronic Engineering, Mechatronic and Robotic Engineering, Aerospace Engineering, Design for Industry and Civil and Structural Engineering.

Extension and Enrichment Opportunities

Actively getting involved in design and development of any **electronic, mechanical** and/or **structural** project will give the very best basis for an informed, enjoyable and successful participation in the A-level.

Reading list

Year 11

PCB Manufacture: How circuit boards are made #electronics #manufacturing #circuitboard - YouTube

Manufacturing: What do Manufacturing Engineers do?

Mechanisms: Mechanical Mechanisms - YouTube

Year 13

The Design of Everyday Things - By Donald Norman - It explains why things are designed the way they are and how to make products that are useful.

The Existential Pleasures of Engineering - Celebrating the fact that engineering is almost a primal instinct and that engineers build things with humanity in mind

Built: The Hidden Stories Behind Our Structures - Built is a breezy and digestible read that interweaves science, history, illustrations, and personal stories to explore how engineering has developed from the mud huts of our ancestors, to skyscrapers of steel that tower over our cities.

Independent Study

- Consolidating notes using the Course Textbook
- Complete and mark past papers using resources from the exam board websites
- Disassemble old or obsolete engineered products and, with the help of the internet, identify what each of the component parts does, how it is joined and how it might have been manufactured.
- Spot any time someone has a difficulty or something that could be improved for them and do a quick sketch or block diagram of a potential solution.