VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANASANGAMA, BELAGAVI-590018

An Internship Report

"Manufacturing Technique used in Die Casting Process"

Submitted in partial fulfillment for the award of degree of

Bachelor of Engineering

In

Mechanical Engineering

Submitted by

HARISH.K

1KG19ME008

Internship Carried Out at

HI-TECH TOOLS

Bommanahalli, Bengaluru, Karnataka 560068

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Dr. PN JYOTHI

Professor

Dept. of Mechanical Engg.

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External Guide

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DEPARTMENT OF MECHANICAL ENGINEERING

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 # 15, Mallasandra, Off. Kanakapura Road, Bengaluru-560109

2022-23

K S SCHOOL OF ENGINEERING AND MANAGEMENT

Bengaluru-560109

Dept. of Mechanical Engineering

CERTIFICATE

This is to certify that the internship work entitled "**Manufacturing Technique used in Die Casting Process**" is a Bonafide work carried out by

HARISH.K **1KG19ME008**

In partial fulfillment for the award of **Bachelor of Engineering** in **Mechanical Engineering** of the **Visvesvaraya Technological University, Belagavi** during the year **2022-23**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The internship report has been approved as it satisfies the academic requirements in respect of internship work prescribed for the said Degree.

Signature of the Guide
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Signature of the HOD
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Signature of the Principal
Dr. K Ramanarasimha
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Name of the Examiners Signature with date

1.

2.

INTERNSHIP CERTIFICATE

HI-TECH TOOLS

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Date: 10/10/2022

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **HARISH K (USN - 1KG19ME008)** studying in 6th Semester Mechanical Engineering from K.S. School of Engineering and Management Bangalore, has undergone Internship from **22/08/2022 to 22/09/2022.**

His conduct and character are good during his stay.

For Hi-Tech Tools,

BANGALORE * HI-TECH TOOLS *

Managing Director.

K S SCHOOL OF ENGINEERING AND MANAGEMENT

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DECLARATION

I, Student of Mechanical Engineering, K. S. School of Engineering and Management, hereby declare that the internship report entitled "**Manufacturing Technique used in Die Casting Process** "embodies the record of the internship carried out at **Hi-Tech Tools** under the guidance of **Dr. P N Jyothi** and **Mr. Ravi Kumar.B** for the fulfillment of the requirement of the award of the Degree of Bachelor of Engineering.

HARISH.K 1KG19ME008

Place: Bengaluru

Date:

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without the mention of the people, whose constant guidance and encouragement crowned my efforts with success. I consider it as a privilege to express my gratitude and respect to all those who guided me in the successful completion of this internship.

First of all, I am thankful to my college **K S SCHOOL OF ENGINEERING AND MANAGEMENT** for providing support guidance and a platform to work.

I express my gratitude to **HI-TECH TOOLS** for providing opportunity and guidance to carry out internship work.

I take this opportunity to express my deep regards to **Dr. K. Ramanarasimha**, Principal/Director, K S School of Engineering and Management for providing an opportunity to do this Internship Work as a part of our curriculum in the partial fulfilment of the degree course.

I express my gratitude to **Dr. Balaji B**, Professor and HOD, Department of Mechanical Engineering, K. S. School of Engineering and Management for providing valuable insights, making the resources available at right time and all the encouragement for the completion of my project.

I owe my profound gratitude to my internship guide **Dr. P N Jyothi**, Professor, Dept. of Mechanical Engineering, KSSEM, Bengaluru & **Mr. Ravi Kumar.B**, Ceo, Hi-Tech Tools, Bommanahalli, Bengaluru, who took keen interest in the work and guided all along and for providing all the necessary information.

I extend my profound gratitude to my internship coordinator **Mr. Parashuram A K** , Assistant Professor, Department of Mechanical Engineering, K.S.S.E.M, who took keen interest in the workand guided all along and for providing all the necessary information.

I also wish to thank all the staff of Mechanical Engineering Department for providing all the support whenever needed. I would like to thank my parents for supporting and helping in the completion of the internship work. Last but not the least I would like to thank all my friends without whose support and co-operation the completion of internship would not have been possible.

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Chapter 1

ABOUT THE COMPANY

Hi-Tech Tools incorporated in 2002, primarily manufacturer, supplier and exporter of Auto Parts, Pressure Die Casting Dies, Press Tools, Gaskit Products, Heat Sink, Plastic Parts & more. They use leading edge technologies to ensure consistent product quality and our tools & dies. They do not just make and sell tools & dies. They make and sell cost effective solutions. Hi-Tech Tools led by dynamic, capable and rich experienced team (24 years). They also have die casting component manufacturing unit.

The organization has witnessed amazing success in market in recent times as they have been able to establish ourselves well into the market and the credit for the same goes to our committed professionals who make an amazing team. These professionals are hired in the organization to perform various tasks as per the experience and quantification they hold, moreover, we further ensure to see their aptitude in making a final decision.

Quality is what they promise to their clients and ensure nothing distracts them from delivering that to their valued clients. They have formed a complete process wherein various steps are taken which lead to achieve desired quality. They check the manufacturing at various stages to make sure the end product receives the perfect shape. They have formulated a team of quality auditors who are highly efficient in performing their job with perfection.

An excellent infrastructure is their biggest strength which has assisted us with performing so many functions with perfection. The various departments which make an infrastructure are manufacturing, quality, research and development, logistics, packaging, customer care and many more. These departments deserve great praise for their contribution towards grow

Chapter 2

ABOUT THE DEPARTMENT

2.1 Objective

To gained a good foothold in the market owing to the flawless products and services it is rendering to clients. To surpass competitors in terms of quality and to make a well reckoned with in the market.

2.2 Work Flow

2.3 Software used

- Autocad

Chapter 3

TASK PERFORMED

3.1 Introduction to Die Casting

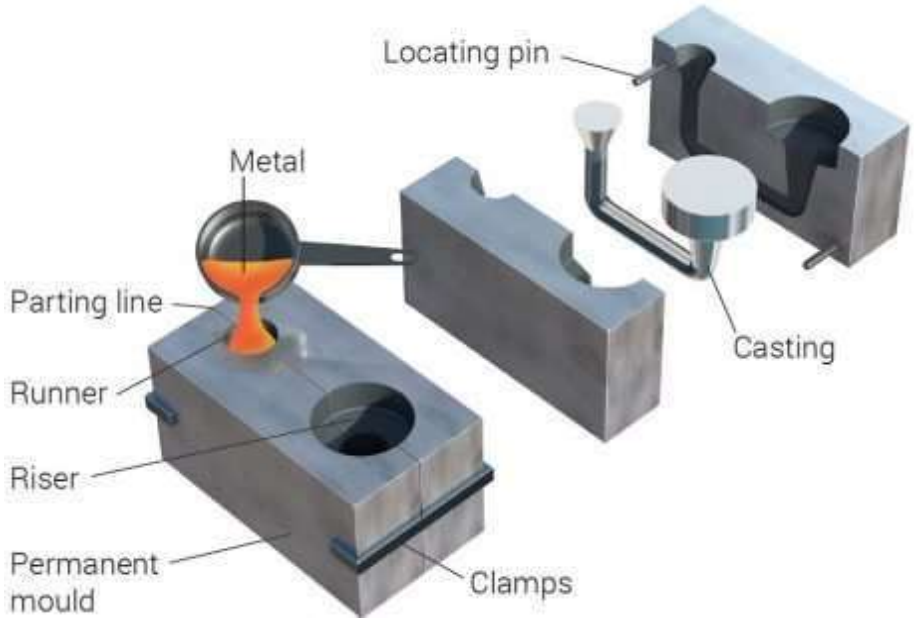


Figure 1: Die Casting Process

Die casting is a metal casting process as shown in figure 1 that involves forcing molten metal under high pressure into a mold cavity. The mold cavity is created using two hardened steel dies that are machined to the desired shape and size of the final product. The molten metal is injected into the mold cavity at high pressure, which helps to ensure that the final product has a preciseand accurate shape.

The die casting process is commonly used in the manufacturing of complex metal parts with high accuracy and consistency, such as those used in the automotive, aerospace, and electronics industries. Some of the advantages of die casting include high production rates, excellent surface finish, and the ability to produce parts with thin walls and intricate shapes.

There are two main types of die casting processes: hot chamber and cold chamber. In the hot

Chamber process, the molten metal is contained in a furnace and is injected into the mold cavity through a gooseneck connected to the die. The cold chamber process is used for metals with high melting points and involves manually ladling the molten metal into the injection chamber before it is transferred to the die.

Die casting is a highly efficient process that can produce a large volume of parts quickly and accurately. It is also highly customizable, allowing for the production of parts with unique shapes and sizes. However, it can be expensive to set up a die casting operation, and the process requires skilled operators to ensure that the final product meets the desired specifications.

Figure 2: Die Casting

3.2 Milling Machine

A milling machine is a type of machine tool that uses rotary cutters to remove material from a workpiece. The milling machine is commonly used in manufacturing and metalworking operations to create precise shapes, slots, and holes in metal, plastic, and other materials.

The basic components of a milling machine include a base, column, spindle, table, saddle, and knee. The spindle is the main rotating component that holds the cutting tool, while the table provides a stable platform for the workpiece. The saddle and knee allow for movement of the table in different directions, while the column provides support for the entire machine.

There are several types of milling machines, including horizontal and vertical milling machines. Horizontal milling machines have a horizontal spindle and a flat table, while vertical milling machines have a vertical spindle and a table that can be moved up and down to adjust the depth of the cut. There are also CNC (Computer Numerical Control) milling machines, which are automated machines that use computer programming to control the cutting process.

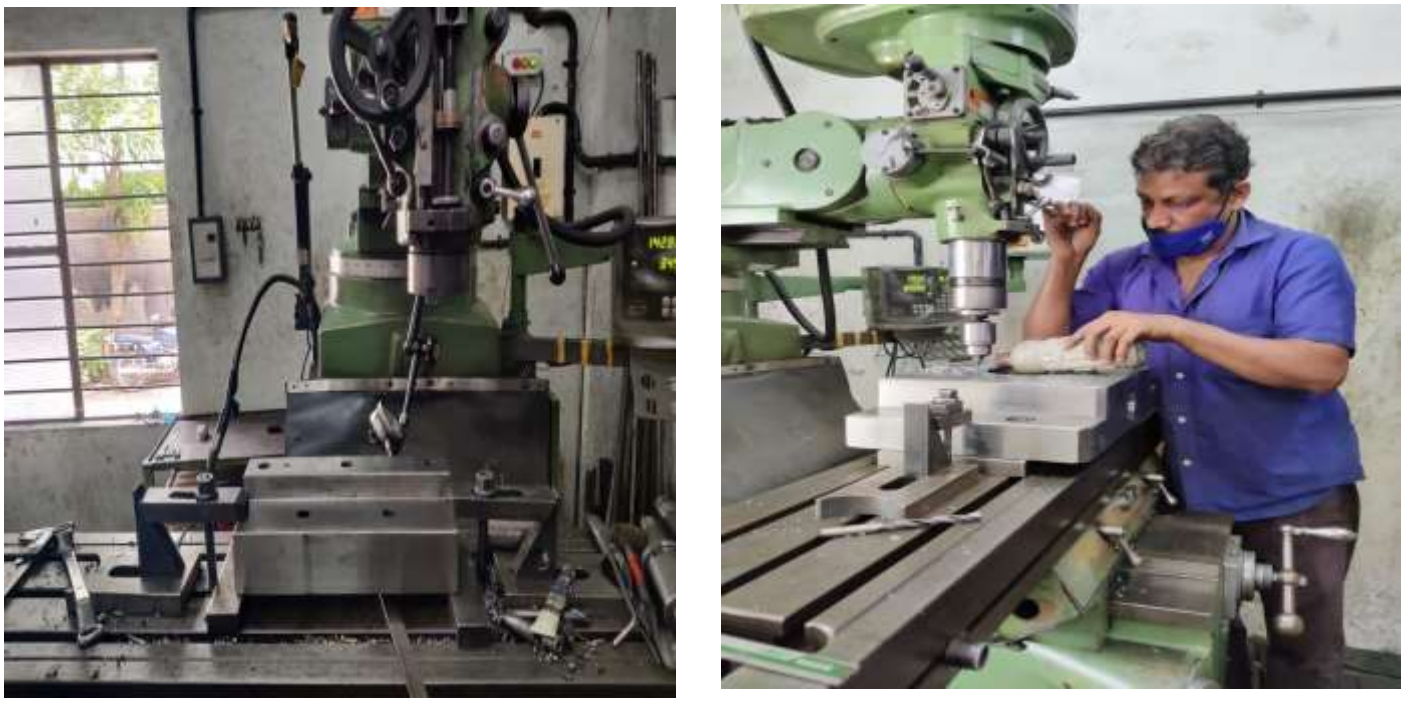


Figure 3: Milling

3.3 Tapping Machine

A tapping machine is a machine tool that is used to create internal threads, such as screw threads, on a workpiece. The machine works by holding the workpiece securely in place and rotating it while a tap is guided into the hole to create the threads.

Tapping machines come in a variety of types and sizes, from small bench-top models forhobbyists and small-scale production to large industrial machines for high-volume manufacturing. They can be manually operated or computer-controlled, and may use a variety of mechanisms to move the tap into the workpiece, such as pneumatic, hydraulic, or electric motors.

Tapping machines are commonly used in industries such as automotive, aerospace, and construction, where threaded fasteners are essential components of many products. They are also used in machine shops and other manufacturing facilities to produce custom parts with specific thread configurations.

Figure 4: Tapping

3.4 Drilling Machine

A drilling machine is a power tool that is used to create holes in a variety of materials such as wood, metal, and plastic. It consists of a motor, a chuck, a spindle, and a drill bit. The drill bit is attached to the spindle through the chuck, which is tightened around the bit to hold it in place. When the motor is turned on, the spindle rotates the drill bit at a high speed, allowing itto penetrate the material and create a hole.

Drilling machines come in various types and sizes, including handheld drills, bench-mounted drills, pillar drills, and radial drills. Handheld drills are lightweight and portable, while bench-mounted drills are stationary and have a table for supporting the workpiece. Pillar drills are larger and more powerful than bench-mounted drills, and they are capable of drilling larger holes. Radial drills are the largest and most powerful type of drilling machine, and they can be used to drill holes in large workpieces that are difficult to move.

Drilling machines are commonly used in woodworking, metalworking, construction, and manufacturing industries. They are versatile and can be used for a wide range of applications, including drilling, reaming, tapping, counterboring, countersinking, and spot-facing.

Figure 5: Drilling

3.5 Catia Software

Catia V5 is a computer-aided design (CAD) software developed by Dassault Systems. It is widely used in industries such as aerospace, automotive, and manufacturing for designing complex 3D models, analyzing them, and creating detailed engineering drawings.

Some of the features of Catia V5 include:

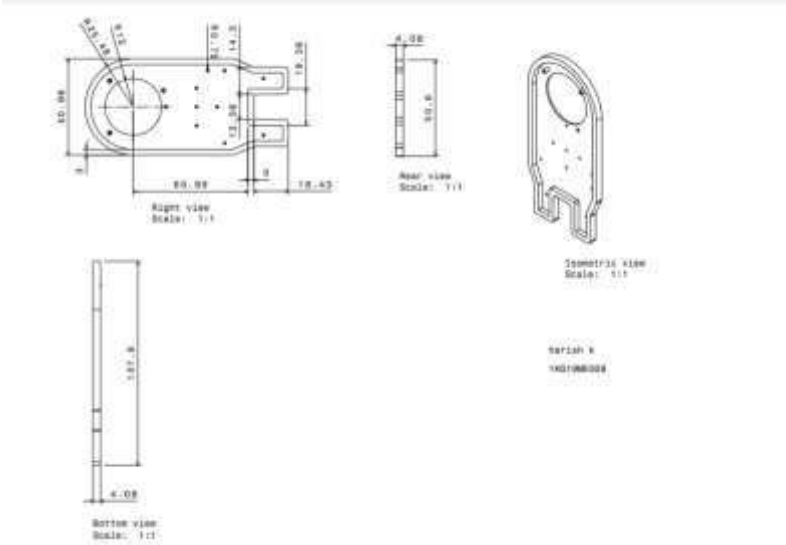
- **Part Design**: This feature allows users to create 3D parts from scratch or modify existing ones. It includes tools for sketching, extruding, revolving, and sweeping.

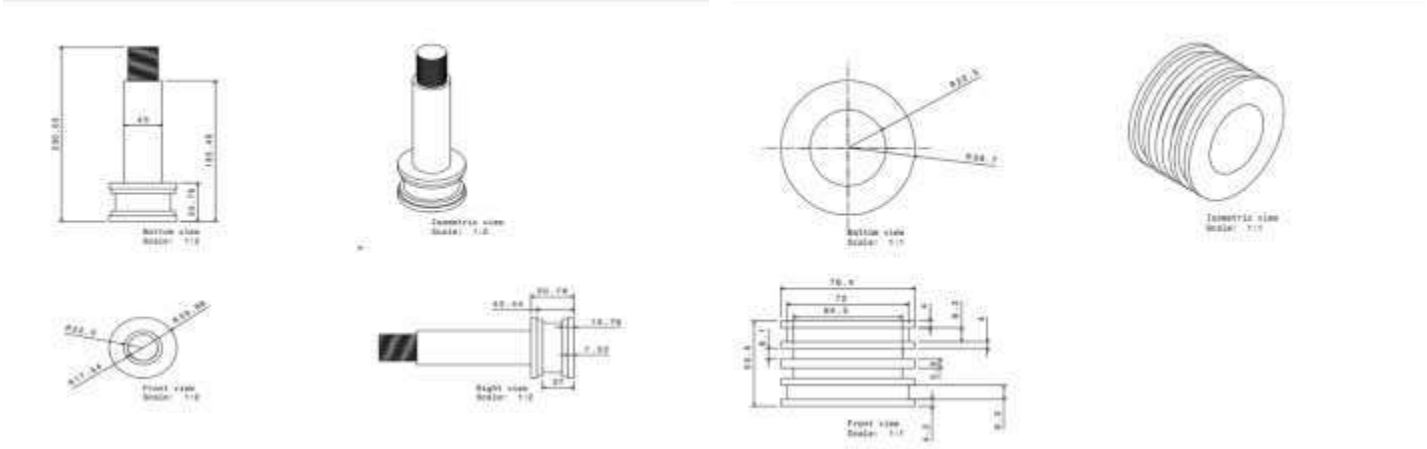
Figure 6:-Part Design of A4 arm

Assembly Design: This feature enables users to create 3D assemblies by combining various parts and components. It includes tools for positioning, mating, and aligning parts, as well as tools for creating exploded views and animations.

Figure 7: Assembly Design

Drafting and Drawing: This feature enables users to create detailed engineering drawings from 3D models. It includes tools for adding dimensions, annotations, symbols, and title blocks.





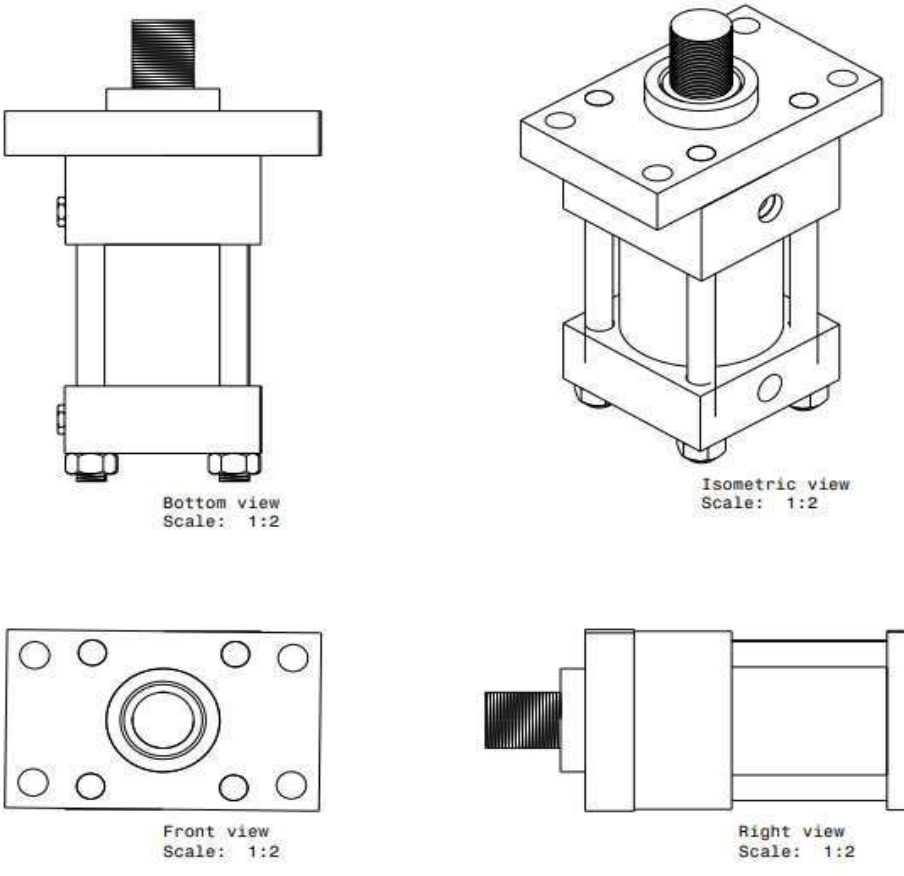


Figure 8: Assembly Draft

Chapter 4

REFLECTION NOTES

4.1 Design

As Catia software has many features, and it's impossible to cover everything. Here are some common commands:

- **Sketcher**: This command allows you to create 2D sketches that can be used as the basis for creating 3D models. It includes commands like line, circle, rectangle, arc, and more.

- **Part Design**: This command is used to create 3D solid models. You can use commands like extrude, revolve, sweep, blend, and more to create complex shapes.

- **Assembly Design**: This command is used to create 3D assemblies of multiple parts. You can use commands like insert, constrain, and mate to assemble the parts.

- **Drafting**: This command is used to create 2D drawings of 3D models. You can use commands like view creation, dimensioning, and annotation to create detailed drawings.

- **Generative Shape Design:** This command is used to create complex free-form shapes. You can use commands like loft, blend, fillet, and more to create smooth and organic shapes.

- **Wireframe and Surface Design**: This command is used to create wireframe and surface models. You can use commands like point, line, spline, and more to create complex surface models.

- **Analysis**: This command is used to analyze and optimize the design. You can use commands like finite element analysis (FEA), kinematics, and more to evaluate the performance of the design.

These are just a few examples of the many commands available in CATIA V5 software. Each command has its own set of options and parameters that allow you to customize the results to fit your needs.

4.2 Learning Die Casting

During my internship at Hi Tech Tools, I had the opportunity to learn about the process of die casting. I was able to observe and participate in various stages of the process, from the initial design of the mold to the finished product.

I learned how to prepare the mold and how to pour the molten metal into it, as well as how to remove and finish the final product. I also gained valuable experience in quality control, inspecting the finished products for any defects or imperfections.

Through this hands-on experience, I developed a deeper understanding of the principles and techniques involved in die casting, and I gained a greater appreciation for the skill and precision required to produce high-quality parts. Overall, my internship at Hi Tech Tools provided me with a valuable learning experience and helped me develop my skills and knowledge in this field

4.3 Learning Tapping

During my internship in Hi-Tech Tools, I had the opportunity to learn tapping, a metalworking process that involves cutting threads into a hole using a tap. I was fascinated by the precision and skill required for this task, and I was eager to learn.

My mentor taught me the basics of tapping, including the proper way to hold the tap and the importance of starting with a small pilot hole. Through hands-on practice and guidance from my mentor, I gradually became more proficient at tapping.

As I became more experienced, I also learned about the different types of taps and how to choose the right one for the job at hand. I gained a greater appreciation for the importance of precision and attention to detail in metalworking, and I feel grateful for the opportunity to have learned this valuable skill during my internship.

4.4 Learning Drilling

During my internship at Hi Tech Tools, I had the opportunity to learn drilling techniques. I started by observing experienced professionals, taking note of their methods and tools. I learned about the different types of drills, their sizes, and applications.

Afterward, I was allowed to practice drilling under supervision. I learned about the importance of drill speed, feed rate, and coolant usage. I also learned about the proper techniques for setting up the workpiece and securing it in place.

Throughout the internship, I was able to hone my skills through practice and receive feedback from my supervisors. By the end of the internship, I felt confident in my ability to operate a drill and drill press safely and efficiently. Overall, it was a valuable experience that taught me a lot about the intricacies of drilling and machining

4.5 Learning Milling

During my internship at Hi Tech Tools, I had the opportunity to learn the process of drilling. Under the guidance of experienced professionals, I learned the basics of drilling such as selectingthe right drill bit, setting up the drilling machine, and adjusting the speed and feed rate.

I also learned about the safety precautions that need to be taken while drilling, such as wearing safety gear, keeping the work area clean, and using the correct technique. Through hands-on experience, I gained a better understanding of the importance of precision and accuracy in drilling.

Overall, my internship at Hi Tech Tools provided me with valuable knowledge and skills that will be useful in my future career

4.6 Learning Catia Software

During my internship at Hi Tech Tools, I had the opportunity to learn the process of Catia Software Under the guidance of experienced professionals, Catia is a powerful software used in many industries, including automotive, aerospace, and architecture. If you want to learn Catia, here are some steps you can follow: Familiarize yourself with the software: Start by learning the interface and navigation tools. Catia has a complex interface with many different workbenches, so it's important to understand how to switch between them and use the tools effectively. Practice with tutorials: Many websites offer free Catia tutorials that you can use to practice your skills.
These tutorials will walk you through specific tasks and teach you how to use various tools.

Overall, my internship at Hi Tech Tools provided me with valuable knowledge and skills that will be useful in my future career

4.7 Assembly and Part Design

Designing complex products: With the knowledge of assembly and part design, you can design complex products that have multiple parts and components. You can create 3D models of each part, and then assemble them together to create the final product. Improving design efficiency: By understanding how parts and assemblies work, you can design products more efficiently. You can create reusable components and standardize designs, which can save time and reduce errors. Simulating and testing designs: You can use assembly and part design to simulate and test your designs before creating physical prototypes. This can help you identify potential issues and make changes before manufacturing. Assembly and part design skills can help you collaborate with others more effectively. You can share your designs with team members, and everyone can work on different parts of the assembly simultaneously. Enhancing job opportunities: Knowledge of assembly and part design is a valuable skill in many industries, including automotive, aerospace, and industrial manufacturing.

Overall, my internship at Hi Tech Tools provided me with valuable knowledge and skills that will be useful in my future career

4.8 Learning of Drafting and Drawing

During my internship at Hi Tech Tools, I had the opportunity to learn the process of Drafting o Visualizing and communicating design ideas: Drafting allows you to create precise and detailed technical drawings of mechanical parts and systems. These drawings can help you visualize your design ideas and communicate them effectively to others.

- Creating accurate manufacturing specifications: Drafting ensures that your design is accurate and precise. This is important when creating manufacturing specifications, as even small inaccuracies can lead to costly errors during production.

- Reducing errors and improving quality: With drafting skills, you can create accurate drawings and avoid errors during the design and manufacturing processes. This can lead to higher quality products that meet or exceed customer expectations.

- Enhancing collaboration and teamwork: Drafting allows engineers and technicians to work together more effectively, sharing ideas and expertise to produce better designs. This can lead to more efficient and effective teamwork and better results overall.

- Improving job opportunities: Drafting skills are highly valued in many industries, including automotive, aerospace, and manufacturing. Learning drafting in mechanical engineering can enhance your job opportunities and make you more competitive in the job market.

4.9 Formulas

Mechanical design involves the application of physics and mathematics principles to create mechanical systems and components. Here are some common formulas used in mechanical design:

- Force and torque: $F = ma$ (force equals mass times acceleration); $\tau = rF$ (torque equals radius times force)
- Stress and strain: $\sigma = F/A$ (stress equals force over area); $\varepsilon = (\Delta L/L)$ (strain equals change in length over original length)
- Torsion: $T/J = G\theta/L$ (torque over polar moment of inertia equals shear modulus times angle over length)
- Compression and tension: $P/A = \sigma$ (compressive/tensile stress equals force over cross-sectional area); $\Delta L/L = \varepsilon$ (compressive/tensile strain equals change in length over original length)
- Buckling: $Pcr = (\pi^2EI)/(KL)^2$ (critical buckling load equals π squared times modulus of elasticity times moment of inertia over length squared times effective length factor squared)
- Power: $P = Fv$ (power equals force times velocity)
- Kinematics: $v = r\omega$ (linear velocity equals radius times angular velocity); $a = r\alpha$ (linear acceleration equals radius times angular acceleration)
- Kinematics: $v = r\omega$ (linear velocity equals radius times angular velocity); $a = r\alpha$ (linear acceleration equals radius times angular acceleration)

4.10 References

- Machinery's Handbook: This is a comprehensive reference book for mechanical engineering, including design and drafting. It covers topics such as machine elements, materials, mechanics, and manufacturing processes. It is available in print and digital formats.
- ASME Standards: The American Society of Mechanical Engineers (ASME) develops and publishes standards for mechanical design and drafting. These standards cover a wide range of topics, including design calculations, materials, and fabrication methods.Autodesk
- Design Academy: Autodesk is a software company that provides design and drafting software for mechanical engineering. The Autodesk Design Academy offers free online courses and resources for learning mechanical design and drafting using Autodesk software.
- SolidWorks Resource Center: SolidWorks is a popular software program used for mechanical design and drafting. The SolidWorks Resource Center offers a wide range of tutorials, webinars, and other resources for learning how to use the software for mechanical design.
- Mechanical Engineering Magazine: This is a leading publication for mechanical engineers, covering topics such as design, materials, manufacturing, and testing. It offers articles, news, and reviews of the latest developments in mechanical engineering.
- Udemy Courses: Udemy is an online learning platform that offers a wide range of courses on mechanical design and drafting, including courses on CAD software such as AutoCAD, SolidWorks, and CATIA. o American Society of Mechanical Engineers (ASME): https://www.asme.org/
- ASME is a professional organization for mechanical engineers that provides resources, standards, and networking opportunities for members.
- Society of Automotive Engineers (SAE): https://www.sae.org/

- SAE is a professional organization for automotive engineers that provide resources, standards, and networking opportunities for members.
- Mechanical Engineering Magazine is a leading publication for mechanical engineers that covers the latest developments in the field.
- MIT Open Courseware offers free online courses in mechanical engineering, covering topics such as thermodynamics, mechanics, and materials. Mechanical Design Handbook: https://www.engineersedge.com/mechanical_design_index.htm
- This website offers a comprehensive handbook for mechanical design, covering topics such as machine elements, materials, and design calculations. SolidWorks Resource Center: https://www.solidworks.com/sw/resources/
- SolidWorks is a popular software program used for mechanical design. The SolidWorks Resource Center offers tutorials, webinars, and other resources for learning how to use the software for mechanical design. o Autodesk Design Academy: https://academy.autodesk.com/design-academy/mechanical-engineering
- Autodesk provides a range of software for mechanical design, including AutoCAD and Inventor. The Autodesk Design Academy offers free online courses and resources for learning mechanical design using Autodesk software.
- Mechanical Engineering Calculators: https://www.engineeringcalculator.net/mechanical-engineering/
- This website offers a range of calculators for mechanical engineering calculations, including stress, strain, torsion, and beam deflection.
- MIT OpenCourseWare Mechanical Engineering: https://ocw.mit.edu/courses/mechanical-engineering/
- MIT OpenCourseWare offers free online courses in mechanical engineering, including courses on design and analysis of mechanical systems.