



**First stage**

**First semester**

**Workshops**

**Metal casting processes**

**Lecture: 1**

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**Casting** is one of the oldest manufacturing process. It is the first step in making most of the products.

- **Steps:**

- Making mould cavity
- Material is first liquefied by properly heating it in a suitable furnace.
- Liquid is poured into a prepared mould cavity
- Allowed to solidify
- product is taken out of the mould cavity, trimmed and made to shape
- We should concentrate on the following for successful casting operation:

(i) Preparation of moulds of patterns

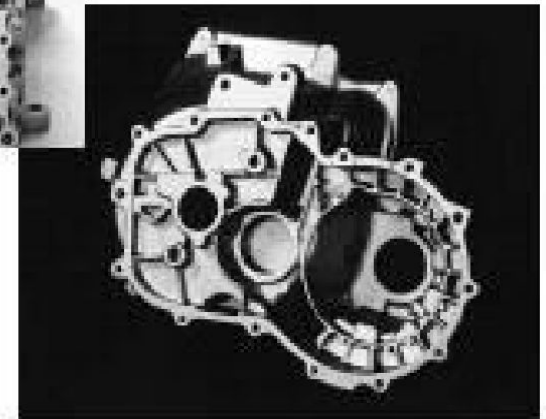
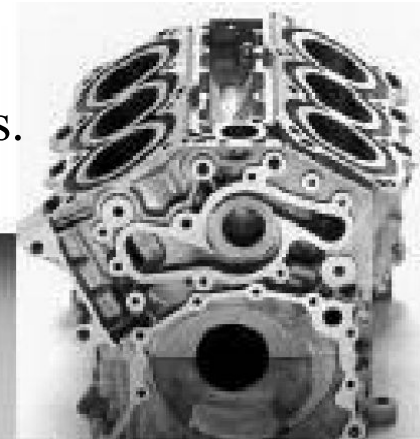
(ii) Melting and pouring of the liquefied metal

(iii) Solidification and further cooling to room temperature

(iv) Defects and inspection

# Advantages

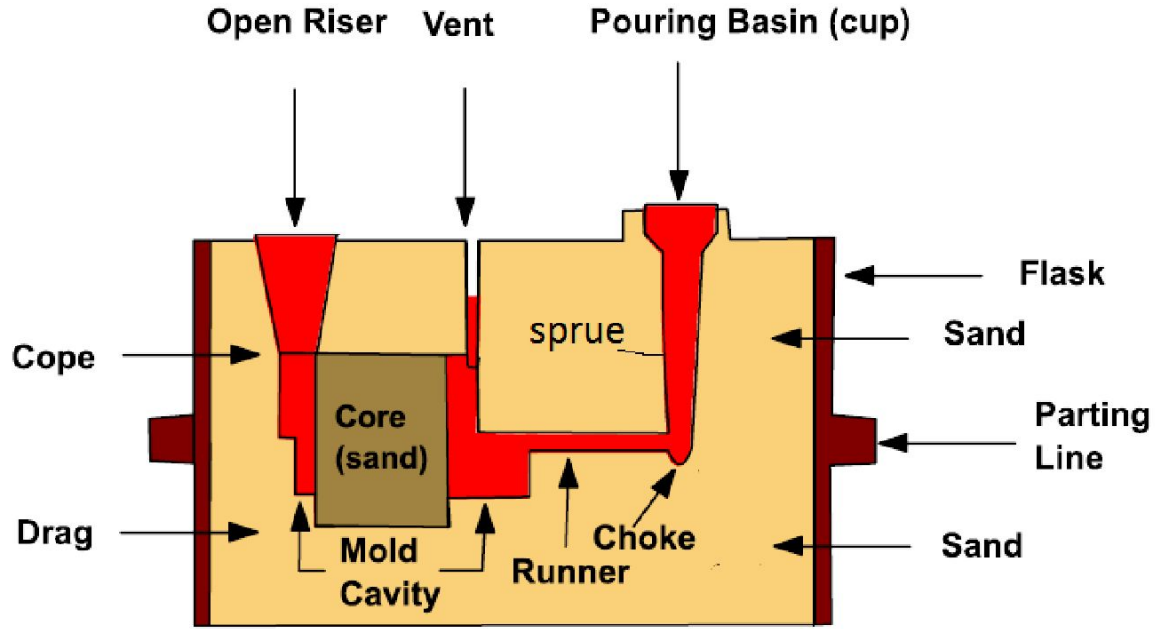
- Molten material can flow into very small sections so that intricate shapes can be made by this process. As a result, many other operations, such as machining, forging, and welding, can be minimized.
- Possible to cast practically any material: ferrous or non-ferrous.
- The necessary tools required for casting moulds are very simple and inexpensive. As a result, for production of a small lot, it is the ideal process.
- There are certain parts (like turbine blades) made from metals and alloys that can only be processed this way. Turbine blades: Fully casting + last machining.
- Size and weight of the product is not a limitation for the casting process.



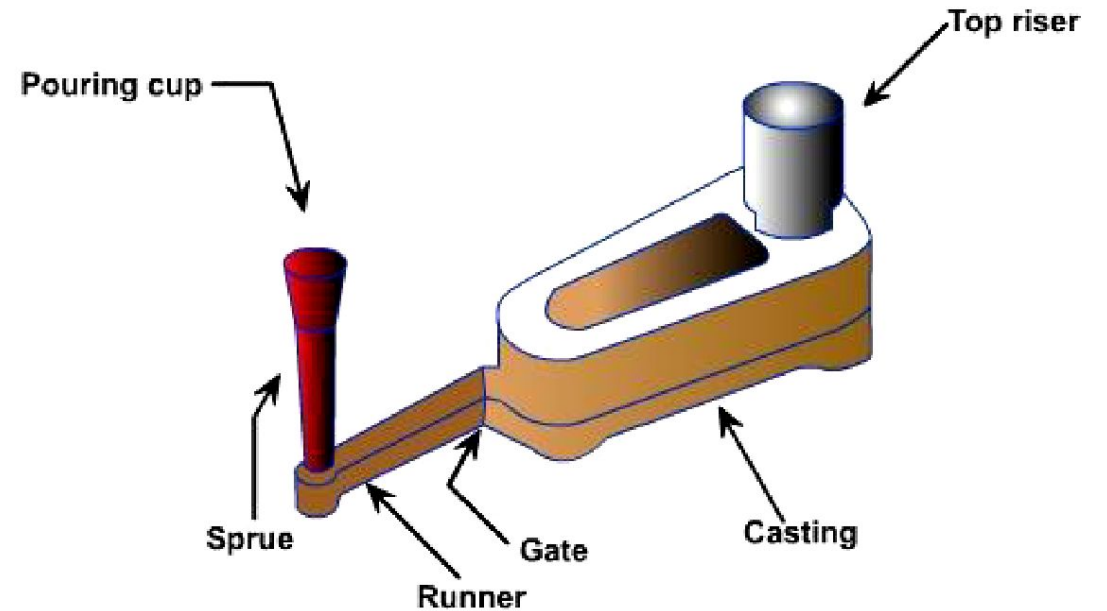
# Limitations

- Dimensional accuracy and surface finish of the castings made by sand casting processes are a limitation to this technique.
- Many new casting processes have been developed which can take into consideration the aspects of dimensional accuracy and surface finish. Some of these processes are die casting process, investment casting process, vacuum-sealed moulding process, and shell moulding process.
- Metal casting is a labour intensive process
- Automation: a question

# Typical Sand Mould



Mould Section and casting nomenclature

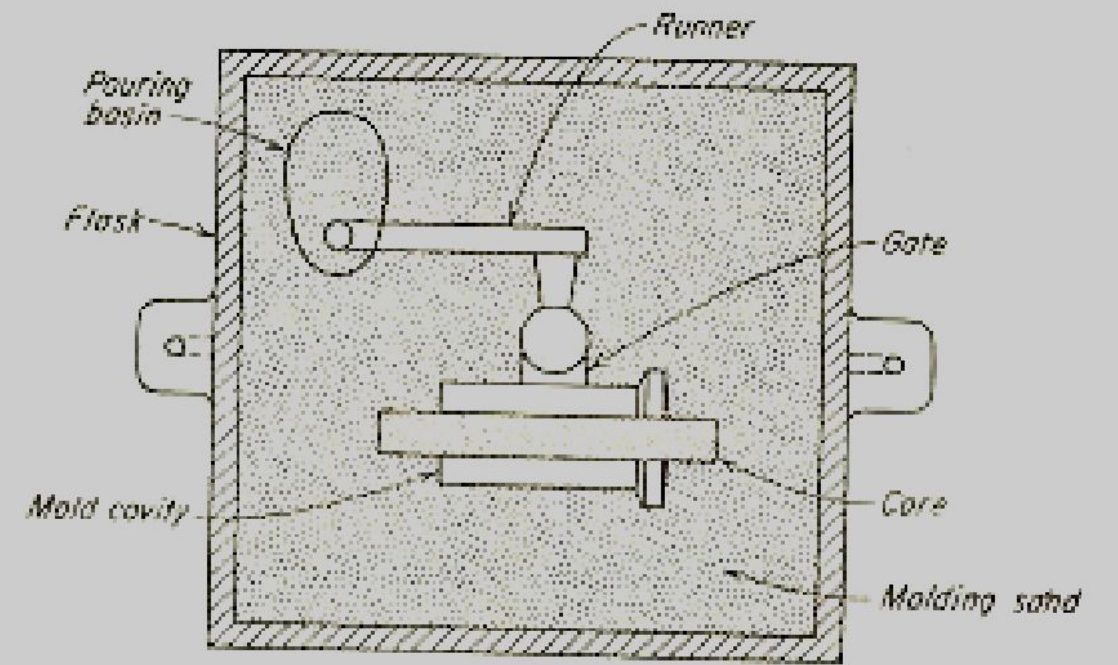


pattern attached with gating and risering system

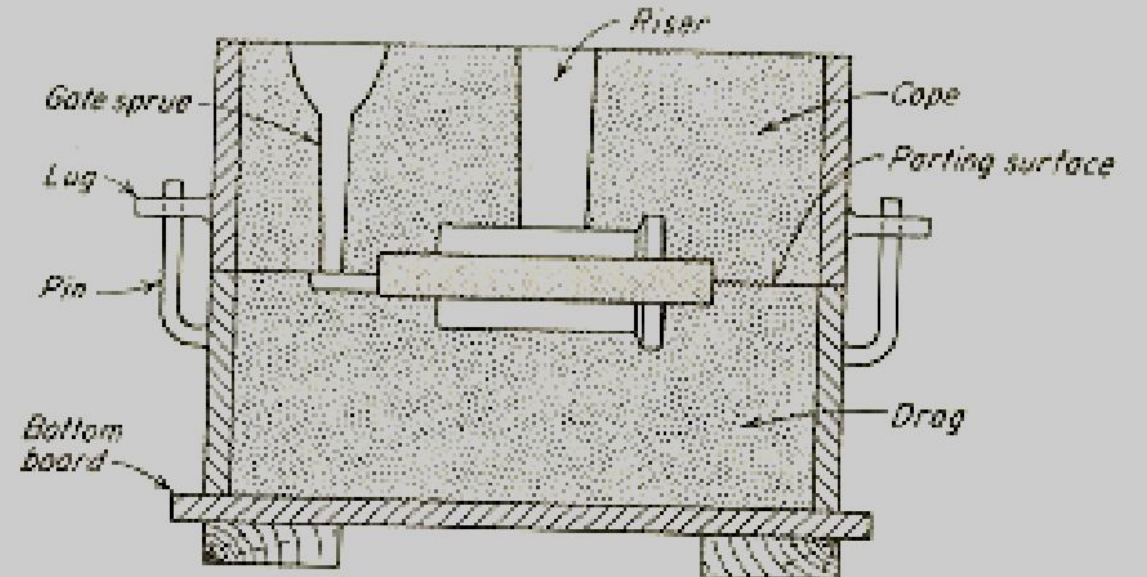
# Mould Section and casting nomenclature

(a) top view

(b) front view



(a)



(b)

## Important casting terms

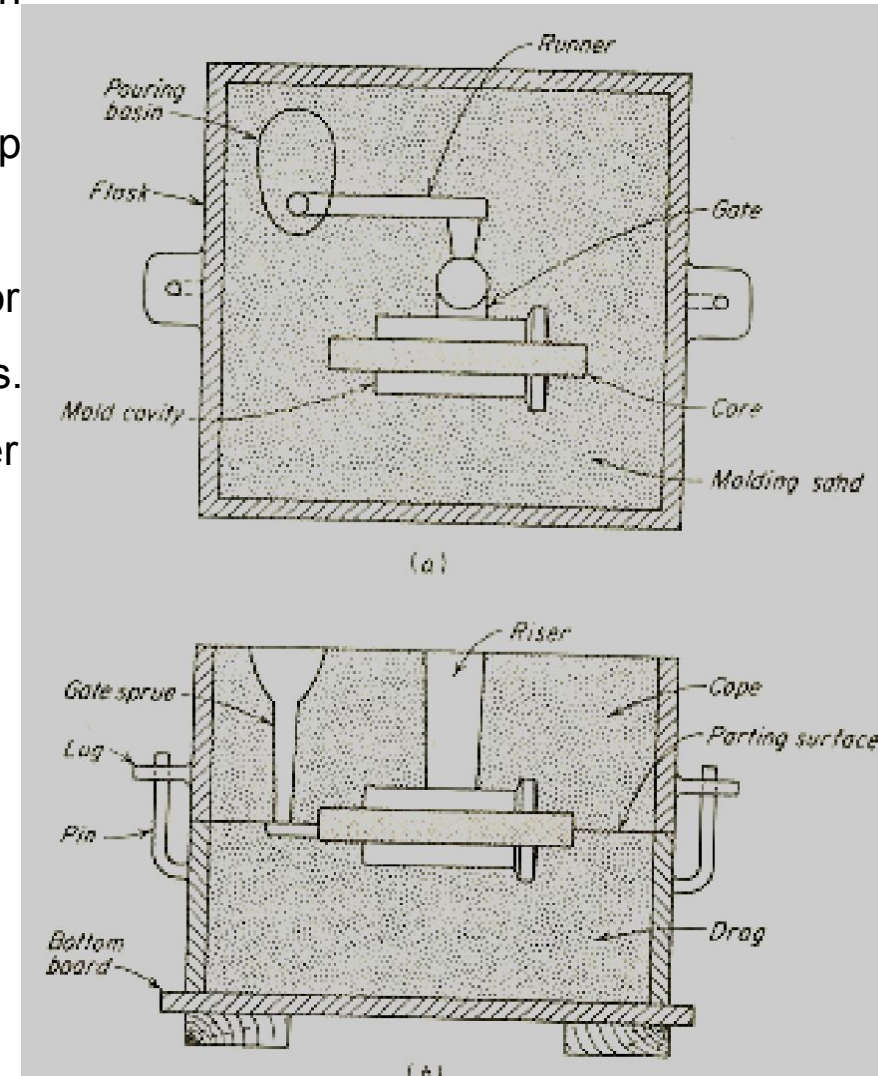
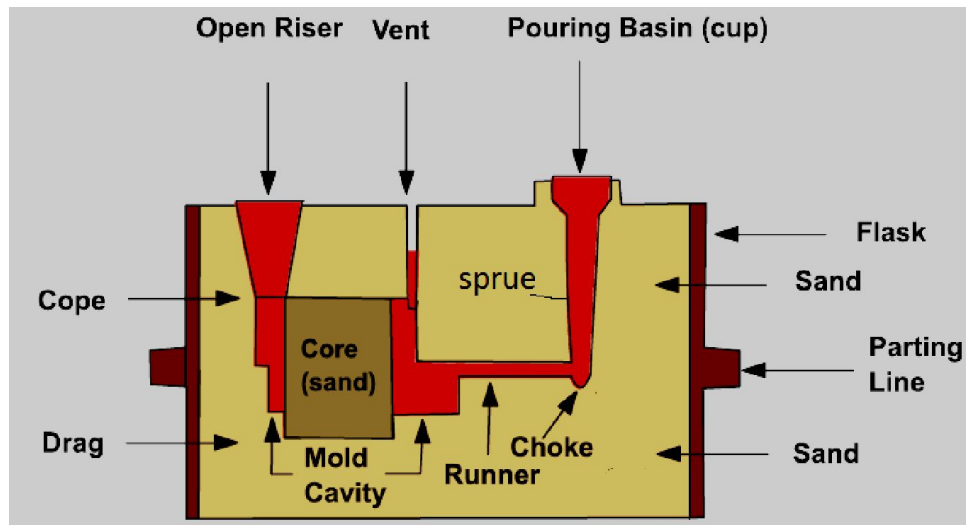
**Flask:** A metal or wood frame, without fixed top or bottom, in which the mould is formed. Depending upon the position of the flask in the moulding structure, it is referred to by various names such as **drag – lower moulding flask**, **cope – upper moulding flask**, **cheek – intermediate moulding flask** used in three piece moulding.

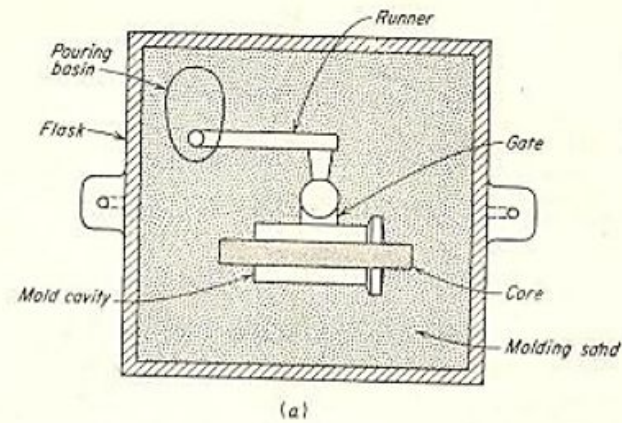
**Pattern:** It is the replica of the final object to be made. The mould cavity is made with the help of pattern.

**Parting line:** This is the dividing line between the two moulding flasks that makes up the mould.

**Moulding sand:** Sand, which binds strongly without losing its permeability to air or gases. It is a mixture of silica sand, clay, and moisture in appropriate proportions.

**Facing sand:** The small amount of carbonaceous material sprinkled on the inner surface of the mould cavity to give a better surface finish to the castings.





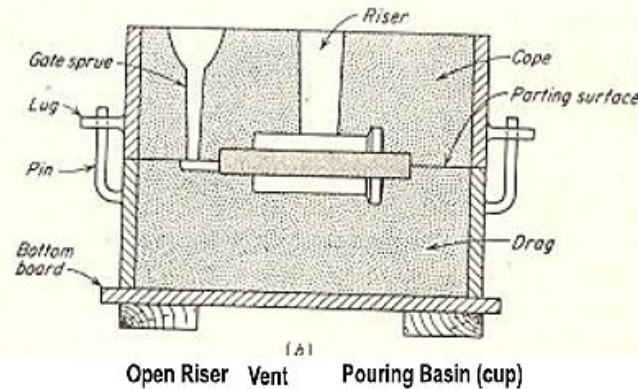
**Core:** A separate part of the mould, made of sand and generally baked, which is used to create openings and various shaped cavities in the castings.

**Pouring basin:** A small funnel shaped cavity at the top of the mould into which the molten metal is poured.

**Sprue:** The passage through which the molten metal, from the pouring basin, reaches the mould cavity. In many cases it controls the flow of metal into the mould.

**Runner:** The channel through which the molten metal is carried from the sprue to the gate.

**Gate:** A channel through which the molten metal enters the mould cavity.



**Chaplets:** Chaplets are used to support the cores inside the mould cavity to take care of its own weight and overcome the metallostatic force.

**Riser:** A column of molten metal placed in the mould to feed the castings as it shrinks and solidifies. Also known as “feed head”.

**Vent:** Small opening in the mould to facilitate escape of air and gases

