



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND DEVELOPMENT CASTING
MOULD FOR RESIN BASED MEDALS**

Thesis submitted in accordance with the partial requirements of the
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By

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APPROVAL

The thesis submitted to the senate of UTeM has been accepted as partial fulfillment of the requirement for the degree of Bachelor of Manufacturing Engineering (Design).

The members of the supervisory committee are as follows:

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ABSTRACT

“Design and development casting mould for resin based medals” is industrial based project related to design a casting mould which can produce a resin based medal in various type of geometry. The previous problem with wooden mould is its limitation in the flexibility of the design configuration of the pattern, while rubber mould are difficult to extract the finish product. The goal of concept generation is to come up with some mould concept ideas. The conceptual design of a casting mould is a highly iterative process. It involves a substantial knowledge component about areas of customer needs, part design requirement, material selection, mold design features, mold making processes, fixtures, tools and product ergonomics. The best design is then chosen by using concept selection. CAD/CAM software is use to generate a 3D model of the product which will help the concept design of the mould. Applicable knowledge like computer aided design, manufacturing process, and material selection is required during the construction of prototype of the machine. The best design will then be fabricated and functional testing is done on the mold. A various type patterns of resin medal are produce as the final outcome of the project. The problem and challenges faced in completing this task is discussed and concluded.

ABSTRAK

“Rekabentuk dan pembangunan acuan tuangan untuk damar pingat” adalah projek berpangkalan industri yang berhubungan dengan sebuah acuan tuangan yang boleh menghasilkan damar pingat dalam pelbagai jenis corak. Masalah sebelum ini bagi acuan kayu adalah batasannya dalam keflexibelan reka bentuk corak dan acuan getah adalah sukar untuk mengeluarkan hasil produk. Matlamat konsep generasi adalah untuk menghasilkan beberapa konsep reka bentuk acuan. Konseptual Reka bentuk acuan tuangan adalah satu proses yang amat berlelar. Ia melibatkan pengetahuan cukup banyak mengenai keperluan pelanggan, pembahagian keperluan reka bentuk, pemilihan bahan, ciri-ciri reka bentuk acuan, proses membuat acuan, lekapan, alat-alat dan ergonomik produk. Konsep reka bentuk acuan tuangan yang terbaik kemudiannya dipilih dengan menggunakan konsep pemilihan. Perisian CAD / CAM ialah digunakan untuk menjana satu produk 3D yang boleh membantu dalam pemilihan konsep-konsep reka bentuk acuan tuangan. Pengetahuan seperti reka bentuk berbantuan komputer, proses pembuatan, dan pemilihan bahan diperlukan untuk pemilihan mesin bagi pembinaan prototaip. Konsep yang terbaik kemudian dihasilkan dan ujian fungsi dijalankan. Pelbagai corak pingat damar dihasilkan sebagai hasil terakhir projek ini. Masalah dan cabaran-cabaran dihadapi dalam menyelesaikan projek ini telah dibincangkan dan menyimpulkan.

DEDICATION

To God for His blessings,
To my beloved parents for their support,
To my family for standing besides me,
To all my friends for their encouragement and help,
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LIST OF ABBREVIATION, SYMBOLS, APECIALIZED NOMENCLATURE

CAD	-	Computer Aided Design
CAE	-	Computer Aided Engineering
CAM	-	Computer Aided Manufacturing
CNC	-	Computer Numerical Control

CHAPTER 1

INTRODUCTION

1.1 Background Introduction

In this new century, mould technology plays a very important role in manufacturing a product. In recent years, medals are made by using a wooden mould. This is because the past, there are no technology available. Resin based casting is sculptured on wooden mould. It took a long time to sculpture a single wooden mould. Various patterns are also difficult to produce. When the mould is ready, process casting is done by pouring out plastic liquid into the mould. After the plastic liquid is cold, the pattern needs to be removed from the mould. The pattern is hard to drop from mould. Now, with advance technology, many machines and with devices were produced. High technology is able to brought design of mould to a higher level. High skilled CAD/CAM software can be use for designing moulds and generating CNC codes. With G-code, CNC machining can cut the material with good surface finish and dimension accuracy. The G-code can also be use on the laser cutting machine. Laser cutting is able to cut the material by using laser to melts, burns or vaporizes away leaving an edge with a high quality surface finish.

1.2 Statement of the Problem

UTeM is approach by Cast Craft Industry (CCI) which is located in Telok Emas, Melaka, to solve the problem facing of the existing mould is made of wood, which takes long time to fabricate. In addition, the flexibility of the pattern design is very low. Therefore the type of the pattern produce is limited. The existing mould also encounters the problem of difficulty in taking out the finished medal product in repetition process.

1.3 Objectives

The aim of this project is to design a casting mould for resin based medal in difference type of geometry and at the same time, the pattern is easy to drop from a mould. The objectives of the project include:

1. To get the general standard dimension of medal.
2. Able to carry out several concept design of the mould and able to generate 3D model of mould by using parametric design software.
3. To conduct the material selection for the mould.
4. To do the process planning and fabrication of the mould.
5. To do assembly and functional testing of the resin medal mould.

1.4 Scope and Key Assumptions

At the end of this project, a mould for resin medal will be generated. Several conceptual design of the mould need to be generate base on the problem statement. Here below are some specifications of the mould design:

1. The standard dimension of the resin medal for the mould is to follow the actual medal in figure below.



Figure 1.1: Resin medal.

2. To choose the best conceptual of design the geometry of the casting mould.
3. The mould configuration is finalized regardless to the pattern design available.
4. The task of modeling will be done using software available in FKP lab.
5. Study the machining process that related to manufacture the casting mould. The mould fabricate process is only limited to which available at the lab.

1.5 Importance of the Project

This purpose of this project is to design and development casting mould for resin based medal. As this project is success, various type of geometry for medal can be carrying out. Beside, this will benefit to all the public that are making product using mould.

1.6 Definition of Terms

1.6.1 Design:

A drawing or sketch. It was art or practice of designing or making designs. A basic scheme or pattern that affects and controls function or development: the overall design of an epic poem [22].

1.6.2 Development:

An significant event, occurrence, or change. Determination of the best techniques for applying a new device or process to production of goods or services[22].

1.6.3 Casting:

Casting is a manufacturing process by which a molten material such as metal or plastic is introduced in a mold, allowed to solidify within the mold, and then ejected or broken out to make a fabricated part. Casting is used for making parts of complex shape that would be difficult or uneconomical to make by other methods, such as cutting from solid material [22].

Casting may be used to form hot, liquid metals or meltable plastics (called thermoplastics), or various materials that cold set after mixing of components such as certain plastic resins such as epoxy, water setting materials such as concrete or plaster, and materials that become liquid or paste when moist such as clay, which when dry enough to be rigid is removed from the mold, further dried, and fired in a kiln or Furnace[22].

1.6.4 Mould:

The hollow former into which molten material (typically metal) is poured or soft plastic material is pressed to harden into a required predetermined shape. The simplest type of mould is a one-piece open former in which the casting emerges with one flat unshaped face. Two- and three-piece moulds for use in metalworking were available from middle Bronze Age times onwards. Moulds were also used for making figurines and occasionally for making pottery [22].

1.6.5 Resin:

Any of numerous clear to translucent yellow or brown, solid or semisolid, viscous substances of plant origin, such as copal, rosin, and amber, used principally in lacquers, varnishes, inks, adhesives, synthetic plastics, and pharmaceuticals [22].

Any of numerous physically similar polymerized synthetics or chemically modified natural resins including thermoplastic materials such as polyvinyl, polystyrene, and polyethylene and thermosetting materials such as polyesters, epoxies, and silicones that are used with fillers, stabilizers, pigments, and other components to form plastics[22].

1.6.6 Medal:

A medal is a small metal object, usually engraved with insignia, that is awarded to a person for athletic, military, scientific, academic or some other kind of achievement. There also exist devotional medals, worn to indicate religious faith [23].

1.7 Organization of the Report

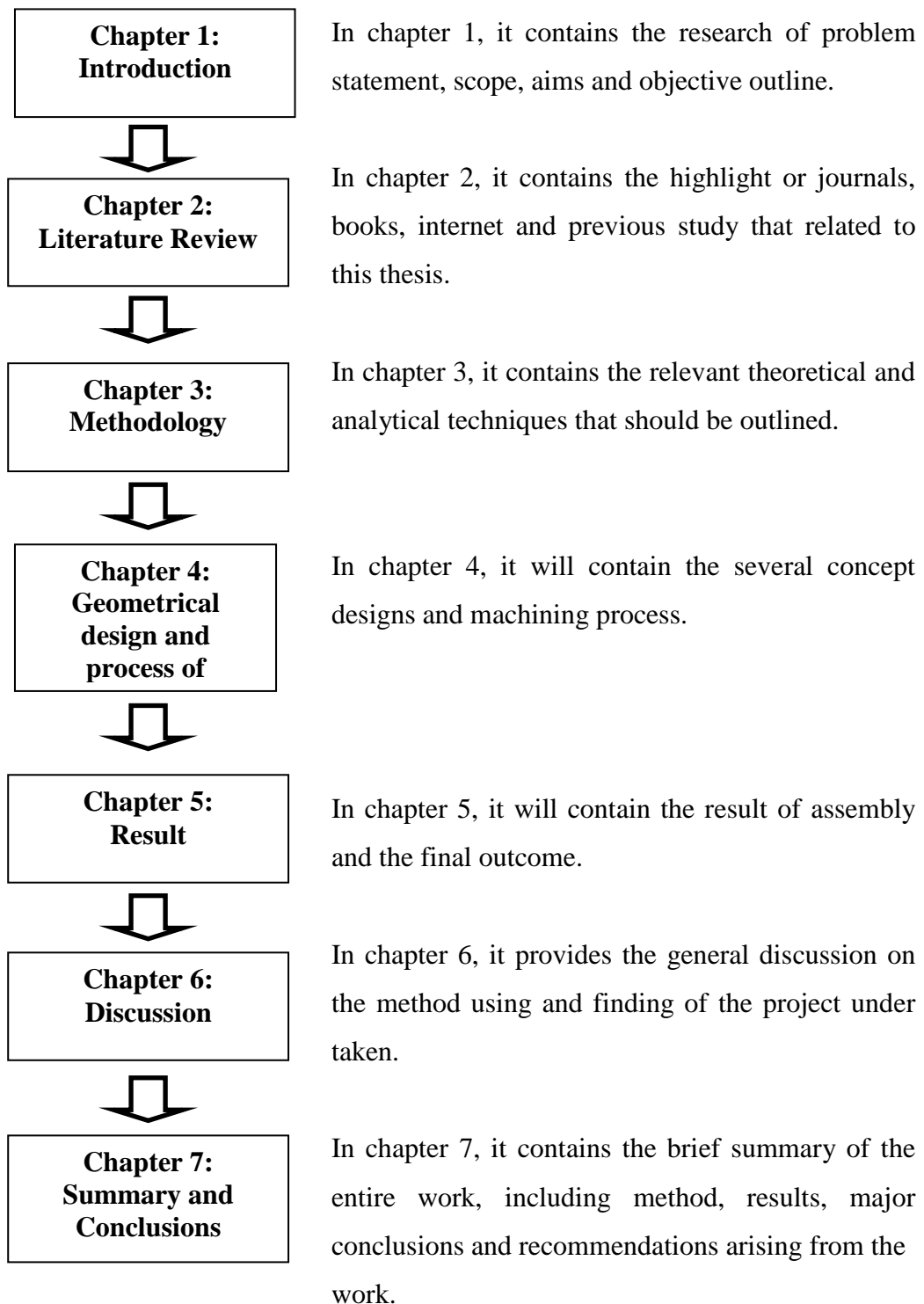


Figure 1.2: Organization of the report

1.8 Summary

Traditional ways make mould already outdated and take time to fabricate a mould. In addition the pattern is limited. Therefore, high technology greatly needed to design the mould. Different kind machining process was introduced in the new century. CAD/CAM and CNC machining of pattern can be direct supplied by 3-D surface data, any ambiguities are avoided. Laser machining can be process directly from 2-D data. High technology is able to reduce time to manufacture, reduce manufacturing cost, and make the casting mould in high flexibility and good functionality, modular and with high surface finish. Hereby, a more quality mould can be made to produce a product with variety pattern.