

A LEVEL

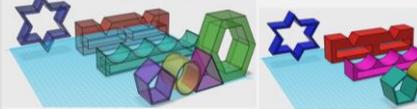
DESIGN & TECHNOLOGY PRODUCT DESIGN

CAD DEVELOPMENTS

After looking at my design paper and choosing some of the shapes that I would like to include in the final product along with some input from my client, we came to the conclusion that some of the more obscure shapes may damage the structural integrity of the design and so we chose the star, hexagon, triangle, circle and pentagon for potential use. I then drafted up these shapes into a CAD program to get a better feel for the scaling of the design. In the process of doing so I drafted up some holders for the more complex shapes such as the star and circle holders are fully done in this iteration on CAD. I have taken screen shots of them both in a wooden texture and in a acrylic texture to give context to the aesthetics of the final product. After consulting (AQA) I concluded that acrylic would be the best as it is self finishing and if chosen in the correct thickness or layered up can provide either a translucent self finish or using a translucent film. I will have to test the layering of the acrylic to see if it gets a good finish when glued together with epoxy or using a translucent film.

Colouring is also important, whether it is going to be translucent acrylic, transparent acrylic, frosted acrylic or black colour acrylic. I will again have to test the different finishes of the black colour acrylic to see if it self finishing property is enough to make a workable ring.

There was also added finishes, by that I mean laser engraving designs into the product. Some of the faces are a bit plain so having an engraving design engraved into the product could be good. There is also the potential of manufacturing a in-between translucent layer of the acrylic, for instance having a 100% version of the primary leg or of animals in the layering in, although it looks reasonably appealing, it provides no way to get to it and thus small parts being a potential hazard is eliminated, as for the edges, that are sharp when coming out of the laser cutter, either filing a new way of having rubber bands on the corners or some other method it is option, or even a chisel edge or even construction a large, irregularly shaped design that goes around the whole product covering the sharp edges would work and could, if done correctly could even give rise to slim water wall storage that could fit paper of books. I will have to make a few designs using the shapes and their layering below I can do that and in my next few steps will talking to the client and getting feedback on the looks as well as drafting up some first designs.



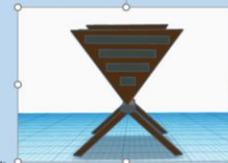
CAD DESIGN



The lamp uses a long wooden spar that stretches along the bottom of the lamp to hold all the panels together. The panels will likely be bolted to the spar. At the bottom, which is a thin piece of wood that makes the lamp stronger and will give it a more detailed and intriguing look. The legs are also bolted to the spar as it is designed to be able to hold the products weight. I have added end pieces to the spar that are there to attach the legs to and give it some more strength. I am going to investigate 3d printing the end pieces out of PLA filament which is fully biodegradable (going toward my goal of a sustainable lamp). 3d printed parts can be aesthetically pleasing and are seen as nice additions to products but the downside is that they take a long time to make and wouldn't likely work in a mass production situation. The lamp side panels won't have any spaces on it as it will use a thin wooden board that will allow light to pass through. The wood will also give the light a warm tone colour. As you can see, this cad design is longer than my original version. I felt that it would be useful to have more space to put plants in but as I can see from this design, the lamp would look better a bit shorter and would fit better into someone's home.



The image above shows the space between the different parts of the lamp. There is the outer section (which holds the light) and the inner section (which holds the plants). The planter (inner piece) is held in place using wooden strips on both sides that the lamp sits on. This means that the holder can be taken out for maintenance. Having empty space will make the lamp lighter and in exchange cheaper to transport. I will likely make some changes to the planter holder and make it easier to take out (using a more durable design). An addition to the lamp that I produced was to add handles to the sides of the lamp to make it easier to move around. The length of the lamp made me think about how it's going to be lit (as it is also a lamp). Multiple bulbs would have to be used to ensure that the entirety of the lamp is lit up and aimed with the coil of the fittings. It would make the lamp too expensive. When searching for a cheaper alternative, I came across LED strips which I think would allow me to light the entire lamp up with only a single strip. LED strips are cheap and can come in a range of different colours. They can also come with infrared controllers that allow the user to change colours remotely. This is a feature that could make my product stand out from the rest.



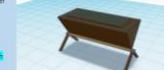
In the image above, you can see the spaces in the front of the lamp. It is identical on both sides. I have chosen to add them as the first iteration of my lamp used solid pieces for the front and back panels which wouldn't allow much light through. Adding some shapes to the lamp gives it a more desirable look and lets light through at the same time. The bottom of the lamp's legs are angled so that it sits flat on the floor. For the legs, I may use different end caps so that legs can be closer together or further away. I will have to make sure that the lamp is stable but compact at the same time. I am still deciding what material to use for the gaps in the side as I could use acrylic which would look good and event use fluorescent acrylic and have a UV bulb inside that would make the plants glow. The problems is that this goes against the idea of it being a sustainable product. When the product is completed, the inner body will be flush with the top of the main body. It will give it a more finished and desirable look.



The image to the left shows my improved cad design in which I have shortened the lamp. It's now much shorter than the lamp on the right (the original) and will be able to fit into smaller living spaces. Its smaller design will cut the material costs and mean that it has a lower price point. Making it shorter means that it can be placed in smaller spaces and doesn't require a massive table to hold it. This means that it could be used as a bedside lamp or a feature on someone's desk.

Conclusion:

Using CAD to design the lamp has been useful as I'm able to change any part of the lamp with ease. Designing with CAD means that I don't need to use materials to create a prototype. This means that I can use the CAD design to decide on what product would look good.



Sixth Form

Year 12 Scheme of Work

Autumn 1 - Developing Practical Skills and Theory Knowledge - Lamp

Autumn 2 - Developing CAD and Forming Skills

Spring 1 - Mock NEA

Spring 2 - Mock NEA

Summer 1 - NEA - Begin Year 13 Main Project

Year 12



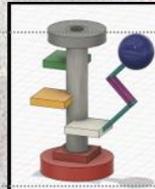
Developed concept ideas

Implementation of cad

After choosing my four favourite designs I went and created versions of them in blender however I found this software to be not as optimal as others so opted for Fusion360 instead which is a computer aided design software which allowed me to recreate my sketches into 3D renders. I did this because it means I can easily change sections of my product as well as integrate certain features which would not be possible to be shown as sketches e.g., how different sections will be joined or what they will look like from different angles. Another positive of using fusion360 is that I have the capability of 3D printing smaller scaled designed so that I have a physical object which can inspect for weak points and get my clients feedback on.

Conclusion

I believe creating my designs in software such as fusion360 was a good idea because it gives me an idea of what my sketched designs would fully look like however it had its drawbacks in the fact that I had to teach myself how to use the software and took a lot of trial and error to achieve models I am happy with.



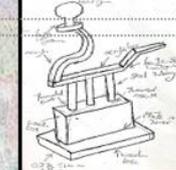
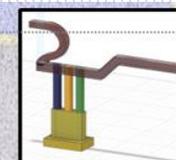
Design A

This product features a hollowed out steel tube which threads into an insert inside of the wooden base which will be painted red. Throughout the steel tube are wooden boxes which will help in place with set screws and each painted a different vibrant colour to match the Memphis design style and to add to this on the middle box there is an acrylic bar which is bent into a zigzag which a plastic ball fixed on the edge and it is held in place with glue for the ball and at the other end the acrylic is inset into the wood so it is firmly held in place and is strong enough to hold its self-upright. And the bulb will be located at the top of the steel tubing on the wooden disk which also has a hole in for the cables to be able to go through.



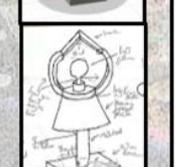
Design C

This product starts off with a wooden rhombus as the base which will be painted a vivid and bold colour before carving out a small section for the acrylic bar to sit in before I bend it around a 90 degree curve which is where it meets another wooden box fixed on top with glue or screws and on the top of this wooden box is another piece of clear acrylic which will be secured in a similar fashion to the first piece and this will bend around another 90 degree curve before bending back in the opposite direction to create a flat section where on the far end 2 vacuum formed semi spheres will enclose a bulb but separated by small pieces of acrylic bar to allow light to get through.



Design B

This product features a wooden base with a box fixed on top with a mortise and tenon joint and above this is 3 acrylic poles each of different colours which are also inset 20mm into the wooden box and on top of these there is a singular piece of acrylic featuring 5 major bends in order to achieve its peculiar shape and this will be achieved by using the heat gun to concentrate hot air on areas so that I can bend them to their desired angles. The base will be cut to size on the table saw to achieve precise cuts and then painted a bold yellow colour in order to stand out and be easily identifiable as a Memphis product.



Design D

From the top of this product there is 2 acrylic bars which intersect at a 90 degree angle and these are connected at their base to 2 more acrylic bars which are bent around 180 degrees to create semicircles which both connect on a wooden disk which is where the light will sit and this is surrounded by a large acrylic cone segment which goes all the way round and I will create this by laser cutting out the flat plan of the shape then heating it and bending it round to create the desired shape. The wooden disk also connects to a wooden pole which goes down to a square wooden base which could be vinyl wrapped in order to get a specific design which cannot be easily painted on.

Whats Assessed?

Year 13

Paper 1

Technical principles

2hours 30 minutes

30% of final mark

120 marks

Technical Principles Includes:

Materials and their applications.

Performance characteristics of materials.

Enhancement of materials.

Forming, redistribution and addition processes.

The use of finishes.

Modern and industrial scales of practice

Digital design and Manufacture

The requirements for product design and development

Health and Safety

Protecting designs and intellectual property

Designs for manufacturing, maintenance, repair and disposal

Feasibility studies

Enterprise and marketing in the development of products.

Design communication.

Whats Assessed?

Year 13

Paper 2

Designing and Making
Principles

1 hour 30 minutes

20% of final mark

80 marks

Designing and Making
Principles Include:

Design methods and processes

Design theory

Technology and Cultural Changes

Design Processes

Critical Analysis and Evaluation

Selecting appropriate tools and equipment
and processes

Accuracy in design and manufacture

Responsible Design

Design for manufacture and project
management

National and international standards in
product design.

Whats Assessed?

NEA - Year 12/13

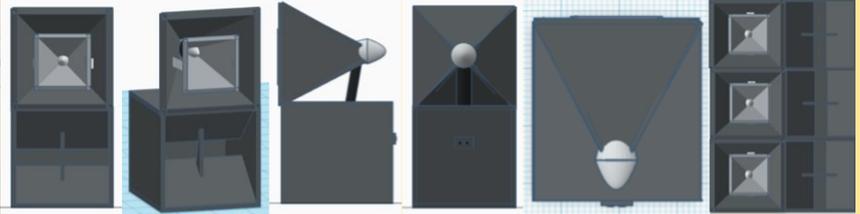
Practical application of technical principles and design and making principles

Substantial design and make project

50% of final mark

Written or digital design portfolio and photographic evidence of final prototype.

INITIAL IDEAS



This is one of my other designs that uses a folded horn for the low mid-range and a square horn for high mid-range and a small horn in the middle for high frequencies. It has the low mid horn under the high section, which means that they aren't point source and won't create a line source very well. One of the positives of this design is that the drivers are pretty much at the same depth. This means they require much less processing. My client said that he wants the design to be easy to transport and lightweight. This design has incorporated this by using the top part of the housing. This has made it much lighter and easy to carry around, but it has subsequently made the design more delicate.

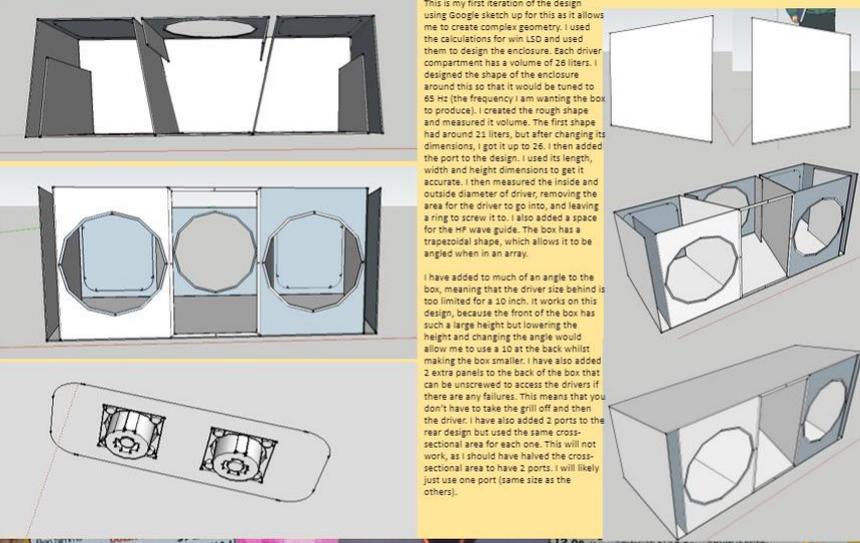
I have designed the box without the top sides as a skeleton enclosure. The mid-range and hf don't need a tuned chamber, so they can go anywhere really. This helps to lower the number of materials needed to build the enclosure, which also means they take less time to build and are much lighter. One problem with this is that the delicate components will be exposed. They will be more likely to get damaged as a slight knock could crack the horn. This design would be more suited to a permanent install in a venue, where it doesn't have to be transported anywhere. I have designed the speaker so that the angle on the top horn can be changed to angle it up or down. This allows the sound to be directed into a section of the room. The box is shown stood up right in the images, but it is multifunctional, as it can be turned sideways to create a line source. The multi-functionality allows my client to use the design in a range of venues.

A benefit of this design, is that it can become modular if the client wants. He can unattach the high mid-section from the low mid-section and add more boxes underneath. It means that I can design more boxes and my client can add it to the stack. Having more boxes with each other will create a louder sound source, but it will also cause cone filtering (when drivers interfere with each other) which won't sound pleasant. This design just used a square horn that won't couple well with the boxes either side of it. I could make the hf-horn reach the side of the box, so that the boxes can couple with each other and become a line source (which will be more efficient, getting more level out of the speakers).

One of the problems with this design, is that the low mid-range driver is exposed to the environment around it. If it's raining outside, the driver will get wet and will have more chance of water getting inside the voice coil and shorting it out. The design could use a ply-wood enclosure, as ply-wood is easy to work with and is strong, which is needed when it's a potential danger to people. Ply-wood is also good at keeping water out and isn't damaged from short exposure to water. If left in the rain for months, it would start to degrade, but being in the rain for an event won't affect the ply. The boxes could be stacked on top of each other (as pictured on the right) and the low mid drivers would couple well and become more efficient. They would require a tilting system so that the boxes cover their own area instead of covering the other boxes area. The speaker also has a forceful look to it, which a lot of venues may not like.

My design brief tells me what I need from my design and how I want to achieve a product with function in mind and nice aesthetics. I have looked at the distribution as I want to see how the product will get to the customers. I have talked about its success, key features, its target user, distribution, mood/feel and its competitors. I did this because it will help me to lay out my intentions so that I can be more organised with my designing. I have been able to think about the aesthetic of the design and how my client could change it on the go. Creating a design brief has made me think about what's needed out of the product and why it's needed. I have also looked at the later stages of the products life.

FIRST CAD DESIGN

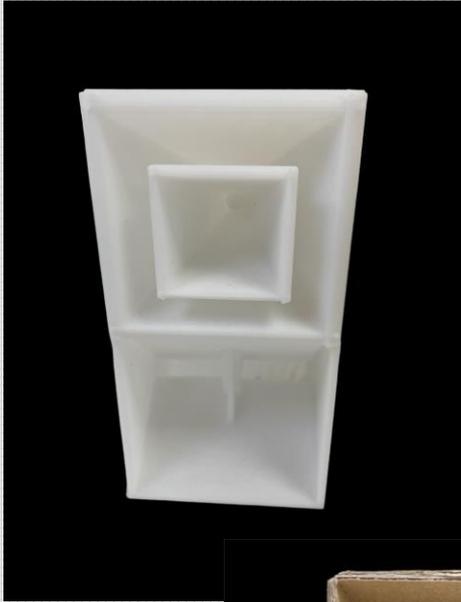


This is my first iteration of the design using Google sketch up for this as it allows me to create complex geometry. I used the calculations for with L&D and used them to design the enclosure. Each driver compartment has a volume of 26 liters. I designed the shape of the enclosure around this so that it would be tuned to 65 Hz (the frequency I am wanting the box to produce). I created the rough shape and measured its volume. The first shape had around 21 liters, but after changing its dimensions, I got it up to 26. I then added the port to the design. I used its length, width and height dimensions to get it accurate. I then measured the inside and outside diameter of driver, removing the area for the driver to go into, and leaving a ring to screw it to. I also added a space for the hf wave guide. The box has a trapezoidal shape, which allows it to be angled when in an array.

I have added to much of an angle to the box, meaning that the driver size behind is too limited for a 10 inch. It works on this design, because the front of the box has such a large height but lowering the height and changing the angle would allow me to use a 10 at the back whilst making the box smaller. I have also added 2 extra panels to the back of the box that can be unscrewed to access the drivers if there are any failures. This means that you don't have to take the grill off and then the driver. I have also added 2 ports to the rear design but used the same cross-sectional area for each one. This will not work, as I should have halved the cross-sectional area to have 2 ports. I will likely just use one port (same size as the others).

There are pros and cons to this design. The arrangement of drivers and ports works well, but the angle of the box is too steep and will need changing. The front of the box is too high, which makes the box unnecessarily large, making them too big.

Last Years NEA



I enjoy Product Design because it is fun being able to think of an idea completely out of nowhere and bring that idea to life. Product Design is a good subject to take because it will develop practical skills and also teamwork with your classmates.

Student Voice

It allows you to be a lot more freer with how you decide to work practical wise and the theory isn't too dissimilar to the GCSE so isn't a big step up.

For me, DT is a fun and creative break from the more difficult subjects I take. A level DT is more engaging and you get to try things you have never done before.

A LEVEL PRODUCT DESIGN



Visit to
Pool Bank
Vintage Interiors



Design & Technology Paris



June 2024



Prince Henry's
Grammar School

SIXTH FORM

Product Design

Course Leader: Mrs C Burton

Why Study Product Design?

This creative and thought-provoking qualification gives students the practical skills, theoretical knowledge and confidence to succeed in a number of careers, especially those in highly sought after Science, Technology, Engineering and Mathematics (S.T.E.M) and creative industries.

Students will investigate historical, social, cultural, environmental and economic influences on design and technology, whilst enjoying opportunities to put their learning into practice by producing prototypes of their choice.

Students will gain a real understanding of what it means to be a designer, alongside the knowledge and skills sought by higher education and employers.

Course Content and Assessment

A Level Subject content:

1. Technical principles
2. Designing and making principles



Assessments

- Paper 1: Technical principles (written exam 2.5hrs) 30% of A Level
- Paper 2: Designing and making principles (written exam: 1.5hrs) 20% of A Level. Mixture of short answer and long response questions.
Section A: Product Analysis (up to 6 short answer questions based on visual stimulus of product(s)).
Section B: Commercial manufacture (mixture of short and extended response questions).
- Non-exam Assessment: Practical application of technical principles, designing and making principles (substantial design and make project) 50% of A Level.
Evidence: Written or digital design portfolio and photographic evidence of final prototype.

Progression Routes

Product Design is an excellent qualification in its own right. It can also be used as a stepping stone into Higher or Further Education to study the many and varied subjects within areas such as Industrial Design, Graphic Design, Web Design, Architecture, Arts or Engineering courses and many others.

Entry Requirements

Students should have completed a GCSE Design and Technology course, attaining grade 5 or above in any area of the subject. Candidates may also be considered without prior experience if they have achieved at least grade 5 in GCSE Maths, English and Science.

Student Case Study



Prince Henry's Grammar School
Sixth Form



Product Design

Case Study

Student Name Jamie Webster

BA(Hons) Industrial Design at Loughborough University

Please could you outline your day to day routine at work?

I'm currently working on 2 major projects; one with an organisation called LIVES that operate in Lincoln, designing an educational product that teaches/engages primary school children the importance of CPR and how to perform it. The other designing a catalogue of shopping centre Christmas decorations for a company called Fizzco projects to be manufactured for display in 2018.



How has studying Product Design aided you in your current job?

I received an unconditional offer from Loughborough when I showed them my AS and current A2 portfolio at interview. I mastered the C.A.D software I needed through this course and felt like I had a head start at university.

Student Case Study



Prince Henry's Grammar School Sixth Form



Product Design

Case Study

Student Name **Ella Churchill**

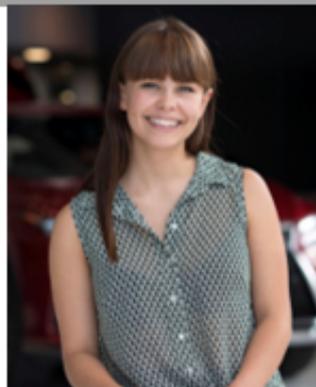
BA(Hons) PR and Marketing Relations at Leeds Beckett University

Please could you outline your day to day routine at work?

Ella is currently sitting her fourth year after carrying out a placement year at Toyota GB and Lexus UK's head office in London. Her placement year saw her working in the Social Media department for the two automotive brands, in close quarters with the Press department.

How has studying Product Design aided you in your current job?

Studying Product Design at PHGS helped me greatly when it came to coursework at university. I've had to complete several portfolio tasks throughout my 4 years and felt at ease after completing at least 2, comprehensive and successful portfolios throughout the A level design course.



Student Case Study



Prince Henry's Grammar School Sixth Form



Product Design

Case Study

Student Name Chris Brown

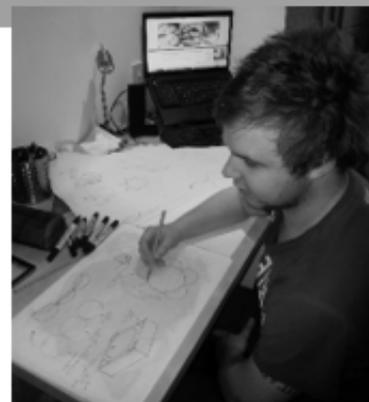
BA(Hons) Product design at Nottingham Trent University

Please could you outline your day to day routine at work?

One of the great things about design is that you don't really have a day to day routine as every day is different and you never know what is going to crop up. That's one of the reasons I got into design!

What do you like about your job?

For me, I love the fact that each and every project is different, one minute you can be making a standard project look attractive, the next you can be fine tuning a new design to make sure the function is flawless. I also like the fact I am able to be creative and put my style into the work I do. The design world seems to have a more relaxed atmosphere to it than other career pathways (until a deadline looms!), which is nice to work in and around, again making the job enjoyable.





Construction manager

Site manager

Construction managers organise the work on building projects, making sure it's completed safely, within budget and on time.

Average salary
(a year)

£27,000 to £70,000
Starter Experienced

Skills and knowledge

You'll need:

- knowledge of building and construction
- maths knowledge
- the ability to organise your time and workload
- leadership skills
- knowledge of engineering science and technology
- business management skills
- the ability to use your initiative
- excellent verbal communication skills
- you will be expected to use a computer confidently as part of this job.



CAD technician

Computer-aided design (CAD) technicians use software to design buildings, machinery, goods and components.

Average salary
(a year)

£15,000 to £35,000
Starter Experienced

Typical hours
(a week)

39 to 41
a week

Skills and knowledge

You'll need:

- design skills and knowledge
- maths skills
- to be thorough and pay attention to detail
- excellent verbal communication skills
- knowledge of engineering science and technology
- thinking and reasoning skills
- the ability to work well with others
- the ability to use your initiative
- you will be expected to know how to use a computer and tools to benefit this job.

Electronics engineer

Electronics engineers design and develop systems for industry, from mobile communications to manufacturing and aerospace.

Average salary
(a year)

£21,000 to £65,000
Starter Experienced

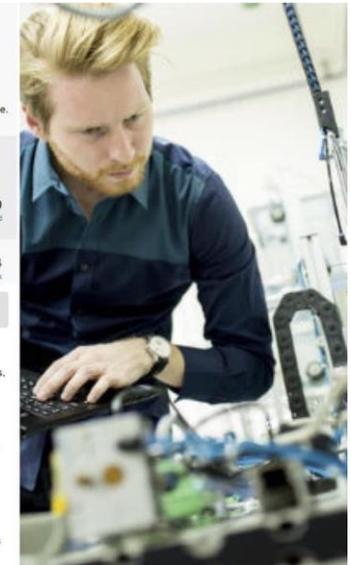
Typical hours

42 to 44
a week

Skills and knowledge

You'll need:

- knowledge of computer operating systems, hardware and software
- knowledge of engineering science and technology
- maths knowledge
- to be thorough and pay attention to detail
- analytical thinking skills
- design skills and knowledge
- the ability to work well with others
- to be flexible and open to change
- being able to use a computer terminal or hand-held device may be beneficial for this job.



WHY PRODUCT DESIGN?



Civil engineer

Engineering consultant

Civil engineers design and manage construction projects, from bridges and buildings to transport links and sports stadiums.

Average salary
(a year)

£24,000 to £80,000
Starter Experienced

Typical hours
(a week)

40 to 42
a week

Skills and knowledge

You'll need:

- knowledge of engineering science and technology
- maths knowledge
- knowledge of building and construction
- design skills and knowledge
- excellent verbal communication skills
- knowledge of English language
- thinking and reasoning skills
- the ability to read English
- you will be expected to use a computer confidently as part of this job.



Product designer

Industrial designer, 3D designer, prototype designer, inventor
Product designers create new products and improve existing ones.

Average salary
(a year)
£19,000 to £50,000
Starter Experienced

Typical hours
(a week)
40 to 42
a week

Skills and knowledge

You'll need:

- design skills and knowledge
- knowledge of engineering science and technology
- the ability to come up with new ways of doing things
- to be thorough and pay attention to detail
- analytical thinking skills
- persistence and determination
- the ability to use, repair and maintain machines and tools
- thinking and reasoning skills
- you will be expected to use a computer confidently as part of this job.



Skills and knowledge

You'll need:

- knowledge of engineering science and technology
- maths knowledge
- design skills and knowledge
- to be thorough and pay attention to detail
- excellent verbal communication skills
- science skills
- analytical thinking skills
- the ability to read English
- you will be expected to use a computer confidently as part of this job.

Aerospace engineer

Aeronautical engineer

Aerospace engineers design, build and maintain planes, spacecraft and satellites.

Average salary
(a year)
£20,000 to £60,000
Starter Experienced

Typical hours
(a week)
39 to 41
a week

WHY PRODUCT DESIGN?

Energy engineer

Renewable energy engineer

Energy engineers research, design and build power generation plants, and work in the oil and gas industry.

Average salary

(a year)

£20,000 to £80,000

Starter

Experienced

Typical hours

(a week)

41 to 43

a week



Skills and knowledge

You'll need:

- knowledge of engineering science and technology
- maths knowledge
- analytical thinking skills
- to be thorough and pay attention to detail
- thinking and reasoning skills
- excellent verbal communication skills
- the ability to use your initiative
- knowledge of building and construction
- you will be expected to use a computer confidently as part of this job.



Skills and knowledge

You'll need:

- design skills and knowledge
- to be thorough and pay attention to detail
- knowledge of engineering science and technology
- patience and the ability to remain calm in stressful situations
- knowledge of manufacturing production and processes
- the ability to come up with new ways of doing things
- to be flexible and open to change
- analytical thinking skills
- being able to use a computer terminal or hand-held device may be beneficial for this job.

Model maker

Model makers design and create 3D models for TV and film, and for use in engineering, construction and architecture.

Average salary

(a year)

£16,000 to £30,000

Starter

Experienced

Typical hours

(a week)

43 to 45

variable



Skills and knowledge

You'll need:

- knowledge of engineering science and technology
- maths knowledge
- knowledge of building and construction
- design skills and knowledge
- excellent verbal communication skills
- knowledge of English language
- thinking and reasoning skills
- the ability to read English
- you will be expected to use a computer confidently as part of this job.

Structural engineer

Structural engineers help to design and build large structures and buildings, like hospitals, sports stadiums and bridges.

Average salary

(a year)

£22,000 to £50,000

Starter

Experienced

Typical hours

(a week)

40 to 42

a week

WHY PRODUCT DESIGN?