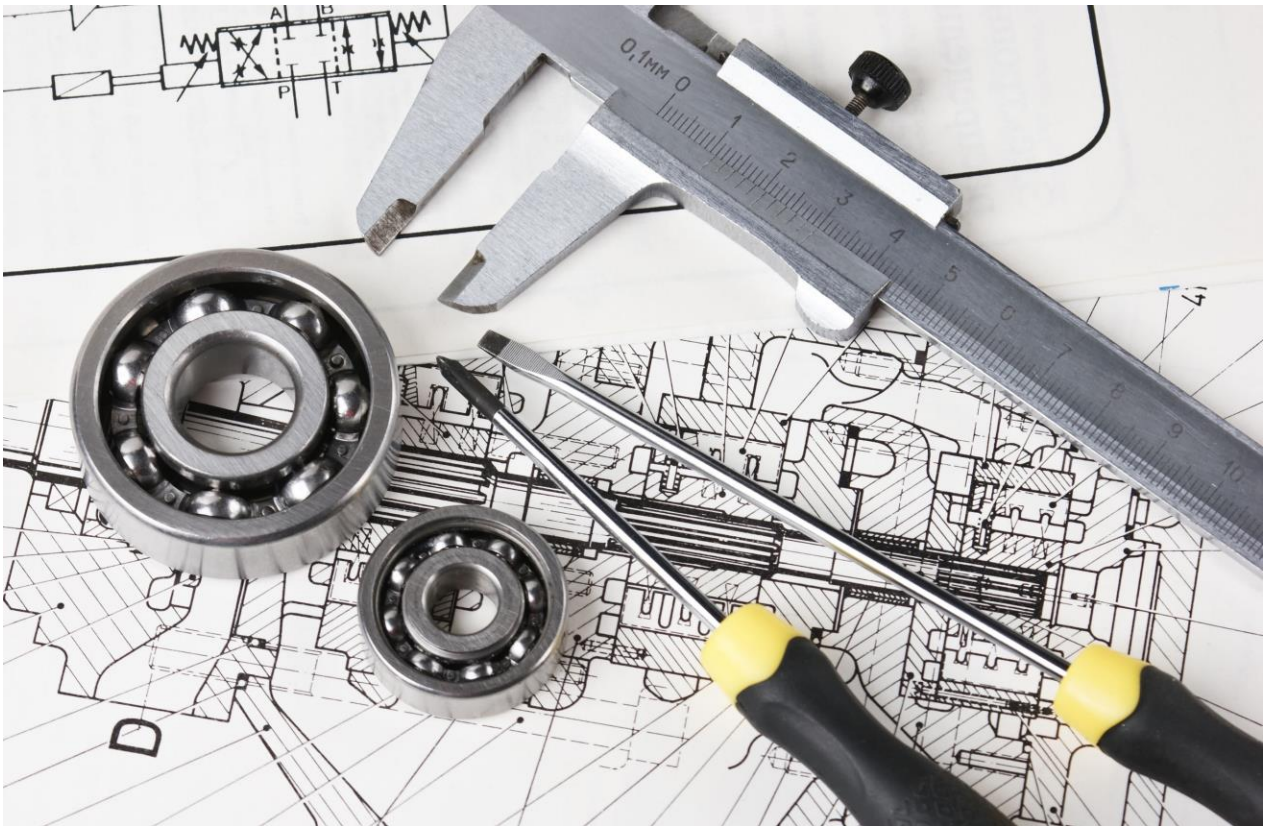


Level 3 Engineering Y11 into Y12 preparation pack



Name

Welcome to Engineering

I am delighted that you have chosen the subject that is Engineering and that you are on a pathway to one of the most exciting careers you can do.

This pack is designed to give you an insight into the areas you will experience over the next two years and also information on how the course will run.

Any questions then please don't hesitate to contact zoe.thompson@swindon-academy.org

Q: Why is Engineering a brilliant subject to study?

A: Engineering has so many different sectors that you can specialise in. From motorsport engineering through to marine biological engineering, it can take you all around the world



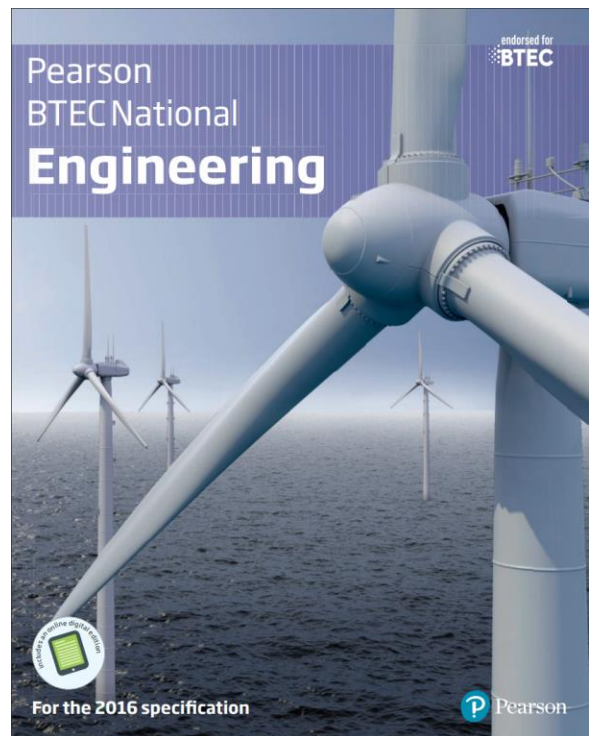
Course Information

At Swindon Academy we run a BTEC National Engineering course.

There is a brief overview of the topics you will study in the table below.

If you would like more information about the topics or how you will be assessed, you can have a look on the BTEC website which contains the specification.

[BTEC in Engineering | Pearson qualifications](#)



AUTUMN	SPRING	SUMMER
<p>Year 12 Unit 2A: Delivery of Engineering Processes Safely as a Team Examine common engineering processes to create products safely and effectively as a team Unit 2B: Develop two-dimensional computer-aided drawings Unit 10A & B: Computer Aided Design in Engineering Develop a three-dimensional computer-aided model</p>	<p>Unit 2C: Carry out engineering processes safely to manufacture a product effectively as a team Unit 10C: Computer Aided Design in Engineering Produce a portfolio that includes the following: 1) A 3D model of a fabricated product containing six components in total, all fully rendered.</p>	<p>Steam Roller Project Students work independently to manufacture a small steam roller. Metal skill stick project Create a project that incorporates all of the skills that have been learnt so far</p>
<p>Year 13 Unit 1: Engineering Principles Mathematical calculations commonly used in engineering applications. Exam to be sat in term 3 in January. Resit available in June if needed</p>	<p>Unit 4: Applied Commercial and Quality Principles in Engineering Students get the opportunity to research and explain how key business activities influence an engineering organisation.</p>	<p>Unit 3 - Engineering design (External exam) 8 hour exam but can be split in to 4 2 hour sessions or 2 x 4 hour sessions. 1 double sided A4 research sheet can be taken in to the exam with you</p>



The Health & Safety
at Work Act 1974

Activity 1: Health and safety

Level 3 BTEC Engineering – Transition Activities

As a starting point for engineering it is important to gain as much understanding of health and safety prior to entering the engineering workshop.

Read the Health and Safety section of the textbook and make notes on the following –

- Health & Safety at work act 1974
- Personal Protective Equipment at Work Regulations 1992
- Control of Substances Hazardous to Health Regulations 2002

[Health and Safety at Work etc. Act 1974 \(legislation.gov.uk\)](http://legislation.gov.uk)

Control of Substances Hazardous to Health Regulations 2002 is another important regulation that needs to be considered in engineering.



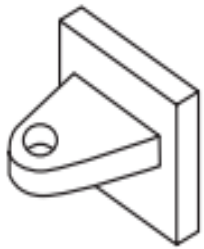
Using the following link, make a list of potentially hazardous substances that you may experience in engineering.

[Control of Substances Hazardous to Health \(COSHH\) - HSE](http://www.hse.gov.uk/coshh/)

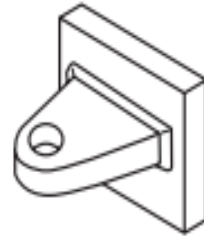
Then investigate the availability of safer alternatives

Activity 2: Risk assessments

Task 2: Below shows 5 alternative concepts for a simple bracket. There are 5 different manufacturing techniques used. Research using the internet three positives and the negatives for each of the techniques and list below.



Initial concept
The design specification calls for an eyelet mounted on a backing plate



Welded fabrication
The part is fabricated by two flat laser- or plasma-cut sheets welded together.



Machined and assembled fabrication
The part is fabricated from two machined elements screwed together.



Casting or moulding
The part is cast or moulded as a single piece.



Sheet fabrication
The part is fabricated by folding flat laser- or plasma-cut sheets.

Positives	Negatives
<ul style="list-style-type: none"> • Ease of manufacture 	<ul style="list-style-type: none"> • Not structurally strong

Activity 3: Redesign an existing product to resolve a fault

An existing product may be failing in use. It will be your job to identify the underlying problem and propose an effective alternative design.

Morphological analysis

One approach to generating ideas involves using morphological analysis, where specific requirements of the product are identified and then a range of solutions is proposed for each item. This generates an array of possible product options. For example, consider a cycle helmet, like the one shown in below.



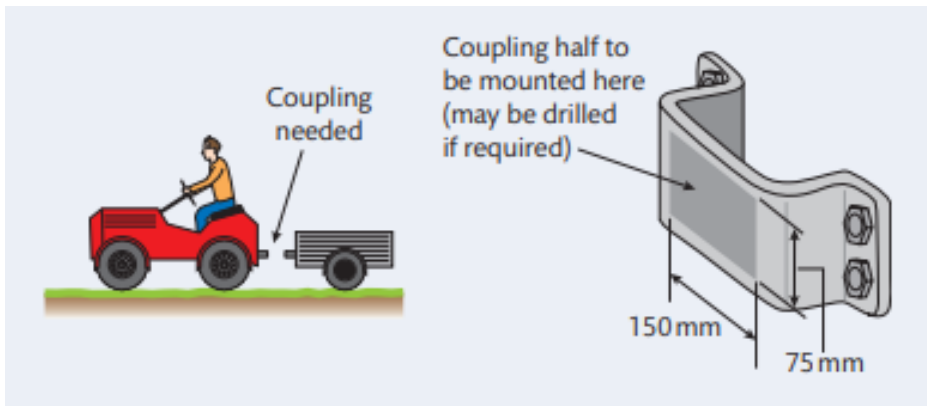
What does a user require of a cycle helmet?

Fill in the rest of the table

Requirements	Possible solutions		
Protect head from penetrating injury			
Suits a range of users			
Can be secured at chin strap			
Keeps head cool			
Shields eyes from the sun			

Activity 4: Redesign an existing product to resolve a fault

Suppose you work for a manufacturer of ride-on electric lawnmowers, and your company is planning to introduce a range of pull-along accessories such as trailers to increase the usefulness of their products. To achieve this, you need to design a pair of couplings, one of which will be fitted to the rear of the ride-on lawnmower, with the mating part attached to the trailer



Sketch of lawnmower trailer coupling – can you come up with an effective solution?

Both the lawnmower and the pull-along devices will have a steel plate that is 5mm thick, 75mm high and 150mm broad, on which the couplings can be mounted.

The coupling should be strong enough to pull an 80kg load over soft ground and be easy to attach and detach. Your company also wishes to make a variant of the coupling that will allow electric power to be transferred to the trailer unit to power lights, leaf-blower units etc. The power connection will be rated at 24V 10A as a minimum. Generate a proposal for the design of the coupling, which should include design variants for both the basic version and the version allowing electrical transfer.

Your proposal pack should take the form of a design log, which should include:

- a range of design ideas generated with the aid of a morphological analysis

Proposal 1

Proposal 2

Recommended websites, apps, and podcasts

Suggested reading list (these are not a compulsory purchase)

Textbooks

- Croft, T. and Davison, R. (2015) Mathematics for Engineers: A Modern Interactive Approach, Pearson.

Recommended Television shows/videos to watch –

- Repair shop
- <http://www.youtube.com/watch?v=ibE626hR0sk>

Useful websites

- <https://www.bbc.co.uk/bitesize/guides/zh4g4qt/revision/1>
- https://www.technologystudent.com/despro_flsh/mats_eng1.html
- <http://www.realworldengineering.org/>
- <http://www.sciencebuddies.org/>
- <http://nevonprojects.com/project-ideas/>
- <http://www.mathsisfun.com/>
- <http://www.mathcentre.ac.uk/students/topics>
- www.autocadtutorials.net
- www.solidworks.com
- <http://www.realworldengineering.org/>
- <http://www.machinerylubrication.com/Read/1330/>

Summary of programme of study

Unit 1 Engineering Principles (Theory from September & Exam in January – Y13)

Mandatory Unit - To make an effective contribution to the design and development of engineered products and systems, you must be able to draw on the principles laid down by the pioneers of engineering science.

The theories developed by the likes of Newton and Ohm are at the heart of the work carried out by today's multi-skilled engineering workforce. This unit covers a range of both mechanical and electrical principles and some of the necessary mathematics that underpins their application to solve a range of engineering problems.

Unit 2 Delivery of Engineering Processes Safely as a Team (Y12)

Optional Unit - Engineering processes, whether concerned with the manufacture of a product or the delivery of an engineering service, are the cornerstones of all modern industrial engineering. A single individual cannot carry out any complex industrial function effectively – often the coordinated efforts of hundreds or even thousands of people are required to manufacture a complex product such as a car or an aeroplane.

This unit covers a range of practical and teamworking skills that are necessary when manufacturing a product or delivering a service safely as a team.

Unit 3 Engineering Product Design and Manufacture (Yr13)

Mandatory exam end of year 13 -Engineering product design and manufacture is the process of transforming a user- or market-driven need for a new or revised design into a commercial product that addresses this need.

Unit 4 Applied Commercial and Quality Principles in Engineering) (Yr12)

Optional Unit - In this unit, you will explore how key business activities and trade considerations influence engineering organisations and are used to create a competitive advantage. You will learn why organisations need to control costs and how they make decisions by applying activity-based costing methods.

Unit 10 Computer-Aided Design in Engineering (Yr12)

Optional Unit - As a future engineer it is important to be able to produce and interpret engineering drawings that help individuals and organisations to communicate ideas, design and manufacture products and improve product performance. Computer-aided design (CAD) is used within the engineering industry alongside other processes to develop, improve and maintain cutting-edge products and systems. In this unit you will acquire the skills to develop two-dimensional (2D) detailed drawings and three-dimensional (3D) models using a CAD system.