**BTEC Level 3 in Engineering**

**Bridging Course**

The BTEC Level 3 Nationals in Engineering consists of 4 units.

Unit 1)Engineering Principles (External)

Unit 2) Deliver of Engineering Processes Safely as a Team (Internal)

Unit 3)Engineering Product Design and Manufacture (External)

Unit 9)Work Experience in the Engineering Sector

This booklet contains a number of tasks which should be completed prior to joining the course in September. Individual teachers may use the tasks as starting points for some lessons and it is important you have completed them all.

Due to the wide scope of the course you may find some units more challenging than others. You should bear this in mind when you tackling the bridging course and at the start the course in September.

Students who have already completed the BTEC First Engineering course, have good grades in Maths, Science, English and/or DT or have an interest in engineering in general will find some units expand on existing knowledge rather than introducing something new and should find those sections relatively easy. Most students will find several of the sections challenging and these are the ones you should persevere with to give yourself the best start in September.

**Due –**

**Unit 1 - Engineering Principles (Mathematics)**

Mathematics and physics are a major part of all areas of life and are of particular importance in engineering. The mathematics and physics you will be asked to tackle in this course will be mostly based on practical issues in engineering. The standard of work will be at A Levelstandard but you will study a narrower range of topics.

**Task 1** In Engineering you regularly have to deal with very large or very small numbers. To make these easier to deal with engineering notation is used. (note that centi and deci are not commonly recommended engineering multipliers.

Place these prefixes in order of size and include the multiplier they represent. (For example kilo means x1000, it is bigger than milli which means x0.001)

tera mega milli giga

micro kilo nano pico

This task should take 15 minutes.

**Task 2**You will also be asked to work out values using equations. It is important that you can manipulate the equations (transpose) to allow you to calculate the value you want.

e.g. The volume of a cylinder v is given by Transpose the equation so you can calculate the radius if you know the volume.

First Step Second step The length of time taken to complete the task will vary depending on your previous experience. Continue until you are confident you can transpose the equation types shown.

Transpose the following formulae to allow you to calculate v or v 1

This task should take 15 minutes.

**Unit 1 Engineering Principles (Electronics)**

Many engineering projects depend on electronic devices as part of their operation. These two complimentary units introduce the basics of the operation of common components as well as some common building blocks of electronic circuits. Both alternating current and direct current circuits are investigated.

Three of the common rules applying to DC electronic circuits are resistors in parallel, resistors in series and Ohms law. The first 2 explain how to calculate equivalent resistances and the third describes the relationship between current, voltage and resistance.

**Task**Using existing knowledge or by searching the BBC Bite-size site for information on Ohms law calculate the following.

1. A 9V battery is used to power a circuit consisting of two 1K resistors in parallel. What is the current flow?
2. A 9V battery is used to power a circuit consisting of two 1K resistors in series. What is the current flow?
3. An LED has a working voltage of 2V and should be limited to a maximum current of 20mA. What is the theoretical value of the resistor needed if it is to be powered by a 9V battery?
4. The LED above is to be used in a car. It will therefore be powered by a 12V battery. What theoretical value resistor will now be required?

**Unit 1 Engineering Principles (Physics)**

Mathematics and physics are a major part of all areas of life and are of particular importance in engineering. The mathematics and physics you will be asked to tackle in this course will be mostly based on practical issues in engineering. The standard of work will be at A Level standard but you will study a narrower range of topics.

**Task 1**The diagram represents the tension forces acting on a single point in a structural framework.

10N

25 degrees

7N

45

5N

Calculate the magnitude and direction (from the horizontal) of the resultant force for the system of coplanar forces shown in the diagram.

Magnitude…………………………………………………………………………………………………………

Direction……………………………………………………………………………………………………………

This task should take 15 minutes.

**Task 2**

A dam is being built to retain water on the River Severn.

The retaining wall for a dam is 10 m high and 5 m wide.

Assume the density of water is 1000 kg/m3.

Dam

water level

**Diagram Not To Scale**

h = 10m

Calculate the hydrostatic thrust on the dam.

Answer………………………………………………………………………………………………………………

This task should take 15 minutes.

**Unit 2 Delivery of Engineering Processes Safely as a Team**

As part of the engineering work you will carry out involves team work, it is important that you assess your current strengths and areas for development.

Consider the following characteristics, qualities and skills. Identify where you have strengths and where you need to develop further.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Skill/ characteristic | Strengths | Evidence | Areas to develop | Plan for development |
| Written  Communication |  |  |  |  |
| Verbal  Communication |  |  |  |  |
| Technical  Drawings |  |  |  |  |
| Manufacturing/ Hand skills |  |  |  |  |
| CAD skills |  |  |  |  |
| Leadership |  |  |  |  |
| Following instructions |  |  |  |  |
| Meeting deadlines |  |  |  |  |
| Self motivation |  |  |  |  |
| Showing Initiative |  |  |  |  |

Are there any of these skills you could be working on over the summer break?

Write a timeplan for how you could develop throughout the summer and Year 12.

**Unit 3)Engineering Product Design and Manufacture**

For Unit three you will need to analyse products for their successes and weaknesses and understand the broad and complex role of a design engineer. For this activity we will focus on Civil Engineering.

Investigating civil engineering

Produce a presentation or report which covers the following information:

* Research the role of a civil engineer.
* Describe and explain the role civil engineers fulfil in society and the types of projects they might work on (include examples)
* Identify the qualifications and courses which a civil engineer would need to complete in order to gain employment.
* Either online or during your daily walk (permitted exercise during lockdown) investigate the different types of civil engineering infrastructure local to you. Take photos/find images of examples of the following:
* 3 different types of street furniture
* 2 different public buildings
* a utility supply access point
* an interesting road network
* For one of the pieces of civil engineering you have found identify the following:
* the opportunities and constraints the civil engineer will have had to consider when planning this work.
* An issue or area for potential development to improve the design
* Suggestions for how these improvements could be made

**Unit 9Work Experience in the Engineering Sector**

Work experience is an excellent opportunity for you to try out different places of work and see job roles in action. For Unit 9 you will need to complete 10 days of work experience in a role related to an engineering sector. This will be done before September of Year 13 in order for you to complete the assignments which relate to the work experience you have done.

**Task 1**You need to draft an email and/or letter to possible workplaces which may offer you a placement. Outline what you are looking for from work experience and why you think you would be suited to this role/sector. Save the letter and print out.

**Task 2**Now you have a template to work from, research different companies and approach them via email or post to try and secure a placement. Think about local companies rather than large international ones as you are more likely to be successful. Send your letter/email and then follow this up with a phone call. Ideally you want to be starting the course in September with your work experience already set up and sorted.

Its important to know the kind of engineering job you want and what sector that job is in. These are just a few of the areas available and a few of the many local businesses.

* Aeronautical Engineering.
* Aerospace Engineering.
* Audio Engineering.
* Automotive Engineering.
* Manufacturing Engineering.
* Marine Engineering.
* Nuclear Engineering.
* UTC Aerospace Systems
* ARUP
* Jackson Hogg
* Siemens
* Virgin Media
* Nissan
* Infinity Resources Solutions
* Rolls Royce

Helpful websites

* <https://www.gov.uk/apply-apprenticeship>
* <https://careerfinder.ucas.com/jobs/engineering/apprenticeship/>
* <https://www.indeed.co.uk/Engineering-Apprenticeship-jobs>
* <https://www.notgoingtouni.co.uk/all/filter/sectorFilter/engineering-9>