My name is James. And last year, I studied VCE VET Engineering Studies at Swinburne University of Technology. My work is a robotic arm designed to help workers in toxic or possibly dangerous industries, such as in the chemical industry where they might be required to move toxic materials.

I've always liked to tinker with robotics. And a robotic arm was always something on my to do list. I always like to explain mechatronics engineering more as robotics engineering. It's a bit of a mix between mechanical engineering, electrical engineering, and software engineering.

So, in my robotic arm, you use the mechanical engineering for the physical stuff then the electronic engineering for the wiring and then the software to programme what your robot does. So inside the controller there's one relay switch, which is for the main linear actuator. And then the Arduino is all connected into a transmitter. So that transmits all its data into the robot, so you can remotely control it.

In the potentiometers, or the dials, is what you call a variable resistor. And that basically would just change the voltage from 0.5 to 0.2, or vice versa, depending on where it's controlled. So then the Arduino would pick up what voltage it's at and be able to tell where exactly the dial is on the potentiometer.

Being a three axis robotic arm, it has a shoulder joint, which moves the whole entire arm, then an elbow joint, which is the second joint up. And then the wrist joint, which just moves the grabber. The main problem with the turning functionality of the robot is that the bearings I was going to use at that size weren't super cheap.

So I had a bit of a little look online, and we could get a Lazy Susan turntable bearing at Bunnings for $10, I think it was, at the time. So that was a lot cheaper. So I just went for that option, which allows for quite a bit of play side to side. So when the robotic arm's fully extended out, it puts quite a lot of weight on the main servo drive that turns the robotic arm around, unfortunately.

Just to try and fix a little bit of the play, I put a ring inside the bearing to try and stop it from wiggling around that much, which did help a bit, but it did up the friction of the bearing, unfortunately. Basically, all of it is 3D printed. All the plastic parts, that's all 3D printed.

Then the main arm itself, that's made out of aluminium tube. I used aluminium because it's pretty strong and it reduces the weight of it. Also, it doesn't corrode basically at all, and it doesn't have a chemical reaction to any toxic chemicals. As well as the plastic, that was made out of PLA plastic, which is also quite chemically resistant.

So I'd make everything for the robot before I assemble it all. The main skills would be 3D CAD. I used 3D CAD a lot on this project for all the 3D printed parts. Then for the arms itself, I had to lay the tube down a little bit to a millimetre thickness. So it's quite a bit lighter now.

Then the legs, I just used an angle grinder to make the strips of stainless steel. I've always really liked the physical, getting your hands dirty, kinds of subjects. It was definitely a really good environment, and especially because your teachers, since they've had that industry practise, instead of teaching you as if it's just a classroom, they teach you for industry.

Instead of teaching you just to know it, they teach you all the stuff that you need to know for industry, which is quite a good skill to learn. It's very different to school. Since it's a lot more self-driven, you really take it at your own pace rather than having to either catch up or slow down. You just go whatever pace suits you. And I'd always like to have something that was in line with my hobby.

If you like getting your hands dirty and having a bit more of a practical subject, I'd definitely recommend it. And even if you're wanting to become an engineer, I would recommend it as well, as I found it quite beneficial to my engineering pathway.

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