INDUSTRIAL TRAINING FIELD REPORT (CHE353)

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ID	2018422992
INDUSTRIAL TRANING DURATION	17 WEEKS (21 MARCH 2021 – 15 JULY 2021)

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ACKNOWLEDGEMENT

Assalamualaikum W.B.T, in the name of Allah SWT, I must express my heartfelt appreciation to the almighty Allah SWT for providing me with the amazing energy and capacity to write this report and complete the industrial training as scheduled in order to complete my diploma course.

First and foremost, I would want to express my heartfelt gratitude and special thanks to my supervisor, En. Mohamad A'tif Bin Mohamed Roznan, who, although working long hours and performing several responsibilities and tasks, has taken the time to listen to and guide me through this industrial training. Not to mention, he continued to encourage and assist me as I completed my smaller projects and assignments until I reached the end outcome that the firm had requested of me at the start of my industrial training. His constant research and advise support was critical in the report's implementation.

Second, I'd like to thank the personnel at Universiti Teknologi Malaysia (UTM) Skudai for assisting me in gaining new information and skills while working on a mini project during this training. Many obstacles await me throughout this training process, but I am grateful to my family, other classmates, and lecturers for their spiritual support during this industrial training.

Last but not least, I would like to wish Universiti Teknologi Malaysia (UTM) Skudai the best of luck and hope that this firm will always strive to be the finest in Malaysia and be noticed internationally.

PREFACE

I am currently completing Chemical Engineering at Universiti Teknologi MARA Johor, Pasir Gudang Campus, 81750 Masai, Johor (UiTM Pasir Gudang). Since this is my third year of studies and the final year of my diploma, I was obliged to attend roughly 4 months or 17 weeks of internship, to finish my diploma. I chose Universiti Teknologi Malaysia (UTM) Skudai as my internship location because I believe this company can develop my hands-on and high-level thinking skills to solve some engineering problems, as well as provide me with good exposure to the various work interfaces in the company while gaining awareness to face the industry in the future.

For the last four months, I've learnt a lot at this firm, such as how to cope with the real world, and I've also learned a lot of new things that I didn't study in class or barely brushed on the surface of before. Of course, that new information will be beneficial to me, and it is also another valuable chance for me to study and obtain as much knowledge as possible in the engineering area for my future preparedness.

In this report, I have created a very detailed report that contains an organisation chart, process flow, and a briefing about my daily activities throughout my internship term, as well as a description of the task had assigned to me.

Table of Content

1.0 INTRODUCTION

Industrial training refers to work experiences that are relevant to professional development prior to graduation. One of the requirements for the award of Diploma in Chemical Engineering, by the Faculty of Chemical Engineering, Universiti Teknologi MARA (UiTM) is that students must complete at least 17 weeks of Industrial Training.

Students must aware that Industrial Training is a fundamental part of the improvement of the commonsense and expert abilities expected of an Engineer and a guide to promising employment. Numerous employers view this period as an opportunity to vet new workers for future work.

All students should put on effort and give an adequate idea into getting the most significant and viable Industrial Training. While troublesome, it is attractive to get insight into a wide scope of activities, for example, plan office, laboratories, and on-location circumstances. It also should be noticed that developing awareness with general working environment conduct and interpersonal skills are the significant purpose of the Industrial Training experience.

Typically, students will go through Industrial Training during semester six and students will get places for Industrial Training in any proper company of their own decisions. The Faculty's Coordinator of Industrial Training and Personal Advisor (PA) will help as much as they can to qualified students on issue viewing the application process just as dependable on the lead of the Industrial Training even having difficulties due to the Covid-19 outbreak. The Faculty's Coordinator and PA's of all classes will put an effort to help the students and keep in touch with them with follow-up due to the decline in the economics of some companies due to the Covid-19 pandemic. Students are encouraged to contact the CIT's office for any request and consistently check the most recent data and updates on Industrial Training posted on the Industrial Training Board at the Faculty.

During the Industrial Training term, students are needed to consistently follow the standard and guidelines while going to the preparation and to record everyday activities in the given logbooks. At the end of Industrial Training, students are required to present a full report, which contains point by point job description did by them. The faculty's staff will likewise keep track of the internship students during the training sessions to evaluate the adequacy of the training program.

Assessment for the industrial training will be based on daily logbook, industrial training report, industrial supervisors and evaluating lecturer evaluations.

2.0 CONTENT

2.1 BACKGROUND OF UNIVERSITI TEKNOLOGI MALAYSIA (UTM Skudai)

Figure 2.1: *Logo of Universiti Teknologi Malaysia (UTM)*

The history of the Faculty of Mechanical Engineering, Universiti Teknologi (UTM) started way back in 1904 as a class for technical studies at the Kuala Lumpur City Council Building. Two years later, the class become a Technical School which located at Batu Lane Malay School. The main role of the school was to train local personnel for manning expanding infrastructures such as cart-roads and railway lines.

Figure 2.2: *The Old Building of Technical School at Jalan Brickfields, Kuala Lumpur in 1925*

In 1925, the Technical school started to extend its course and were conducted together with the Public Work Department. Then in 1941, the Advisory Committee of Technical Schools and the Education recommended that the Technical School be elevated to a college status and proposed that a new Technical College be constructed. In 1946, it offered a three-year Diploma courses in Civil, Mechanical, Electrical Engineering, Land Surveying, Building Architecture and Quality Surveying, while a special in Automobile Engineering was offered for the transportation enforcement officers. Land Surveying, Building Architecture and Quality Surveying, while a special in Automobile Engineering was offered for the transportation enforcement officers.

In 1960, the College began a new era by upgrading its engineering courses to the degree level. Student following the course had opportunities to sit for professional examinations which conducted by the Institution of Civil Engineers and Institution of Mechanical Engineers, United Kingdom & the Royal Institute of British Architects, as well as the Royal Institute of Chartered Surveyors. United Kingdom & the Royal Institute of British Architects, as well as the Royal Institute of Chartered Surveyors.

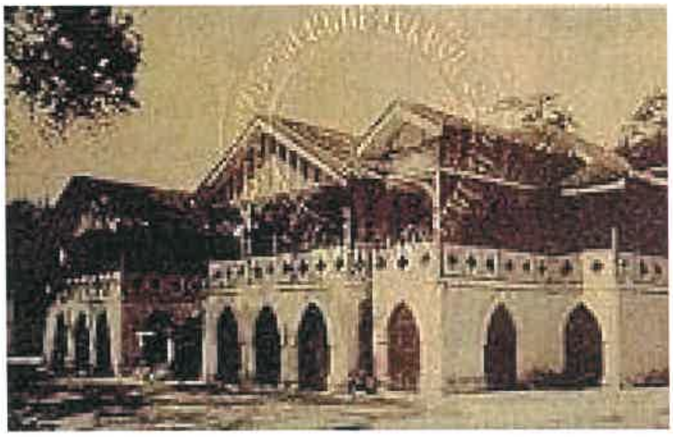


Figure 2.3: *The Building of Technical College at Jalan Bandar, Kuala Lumpur in 1941*

The increase in the enrollment during 1965/1966 academic session, was a direct result of the shift in the government's policy which gave more emphasis on technology-oriented industries in order to develop the growing economy. With the rapid economic expansion, Technical College became the popular choice for further education, well supported by its many modern & improved teaching facilities. With the rapid economic expansion, Technical College became the popular choice for further education, well supported by its many modern & improved teaching facilities. This resulted the university era began in 1972 when a committee was formed by Ministry of Education. On March 14, 1972, the college was granted a university status under section 6(1) of the University and College Act 1971 and it was named as Institut Teknologi Kebangsaan (ITK) (National Institute of Technology).

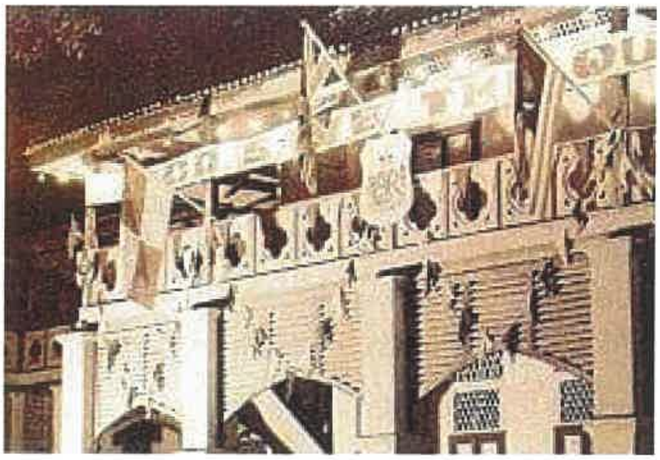


Figure 2.4: *The Building of Institut Teknologi Kebangsaan (ITK) in 1972*

ITK went through tremendous changes & on April 1, 1975, the Institute reached another milestone in its history when it was officially declared as **Universiti Teknologi Malaysia (UTM)**. As the year progressed, the establishment of new faculties also meant new academic programmes, increasing student & staff populations, plus added demands for facilities. This accelerated physical expansion & development had resulted into its move a new campus located on 2,400 acres of land in Skudai, Johor. The RM1 billion new campus was officially opened on September 16, 1985 by His Majesty Sultan Iskandar Ibni Almarhum Sultan Ismail, then the Yang di Pertuan Agong, in his capacity as his capacity as the second Chancellor of UTM.

Figure 2.5: *New Campus Construction at Skudai, Johor in 1985*

After nearly three decades since its establishment in 1975, the Faculty of Mechanical has transformed itself into one of the biggest and most reputed engineering faculties in this region. Now there are over 130 academic staff with annual enrollment of about 2700 students. The achievements have been attributed to the strong and enthusiastic leaderships with a continuous support from members of the faculty.

Figure 2.6: *The Building of School of Mechanical Engineering in 2018*

The School of Mechanical Engineering (SME), Faculty of Engineering, Universiti Teknologi Malaysia, was formerly known as the Fakulti Kejuruteraan Jentera (FKJ). It was set up in 1975 at Universiti Teknologi Malaysia Kuala Lumpur campus. FKJ initially had two departments, namely, the Department of Mechanical Engineering and the Department of Petroleum Engineering. A Dean managed the Faculty with the assistance of a Deputy Dean and two Heads of Departments. On 15th of March 1983, the Department of Petroleum Engineering has been expanded to form a new faculty known as the Faculty of Chemical and Natural Resources Engineering. FKJ moved to a new campus in Skudai in June 1989. To make the Faculty more marketable internationally, the University has agreed to rename FKJ to Fakulti Kejuruteraan Mekanikal (FKM) or Faculty of Mechanical Engineering (FME) on 20th of December 1995. In July 2018, under the UTM Synergy 4.0, FKM was placed under new management named Faculty of Engineering (FE) together with the other five Faculties. FKM was renamed to the School of Mechanical Engineering (SME).

2.2 Company Location

Figure 2.7: *Location of Fakulti Kejuruteraan Mekanikal, UTM Skudai*

Figure 2.8: *Location of School of Mechanical Engineering, UTM Skudai*

Figure 2.7 and **Figure 2.8** illustrate the location of School of Mechanical Engineering, Faculty of Engineering, which is located at Fakulti Kejuruteraan Mekanikal, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor.

2.3 ORGANIZATIONAL CHART

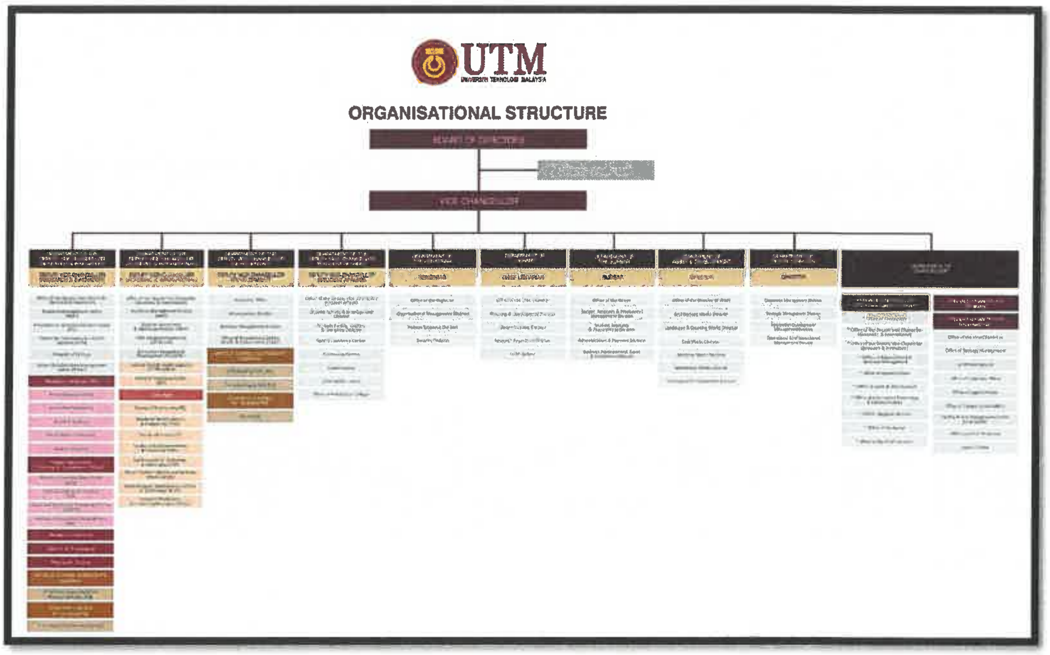


Figure 2.9: *Organizational Chart of UTM*

The figure above shows the current organization chart for the whole Universiti Teknologi Malaysia (UTM) at Skudai, Johor. The university is being led by the current fourth Chancellor, **Her Majesty Raja Zarith Sofiah ibni Almarhum Sultan Idris Shah**. Her Majesty is also the former Pro Chancellor of UTM. The current Pro Chancellor of UTM held by three people, **YBhg. Tan Sri Dr. Salleh bin Mohd Nor**, YBhg. Prof. Tan Sri Dato' Dr. Lin See-Yan and YBhg. **Tan Sri Datin Paduka Siti Sadiah binti Sheikh Bakir**. Under the board of Pro Chancellor is Board of Directors who mostly maintain all UTM in Malaysia and being led by 10 high rank management.

Moreover, the current Vice Chancellor of UTM is held by Professor Ahmad Fauzi Ismail. The Vice Chancellor provides a vital, creative and adaptable vision and leadership for Student Affairs in support of the development, assessment and improvement of student services and experience which meet and support the university's mission and strategic plan. The Vice Chancellor serves as the student advocate within the university community.

Duties include, but are not limited to, the following:

- Provides leadership and supervision for the planning, organizing, and coordinating of the Division of Student Affairs while achieving institutional goals and objectives.
- Assists with campus-wide crisis/emergency response and provides support to students and families in emergency situations.
- Develops and manages the Division's resources and budgets and identifies and projects long- and short-range needs for strategic projections of program and staffing requirements for budget preparation purposes.
- Serves as the chief spokesperson for the Chancellor on matters related to student life, services and programs with students, the community, system offices, state and federal agencies and other campuses.

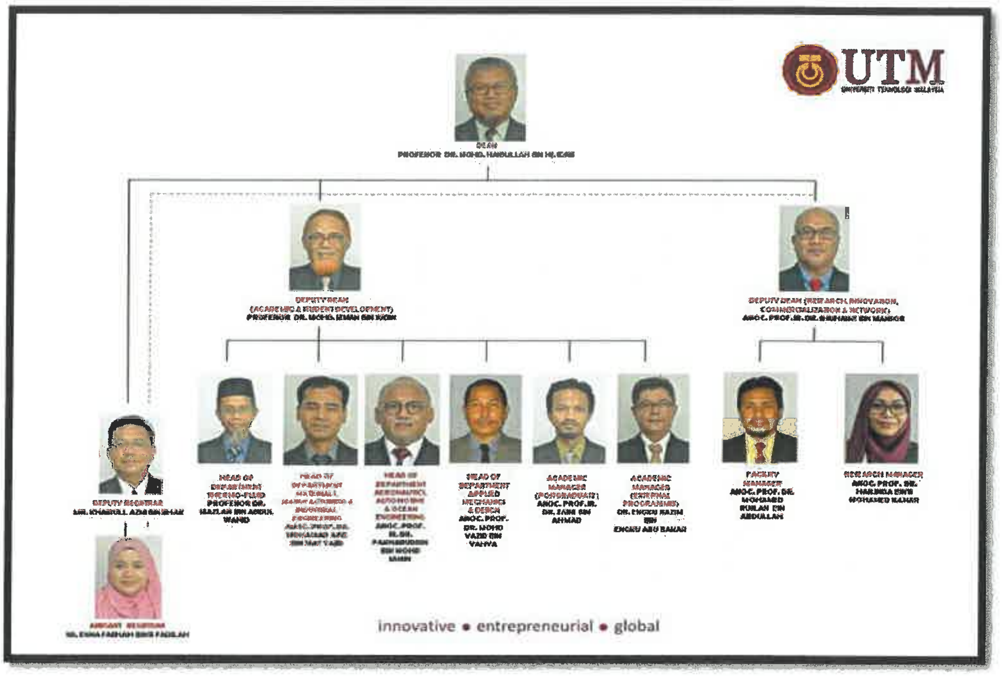


Figure 2.10: *Organizational Chart of SME*

SME is currently led by a Dean and assisted by two Deputy Deans; the Deputy Dean (Academics & Student Development) and Deputy Dean (Research, Innovation, Communities and Networking). A Deputy Registrar with the assistance of an Assistant Registrar handles the administrative matters of the faculty. The administration of the Information Technology (IT) unit is headed by an IT Manager and the Teaching Laboratories are headed by a Laboratory Manager. Currently, the Faculty has FOUR (4) academic departments, each headed by a Head of Department.

They are as follows:

- Department of Applied Mechanics & Design
- Department of Thermo-Fluids
- Department of Materials, Manufacturing & Industrial Engineering
- Department of Aeronautics, Automotive & Ocean Engineering

Figure 2.11: *Latest Organizational Chart of SME*

The figure above illustrates the whole organisational structure of the SCHOOL OF MECHANICAL ENGINEERING. In addition, Mr. MOHAMED A'TIF MOHAMED ROZNAN, the Mechanical Engineer, is the Lab Manager Office Head, and he is helped by 56 assistant engineers and 12 more assistant Vocational Training Officers. Furthermore, Mr. Mohamed A'tif is also our Supervisor (SV) throughout our Industrial Training term, however, he has never had the opportunity to guide us because he is usually busy. Even though he had an inescapable job, he found a method to watch us throughout the duration via Whatsapp. Every week, he requested us to provide an update on the location and the work we had completed.

Dr. Kamarulafizam Ismail is in charge of the Laboratory Manager. He's also a member of Problem Based Learning, which means he's been assigned a job as a guide. Because one of the primary aims of PBL is to teach students how to solve issues, students will need to be guided through the problem-solving process. A teacher can act as a model problem solution by asking questions alongside the students. They also value diverse ideas and techniques, encourage kids to come up with many solutions to a problem, and congratulate students on effective problem-solving skills whether or not they achieve a solution. Aside from that, Dr. Kamarul is our Mini-Project Leader/Advisor, with whom we've been working on tasks he provided us early on.

2.4 Process Flow

- **3-D Printing**

Because of its direct moulding capabilities, 3D printing technology is widely utilised in industrial manufacture, medical biology, and artistic work. Based on the features and benefits of 3D printing technology, this study examines 3D printing technology moulding principles and process flows in automobile manufacturing, aerospace, and electrical industries. Because of its direct moulding capabilities, 3D printing technology is widely utilised in industrial manufacture, medical biology, and artistic work. Based on the features and benefits of 3D printing technology, this study examines 3D printing technology moulding principles and process flows in automobile manufacturing, aerospace, and electrical industries.

3D printing, also known as additive manufacturing, is a method of creating three-dimensional solid things from a digital file. The production of a 3D printed item is accomplished via the use of additive techniques. An item is formed in an additive method by laying down successive layers of material until the product is complete. Each of these levels is a finely cut cross-section of the item. 3D printing is the inverse of subtractive manufacturing, which involves cutting or hollowing out a piece of metal or plastic with a milling machine, for example. 3D printing makes it possible to create complicated forms with less material than traditional production processes.

Figure 2.12: *Creality Ender Pro 3 Printing Machine*

The process flow of 3D printing technology is shown in Figure. It mainly includes four steps, which are three-dimensional modal establishment modal, preprocessing, prototyping and post-processing.

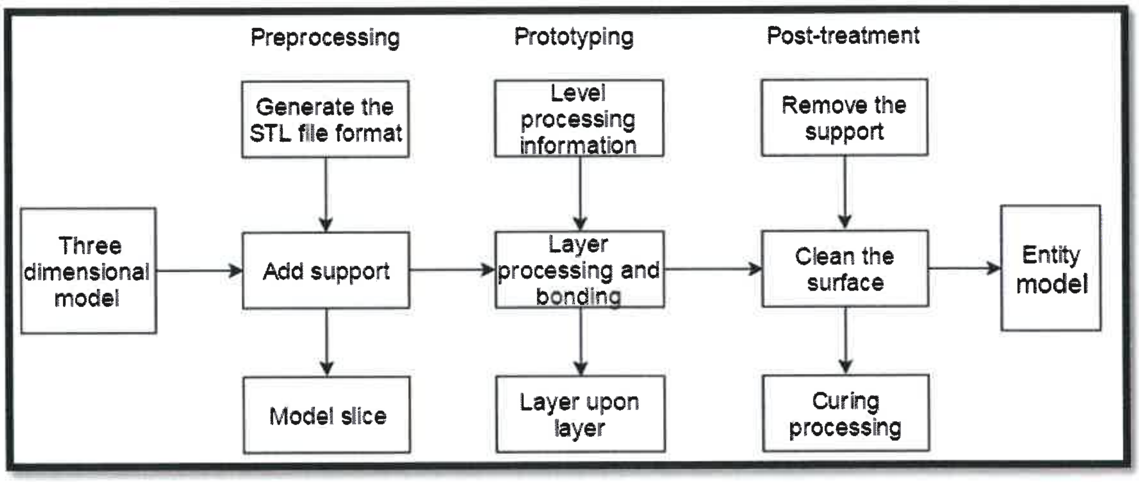


Figure 2.13: *Process Flow of 3D Printing*

1) Three-dimensional model:

   3D CAD data model directly drives the additive manufacturing drives the additive manufacturing system. Therefore, the fist process of additive manufacturing process should be to design the 3D CAD data model of the product.

   i. **DESIGN:** You can use 3D modeling software like Blender, AutoCad, SolidWorks, ThinkerCad or others to create your own designs. Almost any 3D modeling software can be used to create a 3D printable file.
   ii. **DOWNLOAD:** If you have minimal patience and just want to go ahead and print something, you can visit websites like Thingivers, YouMagine, CrabCad, and MyMinifactory Shapeways to download or buy files that other users have modeled. These files are 3d Print ready in most cases and much easier for those want to the work fast

   At present, the data file format widely accepted by various software is STL. First, we need to convert it into an appropriate file format. The most common 3D Printing file format is called **STL**, that stands for **ST**ereo**L**ithography, and named after the first ever 3D printing process.

Figure 2.14: *3D model design*

2) Preprocessing and Slicing:
   This is the process of translating the 3D File into instructions for the 3D printer to follow. Slicing is dividing or chopping the 3D model into hundreds or thousands of horizontal layers, telling the machine exactly what to do, step by step. After the files are Sliced, a new file format is generated called **G-code**, with the file extension **.gcode**. **G-code** is the most widely used numerical code programming language, mainly used in computer-aided manufacturing to control automated machine tools like 3D Printers and CNCs (Computer Numerical Controls). Next, select the appropriate molding direction and cut the 3D model with a series of planes with same spacing along the direction of the molding height, so as to obtain the 2D contour information of the cutting layer. The smaller the spacing height, the higher the molding accuracy and the longer the molding time, and the lower the molding efficiency.

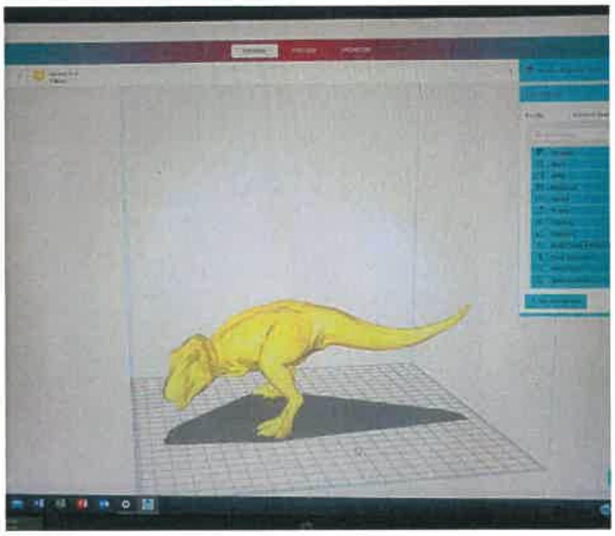
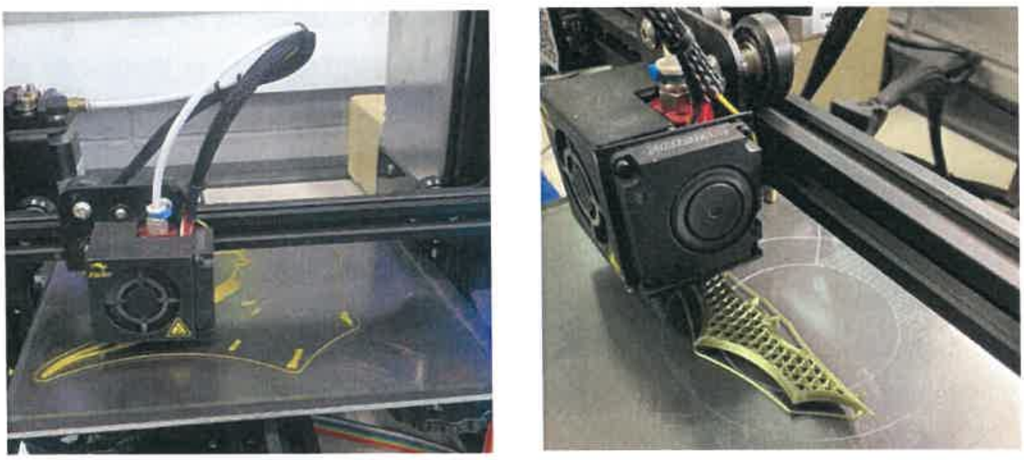


Figure 2.15: *3D Model Slicing in Ultimaker Cure*

3) Printing:

The printing machines are made of many moving and intricate parts, and they demand correct maintenance and calibration to produce successful prints. The machine will follow the automated **G-code** instructions, so as long as there is no software error or the machine doesn't run out of raw material, there should not be an issues during the printing process.



(i) (ii)

Figure 2.16 (i) and (ii): *3D Printing Process*

4) Post-treatment:

Post-treatment is a crucial step in ensuring the components' beauty and functionality. The most of 3D printed items are rough and lacking a completed feel, but they may be significantly improved with the appropriate methods and expertise. Printed pieces can be precisely transformed into a real-world model of the original concept by sanding, painting, polishing, and other post-treatment processes. Where aesthetics is not essential, but mechanical characteristics are, a variety of industrial processes may take place. Post-treatment can be a vital and time-consuming procedure, but as technology advances, those stages will be automated. The goal of post-treatment is to improve the product's strength and reduce the product's surface roughness. Repairing, grinding, post-curing, peeling, and coating are all part of the process.

(i)

(ii)

Figure 2.17 (i) and (ii): *Examples of Finish 3D Printing Model*

- **Sand Casting**

Sand casting, also known as sand molded casting, is a metal casting process characterized by using sand as the mold material. The term "sand casting" can also refer to an object produced via the sand casting process. Sand castings are produced in specialized factories called foundries. Molds made of sand are relatively cheap, and sufficiently refractory even for steel foundry use. In addition to the sand, a suitable bonding agent (usually clay) is mixed or occurs with the sand. To enhance the strength and plasticity of the clay and make the aggregate appropriate for moulding, the mixture is wet, generally with water but sometimes with other substances. Mold cavities and gate systems are made by compacting sand around designs, cutting directly into the sand, or 3D printing.

There are several methods for sand casting in the industry, but only a few methods that I got to learn during the internship period. One of the methods that I learn from the staff is 'Lost Foam Casting' and the other one is 'Green Sand Casting'. This is because the trainee had their industrial training schedules been set up.

Lost foam casting serves a little but significant role in the current acceleration of technological advancement in industry. Consumer demand in the automotive industry is at an all-time high, which means materials technology must keep up, and LFC enables the creation of solid aluminium components to assist achieve weight and cost reductions.

Lost-foam casting (LFC) is a casting technique that uses molten metal to make solid metal components. The LFC method produces these castings at a significantly lower cost than other procedures such as sand casting. The automobile industry's substantial research and development efforts have resulted in major advances in the LFC of cast irons and aluminium alloys. Thus, scientific data on superheats, heat transmission, flow length, and so on are reasonably available for LFC of cast irons and aluminium alloys.

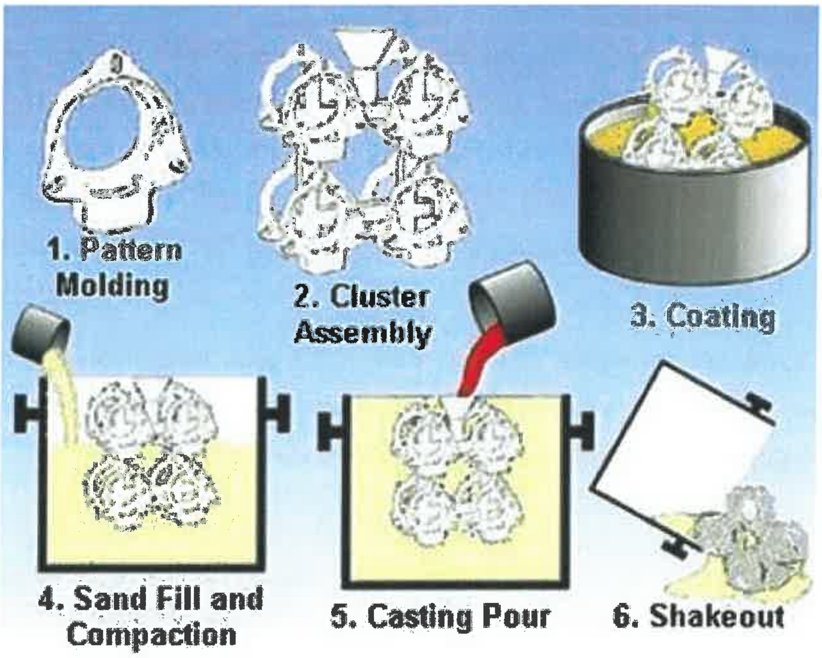


Figure 2.18: *Process Flow of Sand Casting*

The fabrication of the foam mould is the initial stage in lost-foam casting. Using hand or power equipment, a block of polystyrene foam is carved into the exact shape of the completed product. Power tooling is preferable for more consistent shaping of the foam in applications where the dimensions of the completed product must be accurate. The mould is then completely covered with sheetrock mud or plaster. When the foam mould is done, it is buried in a container filled with compacted sand, such as a metal drum. The very ends of the foam form are left exposed to allow the molten metal to enter the mould. During this phase, a handmade tool can be utilised to speed up the process. This instrument, which consists of a hinged cylinder with long handles that can be opened and closed along the side, is put on the sand so that it surrounds the foam piece. When the metal is poured, the cylinder walls retain it and enable it to build up over the piece, resulting in increased pressure and, as a result, a more thorough casting.

Following that, green sand casting is an efficient moulding method that makes use of sand as the primary moulding material. This casting process is known as as "green" since the sand is recyclable and contains no chemical additions, only clay, water, and sand. The moisture level within the moulds gives the sand with a binding structure. Sand casting is one of the few techniques accessible for metals with high melting points, such as steels and titanium. Sand casting is the most frequently used casting method due of its flexibility, heat resistance, and low cost.

Green sand (an aggregate of sand, pulverized coal, bentonite clay, and water) has traditionally been used in sand casting, however modern chemically bonded molding systems are becoming more popular. The most widely used casting sand is silica (SiO_2).

(i)

(ii)

Figure 2.19 (i) and (ii): *Silica Sand*

Generally, the process to cast product by this molding technology is quite simple in comparison with other mold making methods.

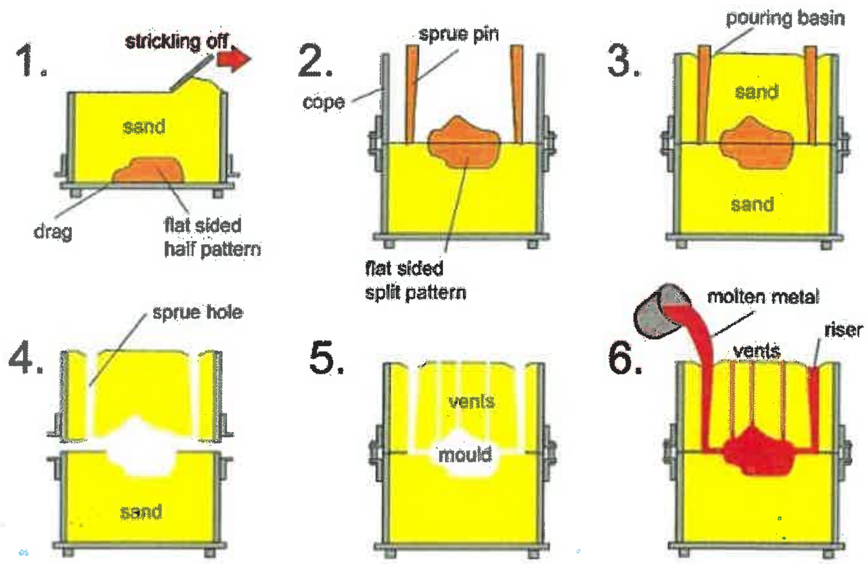


Figure 2.20: *Green Sand Casting Process*

Summarily, **the green sand mold casting process** includes 4 steps as following:

1. Firstly, loading **green sand** into **a flask** (a typical tool used to contain casting mold).
2. Secondly, placing **the designed pattern** inside and pressing it into the sand. The pattern design matchs with the final product including calculation of tolerances. A pattern can be made from any kind of material due to this method doesn't use any heats or chemical compounds affecting the pattern. Froundries often use **plastics and wood** because of their low cost.
3. There will be a suitable mold cavity when removing the pattern. After that, **filling the molten metal into the cavity mold.**
4. Once the metal is cool and solid, a sand mold is removed by **the shakeout process** and casting is collected.

- Milling

Milling machine is one of the most versatile conventional machine tools with a wide range of metal cutting capability. Many complicated operations such as indexing, gang milling, and straddle milling etc. can be carried out on a milling machine

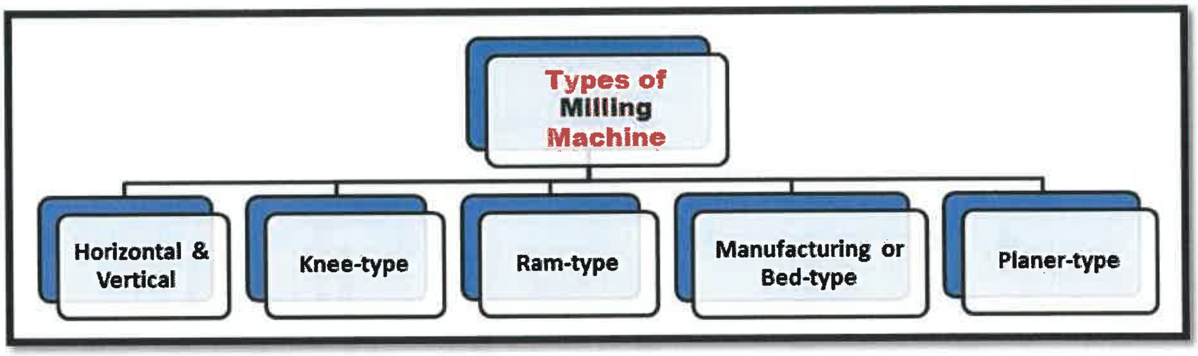


Figure 2.21: *Types of Milling Machine*

Basically, the milling machines are divided into two types first is horizontal milling machine and second one is vertical milling machine. They are further classified as knee-type, ram-type, manufacturing or bed type and planer-type milling machine. So, the milling machine that trainees used in Machine Shop lab is Horizonal & Vertical milling machine.

Milling Processes

Milling is a metal removal process by means of using a rotating cutter having one or more cutting teeth as illustrated in figure 13. The milling cutter is a rotary cutting tool, often with multiple cutting points. As opposed to drilling, where the tool is advanced along its rotation axis, the cutter in milling is usually moved perpendicular to its axis so that cutting occurs on the circumference of the cutter.

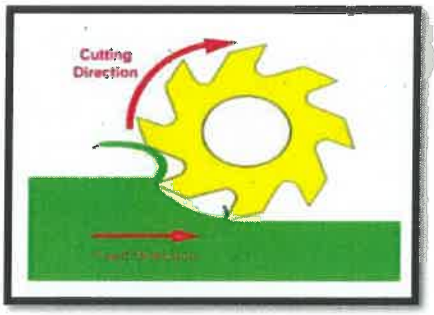


Figure 2.22: *Milling Process*

The workpiece is fed against the spinning cutter to perform the cutting operation. As a result, the spindle speed, table feed, depth of cut, and rotating direction of the cutter become the process's primary parameters. Only by carefully balancing these parameters can good outcomes be obtained.

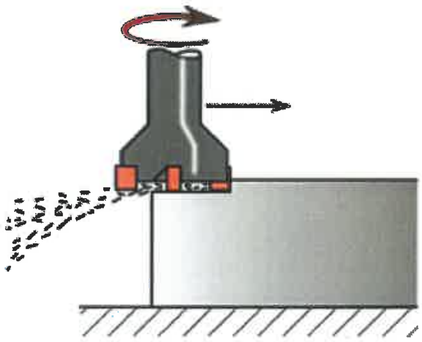


Figure 2.23: *Face Milling Process*

The milling process eliminates material by making several tiny incisions. This is done by employing a cutter with many teeth, spinning the cutter at high speeds, or gently moving the material through the cutter; most commonly, a mixture of these three techniques is used. The rates and feeds are adjusted to accommodate a variety of factors. Feed rate, or simply feed, is the rate at which the piece progresses through the cutter; it is most commonly measured as distance per time (inches per minute [in/min or ipm] or millimetres per minute [mm/min]), however distance per revolution or per cutter tooth are also frequently used.

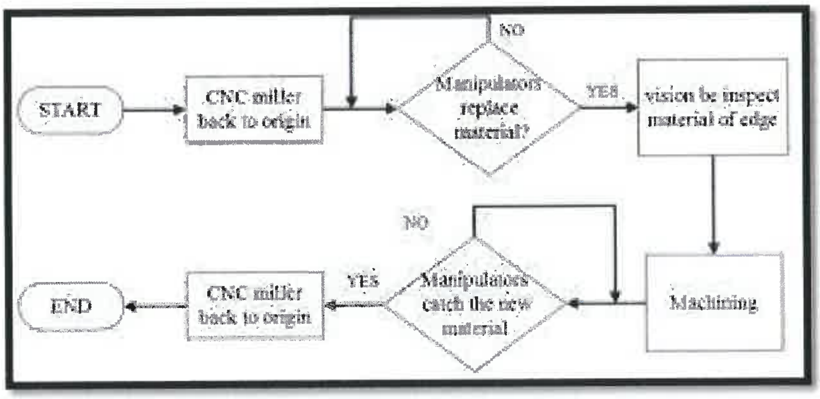


Figure 2.24: *CNC Machining Operational Flow Chart*

In the fully automatic CNC machining production system, a CNC miller is used, and the operational flow chart is illustrated in Figure 2.24. The CNC miller will travel to the edge finder zone and locate the edge of the X coordinate. After inspecting the edge, the CNC miller began cutting the material when it returned to the origin. After the machining is completed, the CNC will wait for the manipulator to change the material.

2.5 Industrial Training Activites

All trainees are required to attend their first day of Industrial Training/Internship at their assigned companies on March 21, 2021. Students must complete 14 weeks of practical training (1/3/2021 – 15/7/2021) as part of the Diploma of Chemical Engineering end-of-semester requirements. My boss, Encik Mohamed A'tif Bin Mohamed Roznan, Mechanical Engineering and Lab Office Manager at Universiti Teknologi Malaysia, has tasked me with a variety of difficult tasks. The trainee reported to Pn. Ruzita Binti Mohamed Salleh, the Administration Assistant in the Lab Office, on the first day. There are a total of five industrial trainees from various universities, with some of them starting their internships as early as this month. Pn. Ruzita greeted all of the trainees and began introducing them to the rest of the office personnel. She then provided the trainee with their Internship Schedule and escorted them to their department on time.

The calendar and timetable of staff working hours that UTM provided to me as part of my internship are listed below. So, theoretically, the trainees work as employees. Typically, the shift begins at 8 a.m. and ends at 6 p.m., in accordance with the regular office hour, which is 8 hours each day.

Industrial Trainee's Schedule

SEKOLAH KEJURUTERAAN MEKANIKAL, FAKULTI KEJURUTERAAN

JADUAL UNTUK PELAJAR LATIHAN INDUSTRI

22 FEBRUARI HINGGA 13 OGOS 2021

MINGGU	TARIKH	MAKMAL	CUTI	T/T STAF MAKMAL & TARIKH
1	22-25/2/2021	PEJABAT PENGURUSAN FASILITI		
2	28/2 - 4/3/2021	MAKMAL SYOP MESIN		8/03/2021
3	7/3 - 11/3/2021			
4	14/3 - 18/3/2021	MAKMAL PENGELUARAN	23/3/2021 KEPUTERAAN SULTAN JOHOR	
5	21/3 - 25/3/2021			
6	28/3 - 1/4/2021	MAKMAL TUANGAN		
7	4/4 - 8/4/2021			
8	11/4 - 15/4/2021	MAKMAL MEKANIK BAHAN & STRUKTUR	13/4/2021 AWAL RAMADHAN	
9	18/4 - 22/4/2021			
10	25/4 - 29/4/2021	MAKMAL KOMPOSIT		
11	2/5 - 6/5/2021	MAKMAL ELEKTRIK		
12	9/5 - 13/5/2021	MAKMAL PEMBENTUKAN LOGAM	13/5/2021 HARI RAYA PUASA	
13	16/5 - 20/5/2021			
14	23/5 - 27/5/2021	MAKMAL FABRIKASI LOGAM	26/5/2021 HARI WESAK	
15	30/5 - 3/6/2021			
16	6/6 - 10/6/2021	MAKMAL BENDALIR	7/6/2021 KEPUTERAAN AGONG	
17	13/6 - 17/6/2021			
18	20/6 - 24/6/2021	PROJECT		
19	27/6 - 1/7/2021			
20	4/7 - 8/7/2021			
21	11/7 - 15/7/2021			
22	18/7 - 22/7/2021		20/7/2021 HARI RAYA HAJI	
23	25/7 - 29/7/2021			
24	1/8 - 5/8/2021			
25	8/8 - 12/8/2021	PEJABAT PENGURUSAN FASILITI	10/8/2021 AWAL MUHARAM	

Figure 2.25: *Trainess's Schedule*

Timetable

Day	Hours	Rest Time	Hours
Sunday - Wednesday	8.00 AM – 1.00 PM	1.00 PM – 2.00 PM	2.00 PM – 5.00 PM
Thursday	8.00 AM – 1.00 PM	1.00 PM – 2.00 PM	2.00 PM – 3.30 PM

Table 1: *Working Hours Schedule*

Week 1 (21st March 2021 - 25th March 2021)

Trainees were brought to this week's department and were presented one by one by staff members who worked there. Following that, Mr. Mohd Syawal Fitri Bin Jamalluddin, the Assistant Officer Vocational Trainer at Machine Shop Lab, briefed us on the norms and regulations that must be observed throughout the internship time. He went through the safety concerns and what we might learn at work. Then, he introduces most of the machinery and equipment that may be utilised in the lab, since some of the devices are malfunctioning and must be replaced. This week, we have been allocated to the Production Lab, where we will be guided by Mr. Roslin Bin Yasak, an Assistant Officer Vocational Trainer. We were introduced to the new lab, the 3-D printing lab, and learned about software programmes like Tinkercad and Unigraphic, which are comparable to AutoCad. He provided us a quick overview of the Ender 3 Pro 3-D Printer and showed us how to operate it as well as how to maintain it. Later, he granted us permission to print whatever we wanted from what we had learned and apply it to the 3D print design.

Week 2 – 3 (28th March 2021 – 8th April 2021)

For the following two weeks, the trainees will be allocated to Foundry Lab, where the person in charge is Mr. Wan Mohd Mazian Bin Wan Abdullah, but he prefers to be addressed as 'Abang Wan,' an assistant engineer. He introduced himself, then gave us a quick overview of the Foundry Lab and invited us to explore several types of casting on YouTube, focusing on 'Lost Foam Casting.' Then Abang Wan assigns us the duty of creating any design with an appropriate form and size for casting. Abang offered us two days to finish our own design for the casting procedure using the styrofoams given. Unfortunately, Dr. Kamarul handed us our mini project early as a preventive step because the pandemic CoVID-19 was still going on throughout the world when we finalised our design. So, we must proceed to the next department, where we shall work on our project under the supervision of Dr. Kamarul. He described the idea, which involves using a power generator to create energy, which is then converted into electricity and used to power a windmill. He provided us information on the work project, and the trainees immediately discussed it and began working on it. First and foremost, the trainees split the effort when operating milling machines at the machine shop to create holes in the project's base plate. Following that, Dr. Kamarul assigned us a challenge in which he handed us a tiny prototype propeller and asked us to replicate it three times. We approached Abang Wan for advice, and he showed us how to do the replicas using the 'Sand Casting' process. We study the fundamentals of constructing a casting pattern out of silica sand. After creating three designs using the 'Sand Casting' process, we carried them to the casting chamber and poured molten metal into the patterns. Following that, we opened the casting to clean up the rough edges and surfaces of the 3-mini propeller using tools and equipment given by Mr. Abdul Saleem, a Foundry Lab employee.

Week 4 – 5 (11th April 2021 – 22nd April 2021)

When Dr. Kamarul arrived to check on our work, we showed him the results of our three small propeller replicas. When he saw the outcome of our efforts, he applauded us and took one of the duplicates to test the rotation of the propeller. To compensate for the prior task that we possessed Abang Wan, the second small propeller was placed in the trophy cabinet. Dr. Kamarul then came to the machine shop to check on the project's development. Dr. Kamarul introduced us to one of his colleagues on the project, Mohd Akmal Hisyam. They watched and commented on our project's development, pointing out errors and providing project direction. Following that, the trainees split the task among themselves in order to work more efficiently and to fix the faults we made. The trainees debated and agreed to divide into two groups (each with three trainees) and concentrate on various aspects of the project. Some handled the physical burden, while others will conduct the project's recalculation and schematic design. We continuously communicate with each other about the project's requirements to minimise small errors in the drafting of orthographic diagrams. Dr. Kamarul requested that we create a engineering drawing for the project, which included a turbine, an electrical break, an electrical motor, and a generator, using unigraphic software. Dr. Fazila, one of the assistants for Research and Development (R&D), presented another mini project that was connected to the prior project and was discussed with Dr. Kamarul.

Week 6 – 9 (25th April 2021 – 20 May 2021)

Before beginning the second project, we attempted to complete the first in order to reduce the workload during the fasting month, which required more energy to complete the tasks. We attempted to assemble the primary equipment component and discovered several errors and miscalculations in the alignment of the coordinated axes. Then, using a cutter machine that is used to merge the main equipment and the other portion, some of us cut a long bolt into four bolts with a length of 330mm. Dr. Fazila approached the trainees for assistance with her student's FYP. We spent many days assisting the student with her project. When the material for the second project came, Dr. Kamarul asked for our assistance in retrieving the goods into the workshop using a forklift. Later, we resumed the first project and discovered offset errors when we built the project again, so we sought assistance from Abang Akmal on how to fix the difficulties. Due to the difficulties requiring perfect accuracy via milling machine, we corrected the offset with the help of Abang Syawal to monitor us. Some of the trainee head to the Fabrication Lab to weld the nut and side plate together. As soon as we received the measurements and dimensions for the second project from Dr. Fazila, we divided into two groups, one for the first project and the other for the second. After a few days of working on both projects, we were forced to relocate to a separate department due to a lack of UTM personnel to oversee the trainees. We spent a day in the Metal Forming Lab under the supervision of Mr. Mohamad Helmi Husin, the assistant engineer in charge of the lab. Abang Helmi gave us a quick overview of the lab's equipment and demonstrated how to use one of the machines. The government suddenly alerted us to the pandemic breakout and declared that our country will be subject to Movement Control Orders (MCO) and Conditional Movement Control Orders (CMCO) (CMCO). So, En. A'tif, our SV, and Dr. Kamarul, our project adviser, had a discussion and assigned us WFH preparation till the end of next week. The following week of CMCO, En. A'tif informed us that we would have to wait until the following week for additional news from the government. Meanwhile, he instructed us to read the SME UTM safety pass module that he had given us before to the commencement of the WFH, and he instructed us to report back on what we learned from the module. The government suddenly alerted us to the pandemic breakout and declared that our country will be subject to Movement Control Orders (MCO) and Conditional Movement Control Orders (CMCO) (CMCO). So, En. A'tif, our SV, and Dr. Kamarul, our project adviser, had a discussion and assigned us WFH preparation till the end of next week. The following week of CMCO, En. A'tif informed us that we would have to wait until the following week for additional news from the government. Meanwhile, he instructed us to read the SME UTM safety pass module that he had given us before to the commencement of the WFH, and he instructed us to report back on what we learned from the module.

Week 10 – 14 (23rd May 2021 – 15th July 2021)

Unfortunately, UTM Skudai was forced to carry out the CMCO procedure due to positive Covid-19 instances in the area from May 21 to June 3, 2021. En. A'tif had discussed with Dr. Kamarul assigning WFH tasks to the trainees, which included writing a theoretical report on prior work such as sand casting, schematic design, CNC machining, and welding in the workshop and lab. As a result, the trainees will have to wait another two weeks for word from the government. Finally, the government has declared that Malaysia would go into 'Total Lockdown' (Phase 1) for two weeks. Our SV nevertheless advised the trainees to do the assigned activities since, in the worst-case situation, the trainees would have something to learn and were requested to keep him updated. For the first two weeks of the lockdown, I spent my time on the first major topic; 3D Print. For the 3D Print topic, I went up searching the history, the basic of 3D print and the all the contribution of it to the society and several major industries such as for manufacturing, food, and others. Then, I moved on to the next major topic, Sand Casting. I spent a week gathering information and finishing for both subtopics, 'Green Sand' method and 'Lost Foam' method. Then, I asked the second set of trainees how they handled the schematic design from the first project, and we spoke about the software they used. They utilised two separate drawing software programmes. They using drawing software that is comparable to AutoCAD but considerably easier to set up and manage, such as Siemen NX and SolidWork. It has been demonstrated that both software programs outperform AutoCAD.

Week 15 – 17 (27th June 2021 – 17th July 2021)

Unfortunately, the government had to prolong their 'Total Lockdown' and enter Phase 2, which meant that some of the internship students' companies had to postpone their work owing to the pandemic's outbreak. This also resulted in the temporary closure of UTM Skudai, therefore for the next three weeks, I must complete the tasks assigned to me by En. A'tif till the conclusion of the internship periods. As a result, the other trainees and I agreed to collaborate in studying and exchanging knowledge on the specified topic of CNC machining and welding. The trainees and I went over all the machines that we had previously introduced and operated one by one. Each machine was classified based on its kind, operation, and function. Furthermore, Dr. Kamarul asked us a favour and assigned us the duty of listing all of the key equipment that we utilised in the first project, as well as the function of each piece of equipment. En A'tif told us to gave him the report within the next week after I finish the industrial training period. The other trainee and I discussed with him and he gave us a chance to submit the report even though it is not finished, then told us he appreciated the effort and commitment throughout the internship period.

2.6 DESCRIPTION OF MINI PROJECT

- Mini Project Phase 1: Wind Turbine Generator

Dr. Kamarul, my Project Advisor, assigned me a mini project that is a group project with other trainees early in the third week. The first phase of the project entitled Wind Turbine Generator, and it's sole function is to generate electricity. It used the same wind turbine theory, in which the wind rotates the turbine's propeller-like blades around a rotor or generator, which is subsequently converted into electricity, a source of renewable energy, but on a smaller scale. Wind power plants generate energy by combining a number of wind turbines in the same location. The terms "wind energy" and "wind power" both refer to the process of utilising wind energy to create mechanical power or electricity. This mechanical power can be utilised for specific activities (such as grinding grain or pumping water), or it can be converted into energy via a generator. Wind conditions, surrounding terrain, accessibility to electric transmission, and other siting issues all influence the location of a wind power facility. These projects' components include a gearbox, main shaft, generator, electrical brake, side plates, and base plates.

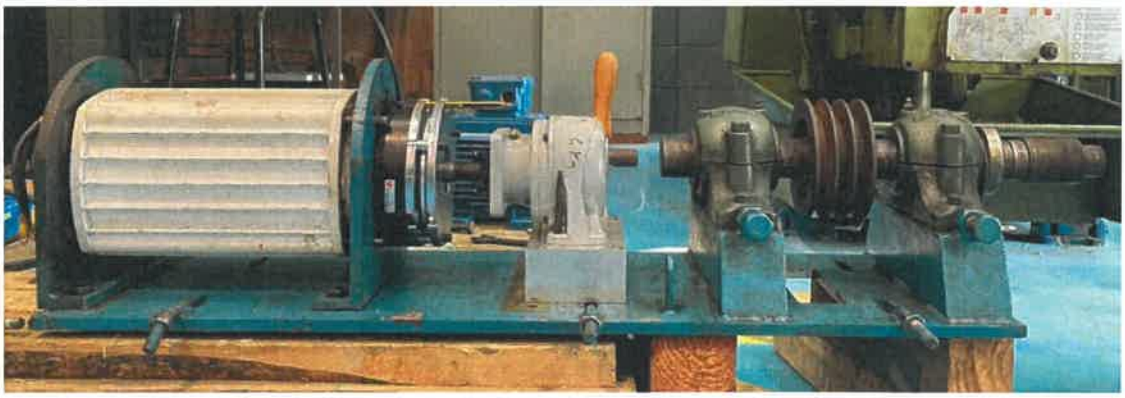
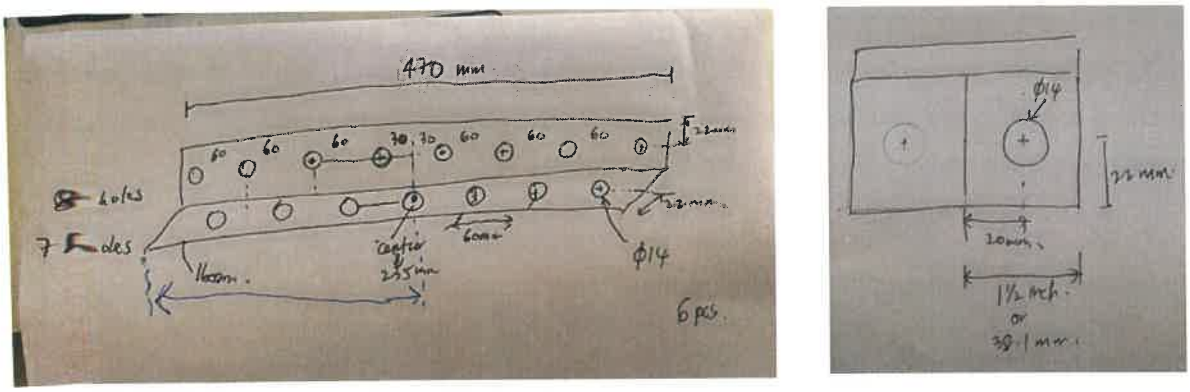


Figure 2.26: *Project main's component assembled*

- Mini Project Phase 2: Steel-beam Support

Dr. Fazila, a Research & Development (R&D) assistant who works with Dr. Kamarulfizam, presented the project's second phase. The second part of the project's function is to support or act as a tower that holds up the generator, allowing the rotary blade to rotate. It is necessary for the tower to be strong and durable in order to spin such a big rotary blade. Dr. Fazila has already conducted research and calculated all of the dimensions required for the project's material. After finishing all of the drilling, milling, and cutting according to Dr. Fazila's calculations, the materials are combined to create the main support of the tower for the Wing Turbine Generator. Unfortunately, owing to the pandemic's rapid breakout, the project had to be postponed, and the trainee did not have the opportunity to complete it.



(i) (ii)

Figure 2.27 (i) and (ii): *The Dimension for the 2nd Project*

Main Activities: -

a) Drilling & Milling

There were a lot of work involving drilling and milling the base of the plate and the side plates. This takes times to complete the work because all the drilling & milling onto the plates required accurate measurement and precision. If there were some miscalculations in terms of the measurement, it will cause excessive dimensional inaccuracies to the plates. Moreover, if there were some problems which involving the machines itself, for example, vibration, chipping on the drill bit. Thus, it will cause some mistakes such as milling alignment, cut too aggressive, workpiece rigidity and others. From these mistakes, it will consume more time to finish even for one work of drilling nor milling.

(i)

(ii)

Figure 2.28 (i) and (ii): *Drilling and Milling the Equipment and Material for the Project*

b) Dimension Calculation

When the work handled involving accurate measurement and precision, then it must be done with dimension calculation first. Thus, every equipment must be calculated and measure before the milling and drilling activities can be conducted. The main equipment such as electrical motor, magnetic brake, generator, and plates need to be measure precisely which will be drawn in 3D orthographic drawing. Afterward, the drawing can be used for future reference when handling the first phase of the project. But it was not an easy task to do because not all of us could find information on the equipment even with six people in a group. So, the trainees come up with a plan to split into 2 group which then distribute the workload to be more efficient.

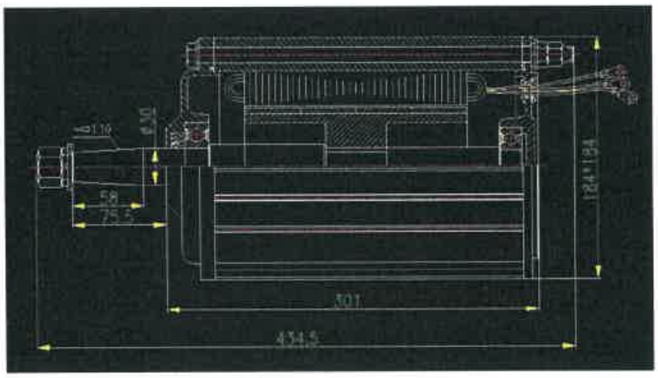


Figure 2.29: *Dimenson for Electrical Motor*

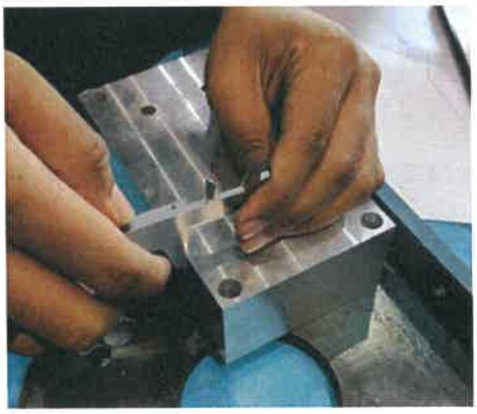


Figure 2.30: *Calculating One of the Equipment*

c) 3D Drawing

Before beginning work on a project, an engineering drawing is essential because the aim of an engineering drawing is to clearly and precisely capture the geometric aspects of a product or component so that a manufacturer or engineer may construct the required item. It may also explain the manufacturing process, be used to transmit technical concepts throughout the design phase or serve as a record of an existing object. An engineering drawing, rather than being a picture, is designed to explain the size and shape of an object and may include information about allowable deviations, load limitations, materials, and any other information that might assist offer a comprehensive knowledge of an item. Engineering drawings are increasingly being created on computers, which may also generate files that direct machines on how to construct the object. For further details, see computer aided design, computer aided manufacturing, and building information modelling. Several software packages were utilised to create the engineering designs, including AutoCAD, SolidWorks, and even Siemens NX.

(i)

(ii)

Figure 2.31 (i) and (ii): *Trainees made 3D Drawing Using Siemens NX*

One of the greatest methods to express one's ideas is through some kind of image or drawing, which will help a lot during the mini project tasks. The goal of an engineering drawing is to capture the geometric aspects of a product or component clearly and precisely so that a manufacturer or engineer may build the needed item. An engineering drawing, rather than being a picture, is designed to explain the size and shape of an object and may offer information regarding permitted changes, materials, and any other information that may assist provide a comprehensive knowledge of an item or for a project. Engineering drawings often comprise several projections depicting various angles of the item, as well as section views and so on. Projections can generate two-dimensional or three-dimensional representations of an object. Typically, engineering drawings are generated in isometric or orthographic format and made using computer software.

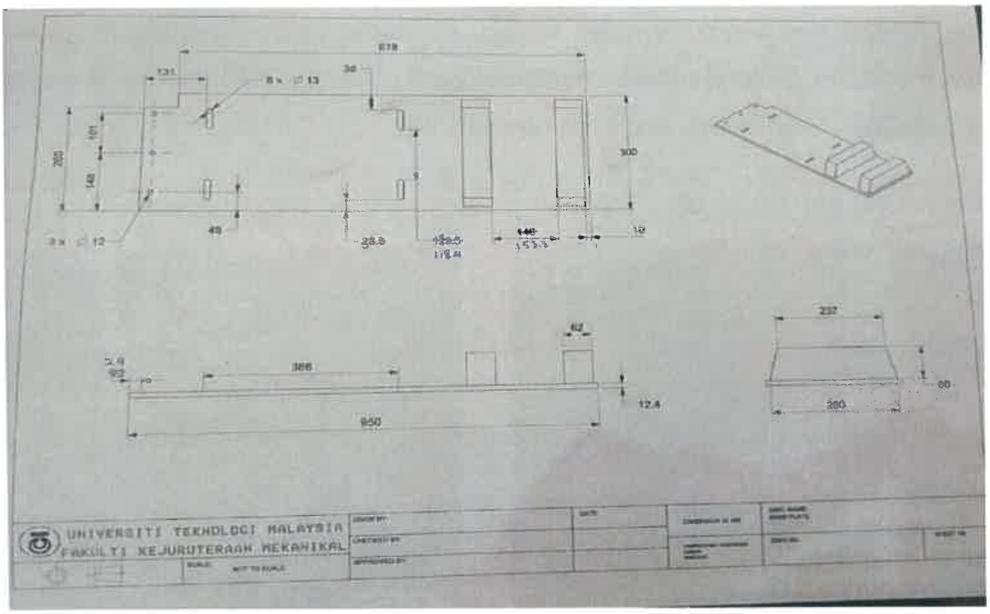


Figure 2.32: *The Orthographic Drawing of Base Plate*

3.0 Conclusion

In conclusion, industrial training has been helpful to both the student and the company during the last 4 months. Many lessons may be drawn from the tasks and projects provided by the supervisor in order to fulfil the criteria of being an internship student. Even though I had a different course engineering assigned, the School of Mechanical Engineering (UTM) Skudai was exceedingly polite in welcoming diploma and also degree students in following the journey to finish their programme. As for myself, I was exposed to a wide range of additional information and materials provided not only by the Project Advisor but also by the entire working staff. This vast industrial training has sharpened my soft skills and increased my confidence in speaking with others. The most enjoyable aspect was the concept of having diverse graduates from various universities and courses; I was able to give various ideas regarding mechanical courses that proved relevant to them throughout the conversation.

It is not simple to cope with the genuine working industry. Anyone wrong action will undoubtedly result in tragedy. In this firm, one of the most important things learned is to not give up easily and to seize any possibilities because there will be no second chances in this actual working experience. Next, while my internship here, I was exposed to a wide range of mechanical engineering equipment at a real-world company. It is not a toy; there must be a reason why the equipment is built in that shape or size. It's all about the engineering design here. I also learnt at the firm that safety is essential and very important because we are not only dealing with heavy machinery but also with structural breakdowns and equipment malfunctions. Even if mechanical engineering is not a particularly dangerous job, dangers might arise during the testing, assembly, and maintenance of equipment.

As for recommendations, I am hopeful that more forthcoming projects may be completed despite the pandemic COVID-19, which has been a physical obstacle for individuals. The company manages to improve on a regular basis and produce effective research among its employees and graduates. Throughout the industrial training phase, it was a simple experience since there were so many eager hands willing to offer as much information as they could. However, there was some fluctuation, ups and downs during the project, and Covid had experienced firsthand hardships, particularly in experiencing both industrial and work-from-home styles of working. To summarise, it was a beneficial learning experience and exposure in terms of preparing oneself for the future as well as aiding in the development of critical thinking abilities. In this company, I learned how to deal with actual applications as well as various new concepts from other engineering courses.

Finally, in my opinion, if the students do not participate in this industrial training environment, the ideas that I learned during my studies would be wasted. As for me, this practical phase of my education allows me to better comprehend and become more aware of the many engineering businesses. Even though I did not have the opportunity to use my chemical engineering skills, I did have the opportunity to broaden my understanding of mechanical engineering. Of course, that new information will be beneficial to me, and it is also another valuable chance for me to study and acquire as much knowledge as possible in the engineering field for my future planning.

4.0 Reference

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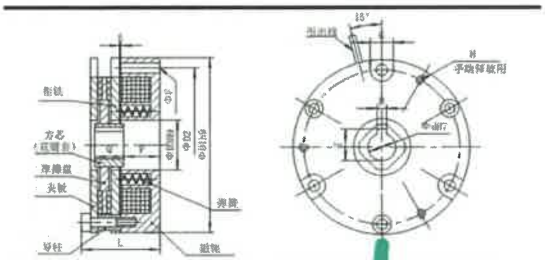
5.0 Appendices

- Sand Casting

- Mini Project



规格 / 参数	2	4	8	16	30	50	100	200	500	1000	2500
静摩擦扭矩(N.M)	2	4	8	16	30	50	100	200	500	1000	2500
励磁电压(DC V)	12/24/48/99/171										
功率(20°C W)	15	18	20	25	40	35	50	60	120	175	290
接通(释放)时间(ms)	51	63	87	110	140	152	165	230	360	450	510
断开(制动)时间(ms)	45	55	72	95	120	130	140	170	270	320	380
D1	77	85	97	117	125	145	165	187	296	400	520
D2	68	74	85	108	112	130	150	170	270	365	485
D3	20	20	28	40	40	49	62	62	100	135	180
d	12	12	14/15	19/20	19	25	28	32	50	58	80
B	4	4	5	6	6	8	8	10	14	16	22
T	13.8	13.8	16.3/17.3	21.8/22.8	21.8	28.3	31.3	35.3	53.8	62.4	85
L	34	35	40	43	53	57	71	80	95.5	117	151
P (推荐)	18	19	21	20	26	30	[illegible]	22	51	25	68
Q	12	12	14	20	20	25	40	40	40	85	80
F	3-4.5	3-5.5	3-5.5	3-6.5	3-6.5	3-6.5	3-9	3-9	4-13	6-15	8-17
G	3-10	3-11	3-11	3-11	3-14	3-14	3-16	3-16	4-21	6-28	8-30
H	3-M3	3-M3	3-M5	3-M4	3-M5	3-M5	3-M6	3-M8	4-M12	3-M16	4-M16
δ	0.2	0.2	0.25	0.25	0.25	0.25	0.3	0.3	0.4	0.6	0.7
δmax	0.8	0.8	0.9	0.9	0.9	0.9	1	1	1.2	1.3	1.5
允许最高转速(rpm)	3000	3000	3000	3000	2500	2500	2500	2000	1500	1500	1500

- Engineering Drawing