

The equipment we made sure the lathe was clean and clear of debris before it was used, to do this you wound down the measuring plate with it was flat and in contact with the table and then press the zero button.

Photos:

Engineering Applications 13/10/17
Goleth Station MTBOH 1pm-3pm

Aim for Session: ~~Introduce~~

Introduction to using the lathe and using a micrometer.

Health and Safety:-

Hazards included oil and chemicals draining our moisture from hands causing dermatitis. Swarf from cutting metal on the lathe which could cause damage to the eyes.

PPE used:-

Goggles were worn at all times when in the workshop. Steel toe cap boots and an engineers coat were also worn at all times. Barrier cream was applied before work started.

Processes:-

The equipment used in the lesson consisted of: lathe, micrometer, digital Vernier height gauge. When setting up

Observations:-

Measurements:-

We had to measure the height of our metal cylinder at multiple stages of cutting to ensure we were within the allowed tolerances. We also used the micrometer to measure the diameter of our cylinder.

Observations:-

From doing the task I saw how accurate the pieces of equipment are and how small movements could move the equipment quite far so that it could cut too much off your piece. This meant you had to be very delicate with the machines to ensure you do not make a mistake.

Achievement:-

During the lesson I achieved the given task and I was able to get my piece to the required height of 105.22mm.

Feedback:-

I worked well with high standards.



digital vernier height gauge. Before we used the lathe we have to make sure it is clear of debris and the speeds are set correctly. To set up the centre drill and live centre you have to fix them into the backstop on the lathe. The backstop would then be pushed towards your piece and fixed in place by pulling a lever on the back and tightening ~~on~~ nut on the back. When taking measurements with the height gauge you have to set it to zero first, to do this wind down the measuring plate until it is flat with the surface you are measuring from and press the 'zero' button.

Photos:

Engineering Applications
Garrett Sheldon MTBOL

20/10/12
1pm-3pm

Aim:-

Cut a back section of height 23mm and diameter 35mm. Make diameter of entire piece 40mm. Use Centre drill to create small hole that the live centre can fit into.

Health and Safety

Hazards included oil and chemicals drawing out moisture from hands causing dermatitis. Swarf produced from cutting metal on the lathe that could cause damage to the eyes.

PPE used:

Goggles were worn at all times in the workshop. Steel toe cap boots and engineer's coat were also worn. Barrier cream was applied before work started.

Processes:

The equipment used during this lesson was lathe, Centre drill, live centre, micrometer and

Piece you measure with a micrometer, this is much more accurate and has a tolerance of $\pm 0.005\text{mm}$. The height of your cut section will be measured using the digital vernier height gauge, this has a tolerance of $\pm 0.005\text{mm}$ also.

Observations:

During the task we used the automatic feed when cutting. This made the bed move along the Z axis at a constant rate or the cutting tool move along the X axis at a constant rate. This allows for a better finish as the surfaces will not have 'jumps' in the cut as they may if done by hand. The feed would have to be stopped before you reached your desired cut length, this was to ensure you didn't take too much material off.

Achievement:

During the lesson I was able to cut my piece to the desired dimensions and I learnt how to use the centre drill and live centre.

Measurements:

You have to measure from the tip of your piece down to 23mm using the lathe. To do this turn the lathe on so your piece is spinning, then slowly bring the cutting tool to the edge of the piece. Once the tool touches the piece you should zero the Z axis on the lathe. You will also need to zero the X axis so that you can reduce the diameter of the piece. To do this introduce the cutting tool slowly to the outside of your piece while it is spinning. Once the tool makes contact you should stop and zero the X axis. The lathe has a tolerance of $\pm 0.2\text{mm}$ so to ensure measure the true diameter of your

Engineering Applications

27/10/17

Gareth Stadden MTB04

1pm - 3pm

Aim:

To Shape the next 2 sections of the piece which have dimensions:

Length 22mm, width diameter 35mm ± 0.05 mm

and 2 Length 18mm, diameter 28mm ± 0.02 mm.

H&S:

Hazards included oil and chemicals drawing moisture from hands, causing dermatitis. Swarf from cutting metal on the lathe which could cause damage to the eyes.

PPE used:

Goggles were worn at all times when in the workshop. Steel toe cap boots and an engineers coat were also worn at all times. Barrier cream was applied before work was started.

Processes:

The equipment used during this lesson was; lathe, live centre, micrometer and digital vernier height gauge. Before the lathe was used we cleared it of any debris and checked the speeds.

Feedback:

I worked well with good techniques, I just need to ensure that I try and measure slightly more accurately to improve my quality of work.

Measurements:

The first section produced had a width diameter of 40mm. So to produce the first section required during this lesson if you first have to measure your required length of 22mm from the end of that section.

Ø 40mm

To be able to measure your piece on the lathe you must 'zero' the Z axis first. To do this turn on the lathe so your piece is spinning, then slowly bring the cutting tool to the edge of the piece. Once the tool touches the piece you should zero the Z axis on the DRO. You will also need to zero the X axis so you can reduce the diameter of the piece accurately to do this repeat the steps for the X axis but this time the tool should touch the circumference of the piece. To produce your required section you now machine the rest of the piece to the required 36mm diameter. As this section starts a tolerance of $\pm 0.05\text{mm}$ and the lathe has a tolerance of $\pm 0.2\text{mm}$ you should not cut to 36mm ~~start~~ straight away. Proceed to do many small cuts and measure

were set correctly. To set up the live centre you have to fit it into the backstop on the lathe. The backstop is then pushed to the desired position and secured using the lever and tightening nut. Before measuring using the height gauge you must 'zero' it first. To do this lower the measurement platform so that it is flat and in contact with the surface you are measuring from and then press the zero button.

Photos:

Section of diameter $36\text{mm} \pm 0.05\text{mm}$
I was able to get my piece to 36.03mm in diameter. I ran out of time at the end of the lesson and I was unable to complete the 2nd section of diameter $28\text{mm} \pm 0.02\text{mm}$, when I had finished finished my piece had a diameter of 28.62mm .

Feedback:

I worked well with good technique and accuracy. I need to make sure I do not zero the lathe after every cut as this will ensure my piece ~~has~~ is of higher quality and better accuracy.

with a micrometer to ensure you are within the given tolerance. As the micrometer has a tolerance of $\pm 0.005\text{mm}$ it will provide you with a acceptable reading. The Second Section required will be machined in the same way as the previous one but the tolerance on the diameter is smaller at $\pm 0.02\text{mm}$ so more care should be taken. To check the length of your sections are accurate you will measure them with the digital height-gage which has a tolerance of $\pm 0.005\text{mm}$ also.

Observations:

The tolerances were very tight on these 2 sections, this meant a high amount of precision was required. To achieve this many small cuts were made that were followed by micrometer readings. This allowed me to ensure my piece had the correct dimensions.

Achievement:

During this lesson I was able to complete the machining of the first

Processes:

The equipment used during this lesson includes Lathe, Centre drill, live centre, micrometer, 3 stage tapping kit, file, digital vernier height gauge. Before we used the lathe we ensured that it was clear of any debris. The centre drill and live centre were set up by fixing them into the backstop and sliding the backstop to the required position and fixing it in place by pulling on the lever and tightening the nut on the back. The height gauge has to be set to zero before it is used to do this and down the measuring plate until it is flat with the surface you are measuring from and press the 'zero' button. When using the tapping kit a small amount of cutting fluid should be applied to ensure it does not get stuck within the piece and snap.

Photos:

Engineering Applications
Garrett Stoddon MTB04

03/11/17
1-3pm

Aim:

To finish all aspects of the piece. This includes getting the previously bored on section to the desired 28mm $\pm$ 0.02mm. Cutting a hole in the section to align with previously drilled hole in top of piece and to tap this hole. A chamfer ~~seal~~ should also be cut on either end.

Health and Safety:

Hazards included oil and chemicals drawing out moisture from hands causing dermatitis. Swarf from cutting metal on the lathe which could cause damage to the eyes.

PPE used:

Goggles were worn at all times within the Workshop. Stuck for caps boots and an engineers coat were also worn. Barrier cream was applied before work started.

Measurements:

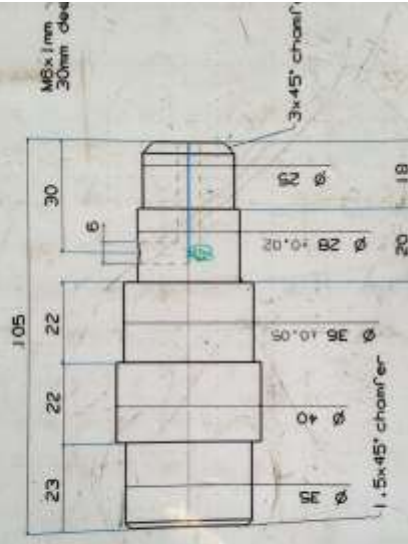
To finish off the section I had to remove 0.4mm of the diameter. To do this I made small cuts and checked the diameter with a micrometer after each one until it was 27.99mm which was within the given tolerance. The final section to be cut was a length of 18mm and a diameter of 25mm. When cutting the piece to the correct length you should cut to 18.2mm first as the lathe has a tolerance of $\pm 0.2\text{mm}$. Measure the section with the digital height gauge which is much more accurate with a tolerance of $\pm 0.005\text{mm}$. The diameter should then be cut. As the tolerance is stated it is within the tolerance of the machine. Again cut to 0.2mm above the stated

Drilling operations

1. Using the appropriate marking out equipment, mark and centre the hole.
2. Set the work up in a V block and drill the hole 14mm deep.

Note

All dimensions in millimetres
Tolerance = $\pm 0.2\text{mm}$ (unless otherwise stated)



all burrs on the piece.

Observations:

When drilling holes with the pillar drill it is very important to ensure that you use a centre punch to make sure that the drill bit follows the correct path. The 3 piece tapping kit can get stuck if not enough cutting fluid is used.

Achievement:

I managed to complete my piece except from cutting the chamfer as the lathe was not set up correctly. All of my cuts were even and within given tolerances.

Feedback:

High quality of work with good working practises. I must make sure that when using a centre punch that the hole is exactly where I want it.

diameter of 25mm. Once cut to 25.2mm measure the piece with the micrometer while it is still in the lathe. The micrometer has the same tolerance as the height gauge of $\pm 0.05\text{mm}$ so it will provide a much more accurate value than the lathe. Once this final section is cut the hole can be drilled into the section of $\varnothing 28\text{mm}$. The hole will have a diameter of 5mm. Use the pillar drill to make this hole. The hole should line up with the centre of the hole (be perpendicular) in the top of the piece. The centre of this hole should be 30mm from the surface of the piece with the pre existing hole. Once this hole has been drilled you should tap the hole from 4 on the top of the piece with a 5mm tapping kit. This is done in 3 stages with 3 pieces. The first tool used has the longest taper, this makes it easier to start tapping the hole and reduces the chance that the tool will snap. Use the other 2 ^{fine} tools to finish the tapping. Use a file to clean up

Feedback:

I am very confident with using all equipment in the workshop as I have previous experience.

Engineering Applications
Barry John

26/1/18
3-5 pm

Aim:-

Introduction to workshop and equipment.

Health and Safety:

Hazards within the workshop include heavy engine parts that could fall or be dropped. Sharp engine parts that can slice you open.

PPE used:

No PPE used in this session as no work was undertaken.

Processes:

The tools shown to us included a socket set, various screwdrivers and a torque wrench. The engine stand was also shown and we were told how to safely manoeuvre and rotate it.

These could then be removed by undoing multiple bolts. Once the 6 cams were removed we were able to begin taking the head off the engine. All parts removed were taken off using the socket set with varying size bits attached.

Photos:-

Measurements:-

When stripping the engine we measured the profile of the cams, due to wear or manufacturing imperfections not all cams were the same size. To account for this there were 'shims' over the valves, these shims all

Engineering Applications
Barry Scha

2/2/18
3-5 pm

Aim:-

To begin to strip down the engine.

Health and Safety:-

Hazards within the workshop include heavy engine parts that could fall. Sharp engine parts that could cut you.

PPE used:

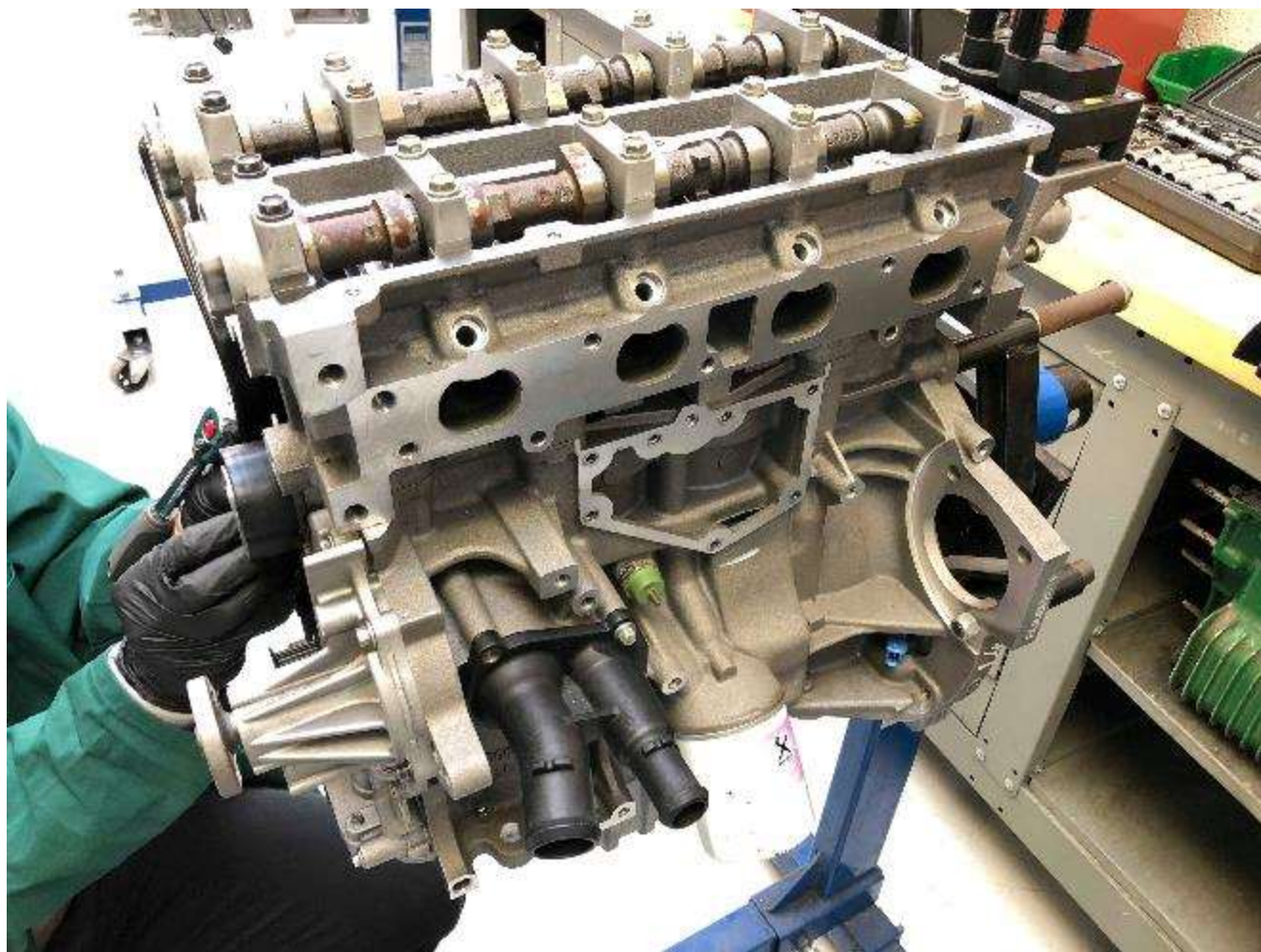
A dust coat was worn along with gloves to reduce the risk of cutting yourself. Steel toe cap boots were also worn at all times.

Process:-

The engine will be stripped from top to bottom. The first things to be removed were all plastic covers, this allowed for components to be accessed. The intake manifold is an example of one of these pieces. The plastic piece that covers the cams was removed to allow us to see the cams.







had different thicknesses, these shims are to ensure the valves are all lowered by the same distance.

Observations:

When removing the cams and all bearings around them it is important to remember what order and orientation they go in otherwise the engine will be unable to turn over.

Achievements:

The engine came apart well and we worked well as a team, measurements were taken accurately.

Feedback:

Worked well with good working practices

Engineering Applications
Barry John

9/2/18

Aim:-

To remove pistons and sump.

Health and safety:-

Hazards within the workshop include heavy engine components that could fall/be dropped. Sharp engine parts could cut you.

PPE Used:-

Gloves and dust coat were worn to reduce chance of getting cut. Steel toe caps were also worn at all times.

Process:-

The tools used in this session included a socket set set, vernier caliper. To remove the pistons from within the block the conrods had to be removed from the crankshaft. To access this part of the engine the sump had to be removed, this was done by undoing



Observations:-

The pistons were the incorrect size for the engine being worked on, this means that the engine was rattling as the pistons were able to move within the block.

Achievement:-

The pistons were very easy to remove, the measurements were taken accurately.

Feedback:-

Worked well as a team with concise and efficient working practices.

Multiple ~~pistons~~ bolts on the bottom of the engine. Once the sump had been removed the conrods and crankshaft were visible. 2 bolts hold the

con-rods to the crankshaft, once these are removed the piston's side out of the block easily. The diameter of the pistons were measured to see if they were circular. The pistons in the engine being worked on were incorrect and they did not fit correctly. The crankshaft was removed and we inspected it to see if there was any wear.

Measurements:-

When the pistons were out of the engine we measured their diameters. The measurement was taken on the crown and skirt, for measurements were taken to see if the pistons were circular and if they were the correct size for the bore of the block.

Engineering Applications
Barry John

16/2/19

Aim:-

To remove valves from the head

Health and safety:-

Hazards in the workshop include heavy engine parts that could fall or be dropped. Also sharp engine parts could cut you.

PPE used:-

Gloves and dust coat were worn to reduce chance of getting cut. Steel toe caps were also worn at all times.

Process:-

Tools used in this session include

a valve spring compressor and magnetic screwdriver. The valve spring compressor is used to compress the spring on the valves, by doing this the valves can be removed. Once the spring has been compressed a tapered split valve keeper can be removed





Feedback:-

Conducted work well as a team with good working practises.

using a small magnetic screwdriver. Once these have been removed it is possible to remove the valve. When the valves are out their length and diameter can be measured. To replace the valves the above process is reversed.

Measurements:-

The valves length and diameter are measured once ^{for} removed, this is done to see how ~~for~~ the valves are displaced when the cam compresses them, & if they are too long they could hit the piston as it travels upwards, damaging the piston, valve or both.

Observations:-

The valve springs were much stronger than I expected them to be.

Achievement:-

All work was done well and the valves were removed and replaced correctly.

secured the sump was reattached and the engine was rotated 180° so the top of the engine could be worked on. The head was the next thing to be put back on. The head bolts have to be tightened to a certain torque, to do this the torque wrench was used, it was set to the correct force and the bolts were tightened. Once the head was attached the cams were replaced and secured, ensuring they were the correct orientation. The timing belt was then able to be put back on, this was fed through and the tensioner was made slack to allow it to fit. Once the belt was attached the plastic covers and other parts could be fitted. This concluded the rebuild of the engine.

Measurements:-

No measurements were taken but care was taken to ensure all bolts were to correct torque and

Engineering Applications

Barry John

23/12/18

Aim:-

To rebuild the engine.

Health and safety:-

Hazards in the workshop include heavy engine parts that could fall or be dropped. Also sharp engine components could cause cuts.

PPE used:-

Gloves and a dustcoat were worn to reduce risk of getting cut. Steel toe caps were also worn at all times.

Processes:-

Tools used in this session include socket set, torque wrench. The rebuild of the engine began from the bottom of the engine. The crankshaft was placed back into the block, the pistons and con rods were then bolted onto it. Once these had all been

all components were in the correct orientation.

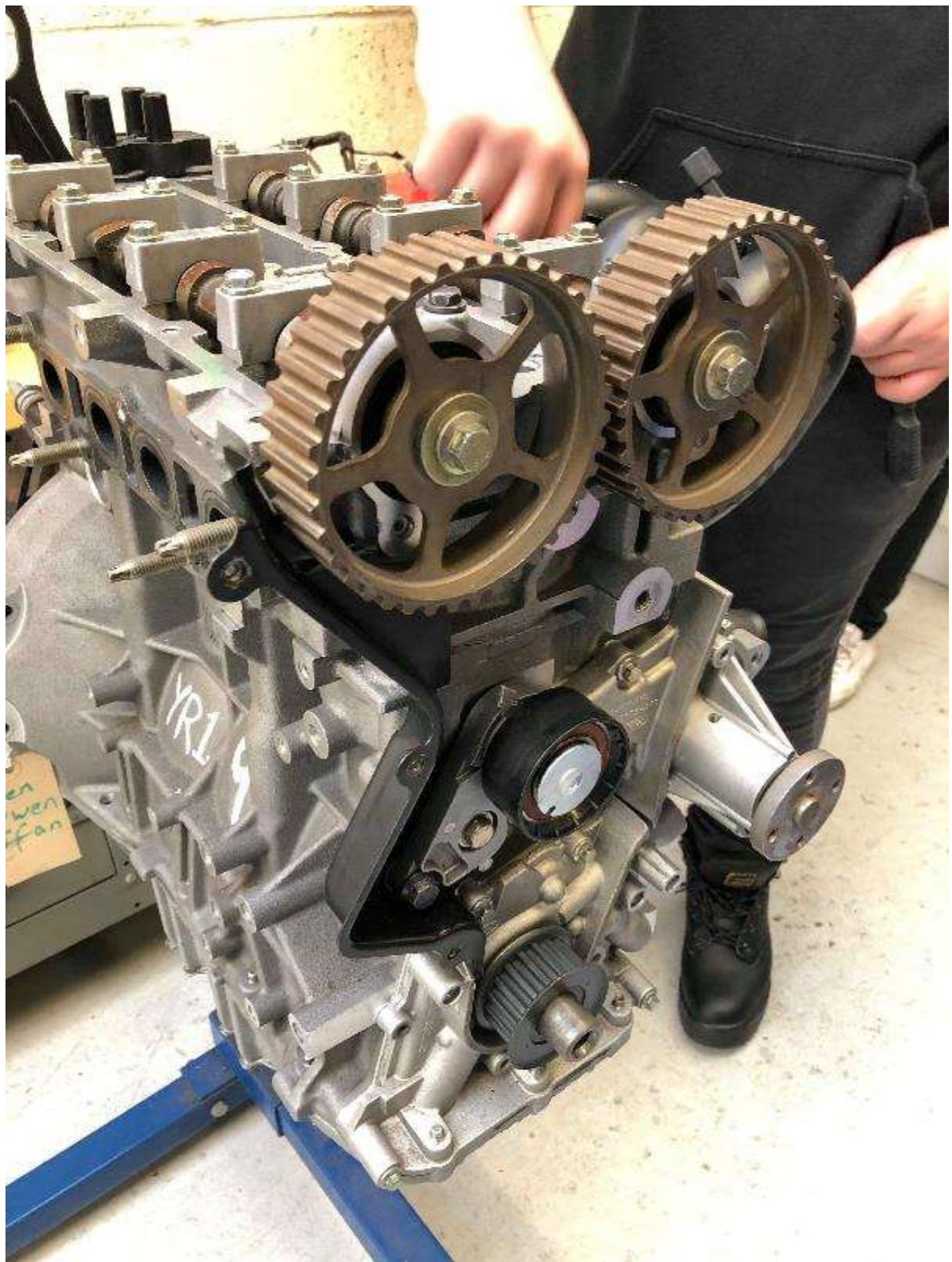
Observations:-

The engine went together well, no bolts were rounded or stripped. There were also no spare bolts left over so nothing was forgotten.

Feedback:-

Engine was put together with a high standard of work and in a good time.





Gears were cut at a slight angle and only the reverse gear was straight cut. We were shown a race gearbox where all of the gears were special forged and straight cut. When looking at the differentials I was surprised at how many moving parts there were within them.

Engineering Applications:
Barry John

9/3/18

Aim:-

Introduction to differentials and gearboxes

Health and safety:-

The differentials and gearboxes are very heavy and could cause damage if dropped or if they fall.

PPE used:-

Steel toe caps were worn at all times.

Process:-

We were allowed to freely look at a variety of differentials and gearboxes. Barry then explained the difference between 5 and 6 speed gearboxes and front ~~engine~~ and rear wheel drive differentials.

Observations:-

When looking at the gearboxes you could see that some of the

