
**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

# Design and Development of Casting Mould Pattern (Keris)

Thesis submitted in accordance with the partial requirements of the
Universiti Teknikal Malaysia Melaka for the
Bachelor of Manufacturing Engineering (Manufacturing Design)

By

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# DESIGN AND DEVELOPMENT CASTING MOULD PATTERN (KERIS)

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SESI PENGAJIAN: 2/2006-2007

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……

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…….

Co-supervisor

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# DECLARATION

I hereby, declare this thesis entitled “Design and Development of Casting Mould Pattern (Keris)” is the result of my own research except as cited in the references.

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# ABSTRACT

The purpose of this research is to develop casting mould pattern (keris). A pattern is a form, template, or model which can be used to make or to generate another objects or parts of an object. The kris or keris is a distinctive, asymmetrical dagger endemic to Malaysia and Indonesia. Both a weapon and spiritual object, keris are often considered to have an essence or presence, with some blades possessing good luck, while other possess bad. The early function of keris is as a weapon to defend oneself, to preserve one's life, and to function as a close range weapon. Preceding the development of culture and art, the shape of keris changed according to the need and its contribution to human's life, among others it could indicate the social status of the owner of the Keris. Keris also functions as the symbol of power. The blade is made from different iron ores and often contains nickel. The 'ukiran' and the sheath are often made from wood. Usually, keris is produce using forging process. For this research, Rapid Prototyping chosen as a technology to produce the pattern meanwhile the process involved is 3D Printing .The product was drawn using SolidWork software. Then, the drawing was transferred to the rapid prototyping machine and the manufacturing process began. As the pattern produced, it will be used to produce the keris using the equipment provided at the FKP lab. Then, conclusion of the overall project is made in order to find out whether the objectives are achieved. Finally, design and process guidelines and procedures to producing pattern are documented..

# ABSTRAK

Tujuan kajian ini adalah untuk menghasilkan acuan tuangan untuk keris. Paten adalah bentuk atau model yang digunakan untuk menghasilkan suatu objek yang lain. Keris adalah sejenis senjata pendek yang digunakan di Kepulauan Melayu dengan meluas pada zaman dahulu. Pada masa itu keris berfungsi sebagai senjata tikam. Kini, keris digunakan sebagai lambang kerajaan dan keagungan raja dan negara. Bilahnya diperbuat daripada besi dan biasanya mengandungi nikel.sementara ukiran dan sarungnya pula diperbuat daripada kayu. Biasanya keris dihasilkan dengan menggunakan proses tempa di mana besi dibakar dan diketuk dengan tukul besi hingga menjadi leper.Untuk kajian ini, teknologi penghasilan model dengan pantas digunakan untuk menghasilkan paten. Proses yang digunakan adalah percetakan 3 Dimensi. Setelah lukisan dihasilkan dengan menggunakan perisian Solidwork, ianya akan dipindahkan ke mesin penghasilan model dan proses menghasilkan paten dijalankan. Setelah paten berjaya dihasilkan, ianya akan digunakan untuk menghasilkan produk dengan menggunakan proses tuangan pasir. Panduan untuk merekabentuk, proses dan juga prosedur penghasilan paten akan di dokumentasikan.

# DEDICATION

To my beloved parents:

Mohd Gazi bin Basran

Salimah binti Haji Siraj

For your love and demonstration the values of education since I'm still a little kid.

To my siblings:

Mohd Rizal bin Mohd Gazi

Mohd Razali bin Mohd Gazi

Suriawati binti Mohd Gazi

Suhaini binti Mohd Gazi

Suhaila binti Mohd Gazi

Norhidayah binti Mohd Gazi

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| | |
|---|---|
| PSM | = Projek Sarjana Muda |
| RP | = Rapid Prototyping |
| CAD | = Computer Added Design |
| CNC | = Computer Numerical Control |
| FKP | = Fakulti Kejuruteraan Pembuatan |

# CHAPTER 1
# INTRODUCTION

## 1.1 Background of Study

No other weapon so characterizes the Malay world as the keris, an elongated dagger. Surrounded by a wealth of lore, it has always been an object of intense curiosity and interest to outsiders. The keris which has special significance has been used as weapons of self defence used by Malays for generations. In the last century, it evolved from a royal weapon of choice to a status symbol in Malay history. The degree of elaborate designs dictated the status in old Malay hierarchy. However, today the keris and other traditional weapons are more for ceremonial and decorative purposes and remain as a Malay Heritage.

## 1.2 Problem Statement

Nowadays, the skills and technology of casting mould pattern making is not shared and this will cause it to be more absolute in the future especially for young generations. In producing a successfully product, the design and process guidelines in pattern making must be well known and followed. The knowledge of pattern making should be shared with others to promote better designs and products. At UTeM, the facilities of casting are sufficient but availability of casting pattern is limited. There are only 5 patterns can be used in the lab which are anvil, bell anchor, centrifugal casting and pipe reducing

flange pattern. By using the method described later in chapter 4, more pattern can be produce and used for lab activities. By conducting this project, it is hope that the process of developing casting pattern will be documented and experienced by students and staff of UTeM.

## 1.3 Objectives

The objectives of the project are:

1. To design and produced a casting mould pattern. of a keris design.
2. To documented design and process guidelines and procedures to producing pattern.

## 1.4 Scope

The scopes of the project were:

1 To conduct reverse engineering at existing keris design.

2 To produce 3D conceptual design.

3 To fabricate the casting mould pattern.

4 To document the process.

# CHAPTER 2
# LITERATURE REVIEW

## 2.1 Keris

The kris or Keris is a distinctive, asymmetrical dagger indigenous to Indonesia, Malaysia, Brunei and the southern Philippines. Both a weapon and spiritual object, keris are often considered to have an essence or presence, with some blades believe to possess good luck and others are bad.[3]

### 2.1.1 Blades and fittings

The Keris blades are usually narrow and have a wide, asymmetrical base. The ‘ukiran’ and the sheath are often made from wood, though examples made from ivory or covered in gold sheets could be found. Blade length is highly variable. The blade is made from different iron ores and often contains nickel. A bladesmith, or ‘empu’, makes the blade in layers of different metal. Some blades can be made in a relatively short time, while more legendary weapons can take years or even a lifetime to complete. In high quality the metal of the blade has been folded dozens or even hundreds of times and handled with the utmost precision.[3]

There are keris blades that purportedly carry the imprints of the smith's thumbs, or even lips, which were impressed upon the blade during the forging process. Blades are acid-

etched after forging to bring out the contrasting patterns formed by the various metals used in the keris. Iron ore sources are rare in some areas of the Malay world, especially in Java. The keris-smiths, called ‘Empu’ (for those highly skilled smiths in the employ of Kratons, who can pass down their title of Empu to their sons) or ‘pandai keris’ (for smiths of varying skill levels, working outside of kratons), often use myriad types of metal ores that they can find to make the blade.[3]

Keris blades can be straight or sinuous. With sinuous blades, the bends are called luks. Most keris have fewer than 13 luks and the number of luks should be odd, or the keris would be considered unlucky. The sinuous blade has become synonymous with the keris, especially today as it has become a popular tourist souvenir. In reality more than half of the old keris have straight blades luks maximise the width of wound while maintaining its weight. [3]

A keris and its sheath have many parts. The names for these parts vary by region. The following terms apply mainly to the Javanese Keris.[3]

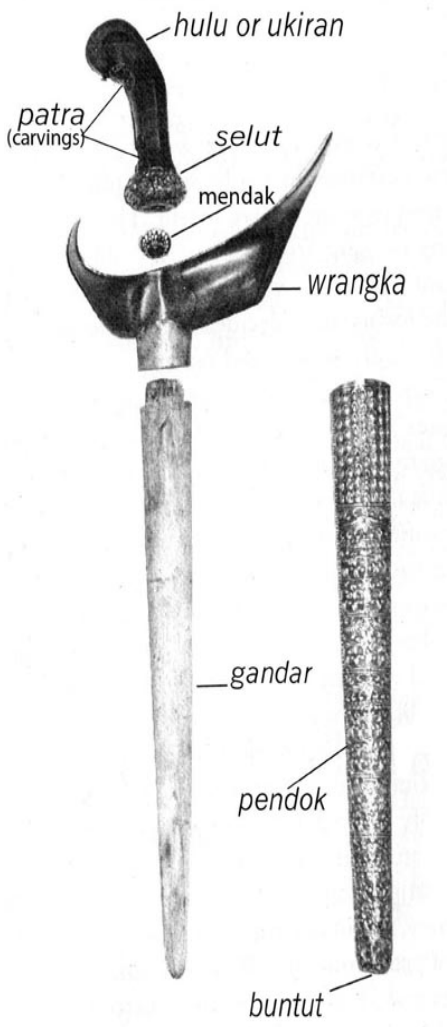


Figure 2.1: keris part.[3]

patra – handle carvings (especially on Javanese ukiran)[2]

ukiran – handle/hilt[2]

selut – metallic cap on the ukiran (not on all krisses)[2]

mendak – metal cup on the tang between the ukiran and the blade guard[2]

wrangka – the wide, top portion of the sheath[2]

gandar – the narrow portion of the sheath[2]

pendok – a metal sleeve for the gandar[2]

buntut- end of the pendok[2]

wilah – blade[2]

pocok – blade point[2]

## 2.2 Patterns

Patterns are a form, template, or model which can be used to make or to generate things or parts of a thing. Patterns are used to mold the sand mixture into the shape of the casting. They may be made of wood, plastic or metal. The selection of a pattern material depends on size and shape of the casting, the dimensional accuracy, the quantity of casting required and the molding process. Because patterns are used repeatedly to make molds, the strength and durability of the material selected for patterns must reflect the number of castings that the mould will produce. Patterns are usually coated with a parting agent to facilitate their removal from the moulds.[1]

## 2.3 Sand casting

The traditional method of casting metals is in sand moulds and has been used for millenia. Simply stated, sand casting consists of placing a pattern (having the shape of the desired casting) in sand to make an imprint, incorporating a gating system, filling the resulting cavity with molten metal, allowing the metal to cool until it solidifies, breaking

away the sand mould, and removing the casting. Although the origins of sand casting date to ancient times, It is still the most prevalent form of casting. Typical parts made by sand casting are machine- tool bases, engine blocks, cylinder heads, and pump housings. [1]

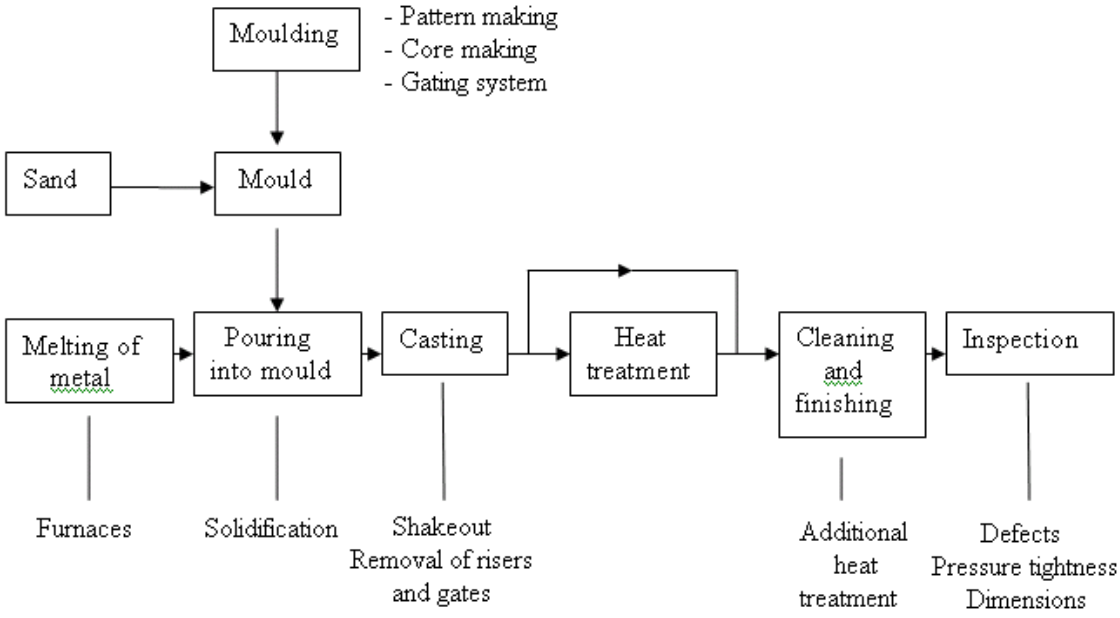


Figure2 2: Outline of production steps.[1]

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### 2.3.1 Major components of sands moulds.

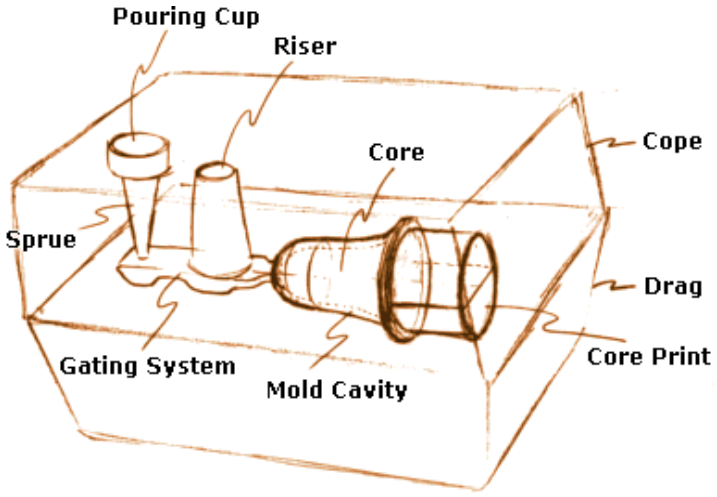


Figure 2.3: Typical Components.[4]

1. Flask
    - Supported mold.[1]

2. Pouring basin
    - Into which the molten metal is poured.[1]
3. Sprue
    - Through which the molten metal flows downward.[1]
4. Runner system
    - Which has channels that carry the molten metal from the sprue to the mold cavity.
    - Gates are inlets into the mold cavity .[1]
5. Riser
    - Which supply additional metal to the casting as it shrinks during solidification.[1]