

Transitioning to CTEC Engineering



CTEC Engineering at Woking College covers a broad range of topics, including mechanical engineering, electrical engineering, engineering science (e.g. materials and gases) and engineering mathematics. Although there is some overlap with courses such as A-level physics, there is probably no other course quite so varied which will allow you to study everything from gear & pulley systems to logic gates and integrated circuits.

Engineering is practical.

CTEC engineering is an academic subject, and both practical and theoretical.

To satisfy your thirst for something hands-on while you are at home, the engineering teachers here at Woking College would recommend the following engineering challenges as devised by UK engineers Dyson:

ENGINEERING CHALLENGES		01 GEODESIC DOMES	02 MARBLE RUN	03 SPAGHETTI BRIDGES	04 STRONG ASA DRINKING STRAW
05 ELECTRIC MOTOR	06 COTTON REEL TANK	07 CARDBOARD BOAT	08 CARDBOARD CHAIR	09 BOAT POWERED BY A CHEMICAL REACTION	10 CARTESIAN DIVER
11 BALLOON CAR RACE	12 DESIGN AND BUILD A HELICOPTER	13 WATER CLOCK	14 METAL ETCHING	15 JELLY AND OIL	16 BUILD A COMPASS
17 A TOUGH NUTTO CRACK	18 BURNING CUSTARD	19 HOMEMADE WATER BOMB	20 POTATO POWER	21 MAKE A PERISCOPE	22 ATTRACTIVE NAILS

<https://www.jamesdysonfoundation.co.uk/resources/challenge-cards.html>

These 22 different practical tasks are wide ranging and vary in their complexity. Be sure to watch the videos first for some inspiration. If you have a passion for automotive engineering, then you might like to try the balloon car race, or if civil & structural engineering are more your thing then you perhaps might try the spaghetti bridge challenge!

Now read on to find out more about the theoretical side of the course.

Engineering is theoretical.

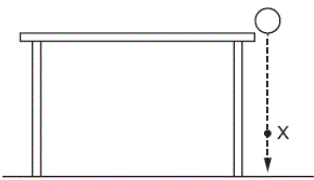
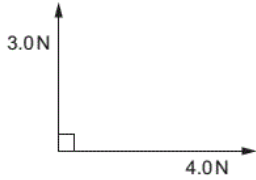
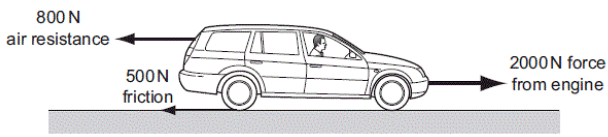
Engineering is an academic subject and when designing systems engineers must have an appreciation of the mathematical, scientific, mechanical and electrical principles at play.

To succeed on CTEC Engineering perhaps the most important skills you will require are those of a mathematical nature. To check your skills, the following document is a good place to start. Although written for A-Level Physics, it covers exactly the skills you will require, such as transposition (rearranging) of formulae, standard form, trigonometry and graphs:

<https://www.deferrers.com/attachments/download.asp?file=1804&type=pdf>

Another important requirement for CTEC Engineering is a good understanding of GCSE Physics. Below you will find two short quizzes to see if you are ready for our mechanical and electrical engineering topics. Don't worry if you get stuck on any questions, but do check your answers against those disguised underneath, and look the topics up in your GCSE Science/Physics textbook if you need to. You can also email an engineering teacher using the contact at the end of this document:

Mechanical Engineering Warm Up ..

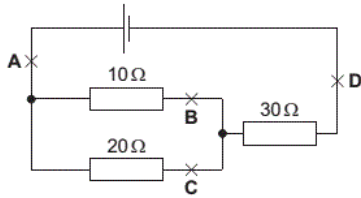
<p>1</p> <p>A ball is dropped from a table-top. Air resistance may be ignored. Which row describes the velocity and the acceleration of the ball at point X?</p>  <table border="1"> <thead> <tr> <th></th> <th>acceleration</th> <th>velocity</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>constant</td> <td>constant</td> </tr> <tr> <td>B</td> <td>constant</td> <td>increasing</td> </tr> <tr> <td>C</td> <td>increasing</td> <td>constant</td> </tr> <tr> <td>D</td> <td>increasing</td> <td>increasing</td> </tr> </tbody> </table>		acceleration	velocity	A	constant	constant	B	constant	increasing	C	increasing	constant	D	increasing	increasing	<p>2</p> <p>What is the size of the resultant of the two forces shown in the diagram?</p>  <p>A 1.0 N B 3.5 N C 5.0 N D 7.0 N</p>
	acceleration	velocity														
A	constant	constant														
B	constant	increasing														
C	increasing	constant														
D	increasing	increasing														
<p>3</p> <p>A car moves along a level road. The diagram shows all of the horizontal forces acting on the car.</p>  <p>Which statement is correct?</p> <p>A The car is slowing down. B The car is speeding up. C The car is moving at a constant speed. D The car is moving backwards.</p>	<p>4</p> <p>A force of 20 N pushes an object of mass 5.0 kg along a rough horizontal surface where the frictional force is 5.0 N. What is the acceleration of the object?</p> <p>A 1.0 m/s² B 2.0 m/s² C 3.0 m/s² D 4.0 m/s²</p>															

Mechanical warm up answers (1-B, 2-C, 3-B, 4-C)

Electrical Engineering Warm Up ..

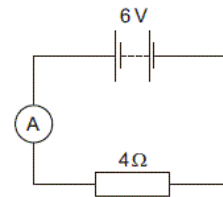
1

The diagram shows a circuit.
Where must an ammeter be connected to measure the smallest current?



2

A 6V supply is connected in series with an ammeter and a 4Ω resistor.

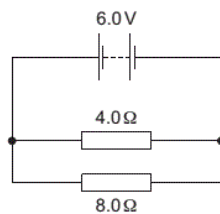


What is the reading on the ammeter?

- A 0.67A B 1.5A C 10A D 24A

3

The circuit shows a 4.0Ω resistor and an 8.0Ω resistor connected to a battery.

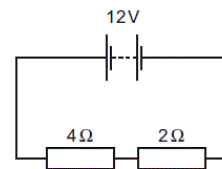


What is the current in the 8.0Ω resistor?

- A 0A B 0.50A C 0.75A D 1.0A

4

In the circuit shown, the potential difference (p.d.) across the 4Ω resistor is 8V.



What is the p.d. across the 2Ω resistor?

- A 4V B 6V C 8V D 16V

Electrical warm up answers (1-C, 2-B, 3-C, 4-A)

We'd like you to hear about how you have got on with these tasks at enrolment day at the end of the summer, so feel free to bring this along with you with any questions. If you'd like to get in touch for help sooner, or have any questions about the course, please do email Matt Klein at mpk@woking.ac.uk

Good luck!