دانشکده فنی و حرفه ای انقلاب اسلامی
زبان تخصصی ریخته گری

حمزه نخعی نیا
زمستان ۹۹

References and useful websites:

- Casting (John Campbell)
- Design for Manufacturing(chapter 6)
- English for Materials Science and Engineering
- www.afsinc.org
- www.amc.aticorp.org
- www.asm-intl.org

محتوای هر جلسه

- تدریس ۲۰ کلمه کاربردی مختص ریخته گری
- بررسی و تحلیل متون و مقالات مربوطه
- تدریس گرامرهای مورد نیاز

نحوه ارزیابی

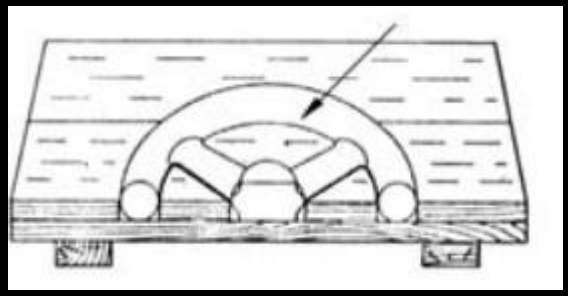
- کوییز هر جلسه (۵ نمره)
- ارائه سمینار به صورت فردی(۵ نمره)
- امتحان پایانی(۱۰ نمره)

محتوای درس

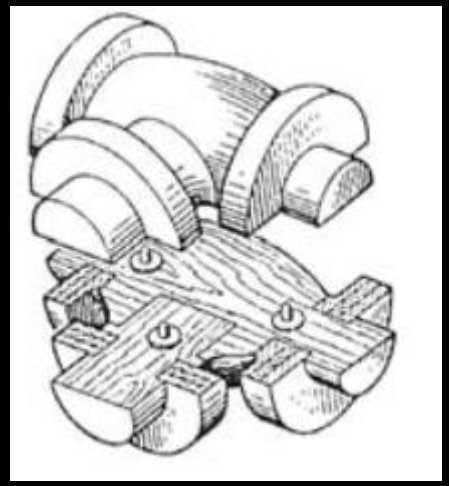
- انواع مدل ها، عیوب ریخته گری، و یادگیری کلمات مربوط به ریخته گری
- ریخته گری و انجماد
- بررسی انواع روش های ریخته گری
- طراحی سیستمهای ریخته گری

Patterns:

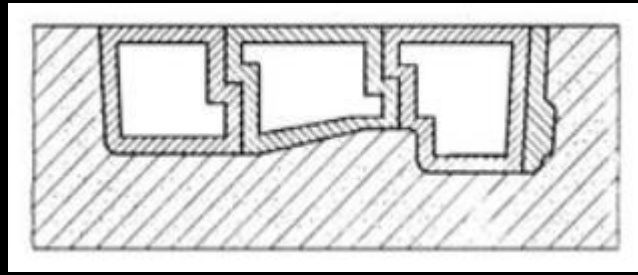
solid pattern, unsplit pattern, single piece pattern, one-piece pattern



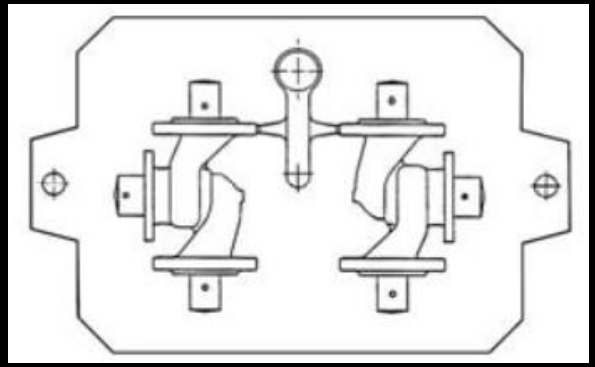
cope and drag pattern, two-piece pattern



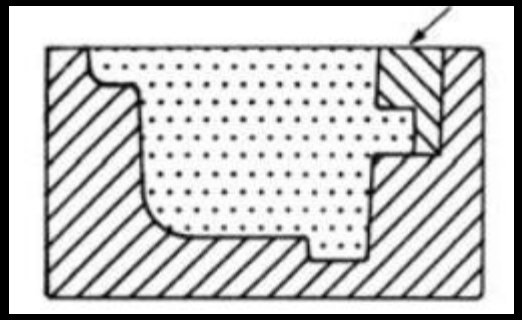
- split pattern, parted pattern, divided pattern
- built-up pattern, multiple-piece pattern, multiple-part pattern



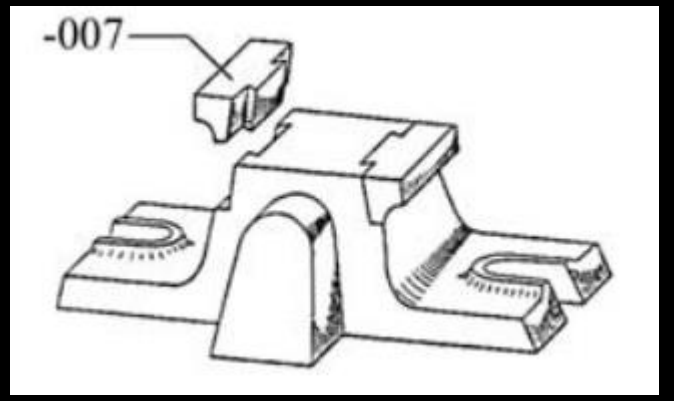
- mounted pattern



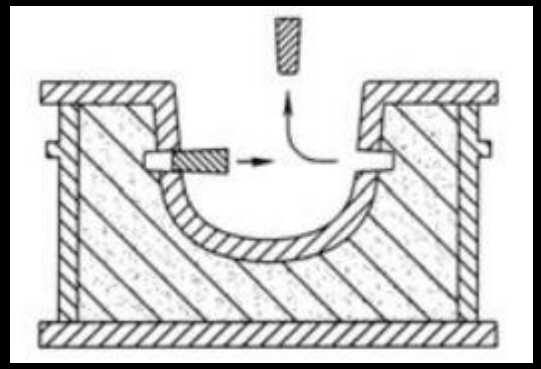
- loose pattern, unmounted pattern
- loose piece, loose part



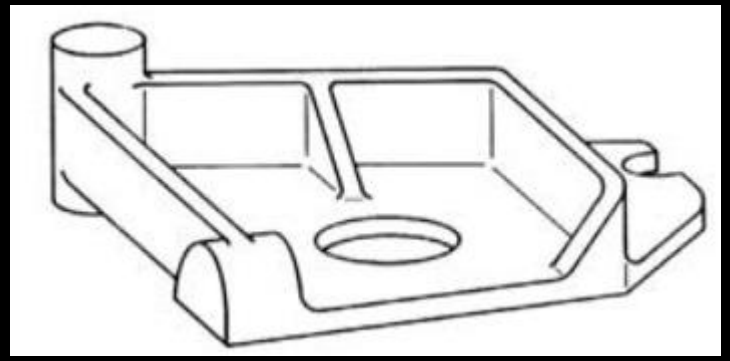
- loose-piece pattern



- **Drawback**

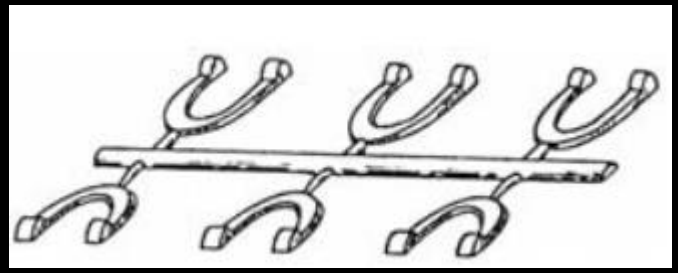


- **natural pattern**

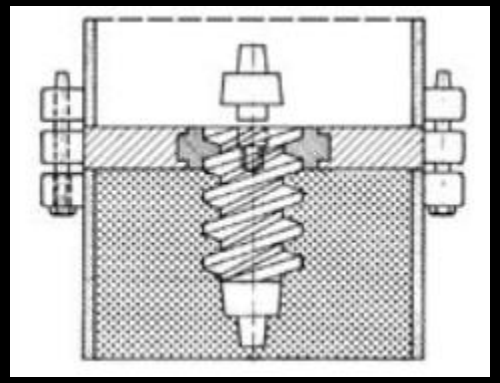


- Double contraction pattern, master pattern
- single contraction pattern, production pattern, working pattern

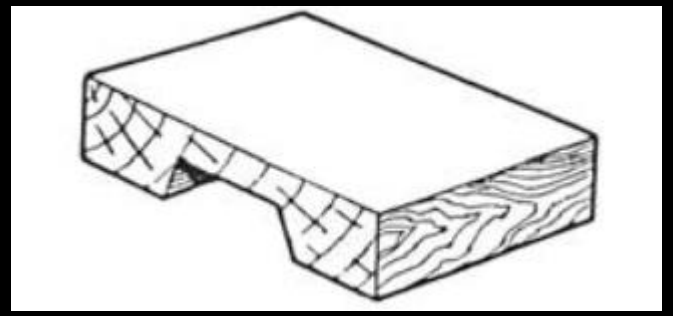
- **standard pattern**
- **temporary pattern**
- **simplified pattern**
- **gating pattern**
- **gated pattern**



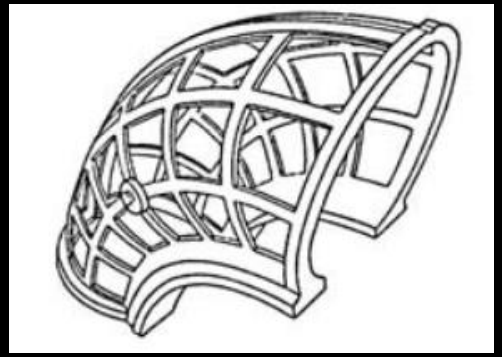
- screw pattern



- flat(-back)pattern



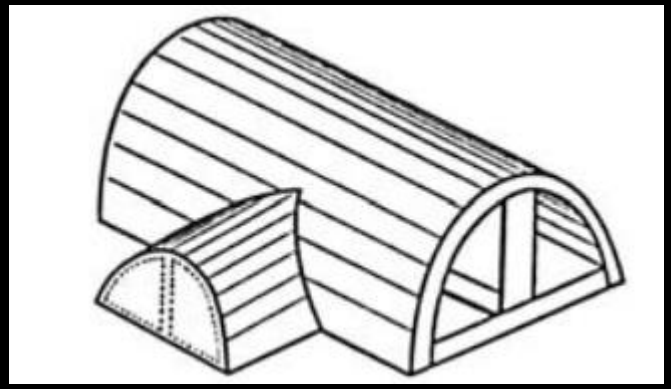
- skeleton pattern



جلسه دوم

Pattern

- **faked pattern**
- **slatted pattern**



- heat disposable pattern, fusible pattern

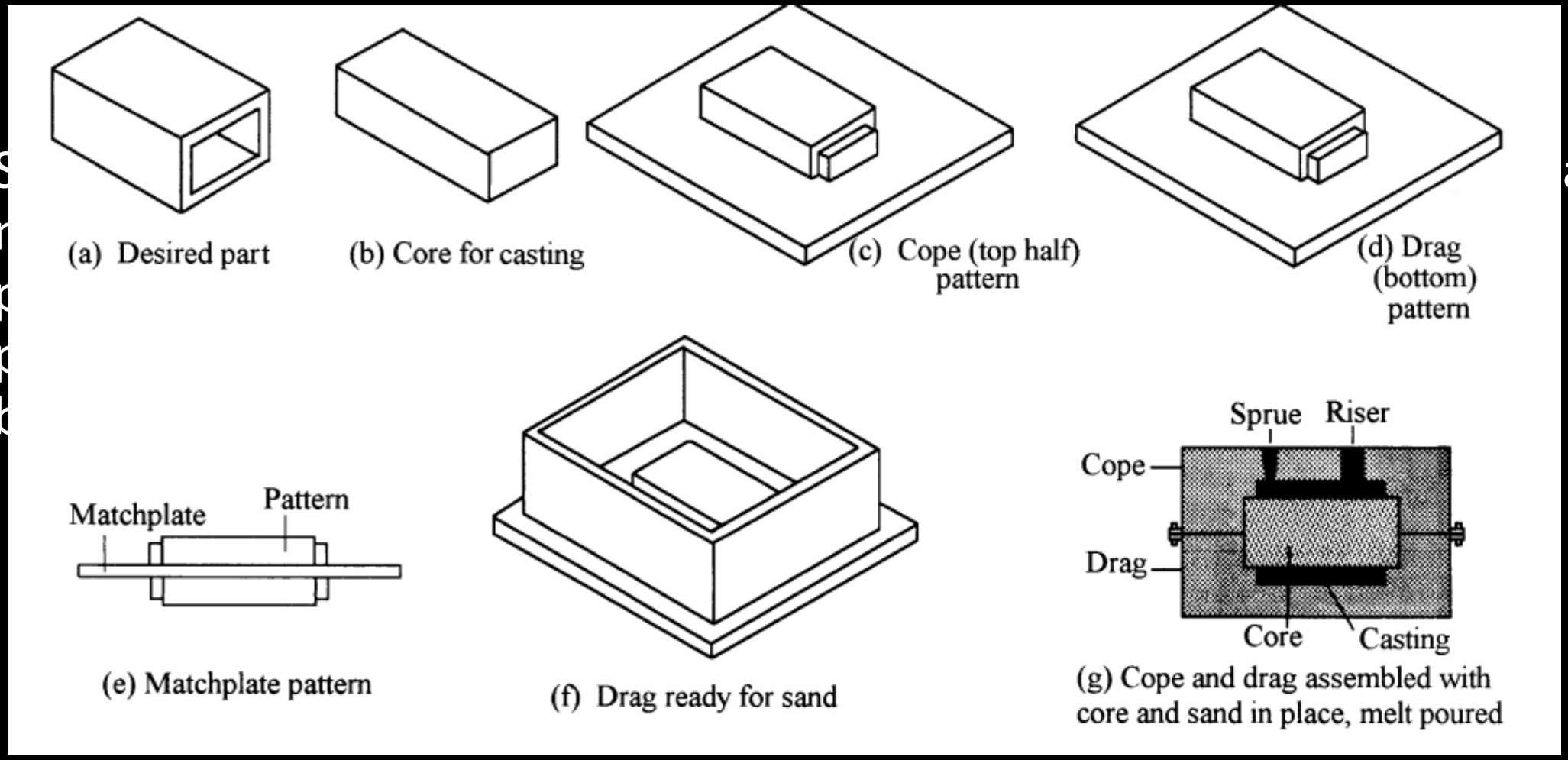
Alloys

- Brass
- **standard brass**
- cast brass
- Yellow brass
- **alpha brass**
- **aluminium brass**
- **silicon brass**
- **naval brass, navy brass**
- **leaded brass**
- **nickel brass**

- tungsten brass, wolfram brass
- high-tensile brass
- german silver, nickel silver
- Monel (metal)
- gilding metal
- red brass, red metal
- light (metal) alloy
- silumin
- modified silumin

SAND CASTING

- S a



- Each half is placed in a molding box, and the sand mixture is then poured all around the pattern. After the sand is packed, holes, which are used to pour the molten metal into the mold (sprue) and to be used as a reservoir of molten metal (risers), are formed in the sand. Vents are also created in order to allow the escape of gases from the melt.

جلسه سوم و چهارم

SAND CASTING

- Then the pattern is removed and a runner system or small passageway is created inside the die through which the melt can flow and be distributed. Gates are the sections where the melt enters the impression. Thus, sprues feed the runners, and the runners feed the gates.

To facilitate removal of the pattern from the sand mold, the pattern must be provided with an angle or taper called *draft*. If possible, parts should be designed so that natural draft is provided (Figure 6.2).

If the part to be cast has one completely flat surface, then the pattern can be made in one piece (Figure 6.2). If the production volume is sufficiently large, the two halves of the pattern are usually mounted on opposite sides of a single board or metal plate to form what is called a match-plate (Figure 6.1e). To avoid the necessity of forming the runner system by hand, the patterns that form the runners can also be mounted on the match-plate. For large castings a match-plate would become too large and heavy for convenient handling and the cope and drag half approach shown in Figure 6.1 is used.

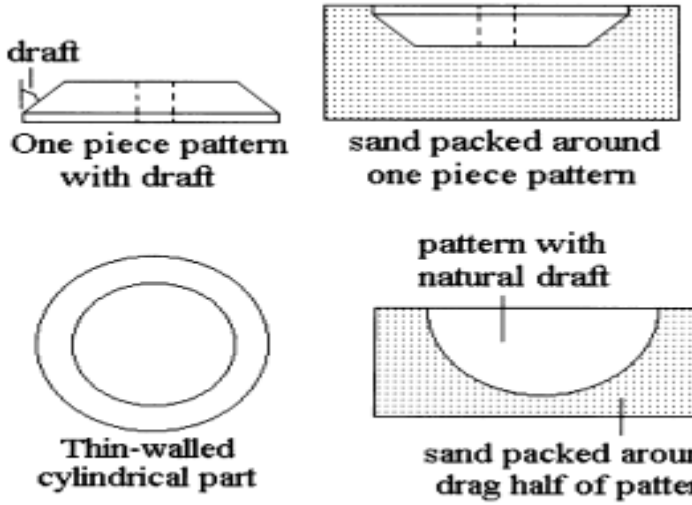


FIGURE 6.2 *An illustration of parts with draft and pattern ready for removal.*

INVESTMENT CASTING

- Investment casting, as well as die casting (which is discussed in the next section), can produce parts of similar geometric shapes and size. Since, as you will learn below, the disposable pattern is made by injecting wax into a mold, features that are difficult or costly to injection mold or die cast (e.g., undercuts) are also costly to investment cast.
- Investment casting is typically used when low production volumes are expected (e.g., less than 10,000 pieces), whereas die casting ten s are expected.
- Investment cast parts can be made of a um and copper alloys, carbon and low alloy ste d cobalt alloys. Die castings, as you will learn in s with relatively low melting temperaturesm p

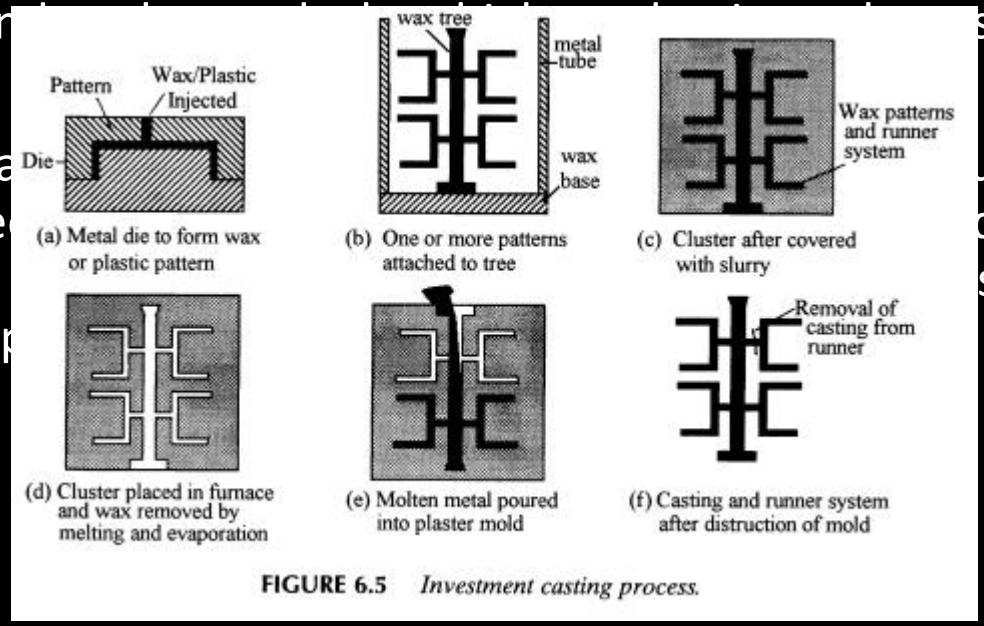


FIGURE 6.5 *Investment casting process.*

- In investment casting (Figure 6.5), a metal die or mold is made by either machining or casting. The more complicated the shape (because of undercuts, for example), the more costly the metal dies.
- After the mold is formed, wax is injected to form a pattern. The external shape of the wax pattern resembles the internal shape of the mold. The wax pattern is removed from the mold and attached to a wax base that contains a gate. If the production volume is large enough several wax patterns are attached to a tree that contains the runners, gates, and other features that will feed and distribute the molten metal. A metal hollow tube is now placed over the wax patterns and a slurry--such as plaster of Paris--is poured to entirely cover the patterns. The completed mold is placed in an oven and the wax removed by melting and evaporation. Following this the mold is usually placed in a second oven to cure for 12 to 24 hours.
- To make parts, the mold cavity is filled with molten metal that is allowed to solidify. To facilitate filling of the mold the melt is poured while the mold is still hot. When the part has cooled, the mold is destroyed and the part removed. The tolerances and surface finishes achievable by investment casting are such that machining is not generally required.

DIE CASTING

- Like injection molding, die casting is a process in which a melt is injected under pressure into a metal mold. The melt then cools and solidifies, conforming to the internal shape of the mold.
- As in injection molding, as the part geometry becomes more complex, the cost of the mold increases. Also, as the wall thickness increases, the cycle time required to produce the part also increases. While the thin film, called flashing (Figure 6.6), that extrudes out through the spaces between parts of a mold is easily removed by hand in the case of injection-molded parts, the same cannot be said for die-cast parts. Hence, because of the difficulty of flash removal, internal undercuts are not generally die cast. Nevertheless, both injection molding and die casting can economically produce parts of great complexity.

- There are two types of die casting machines: a hot chamber machine (Figure 6.7) and a cold chamber machine (Figure 6.8).
- Both have four main elements: (1) a source of molten metal, (2) an injection mechanism, (3) a mold, and (4) a clamping system.

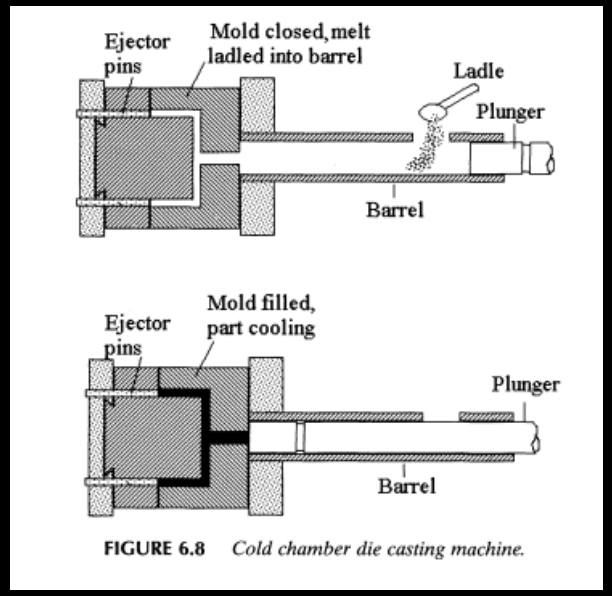


FIGURE 6.8 *Cold chamber die casting machine.*

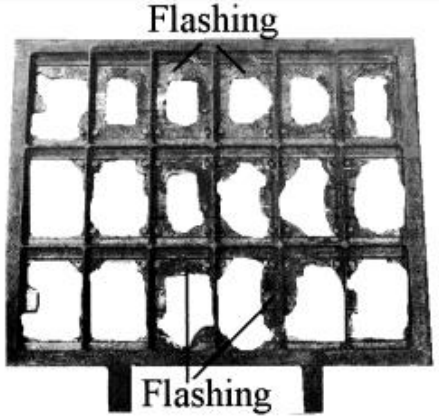


FIGURE 6.6 *Die cast part with flashing.*

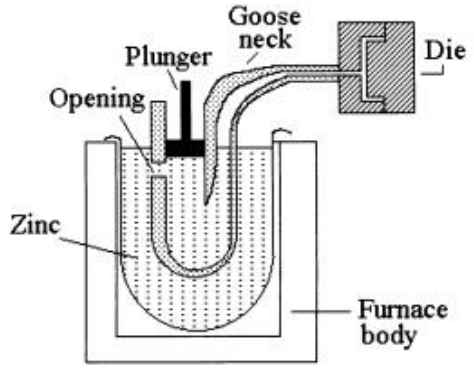
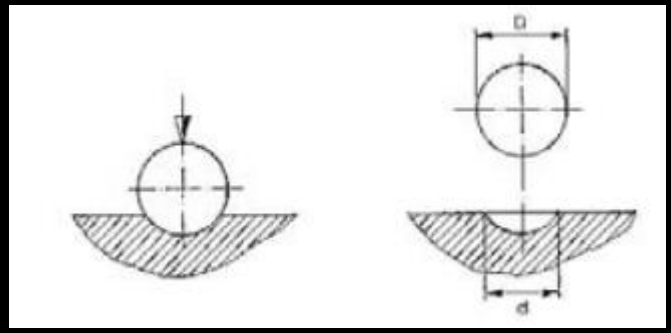


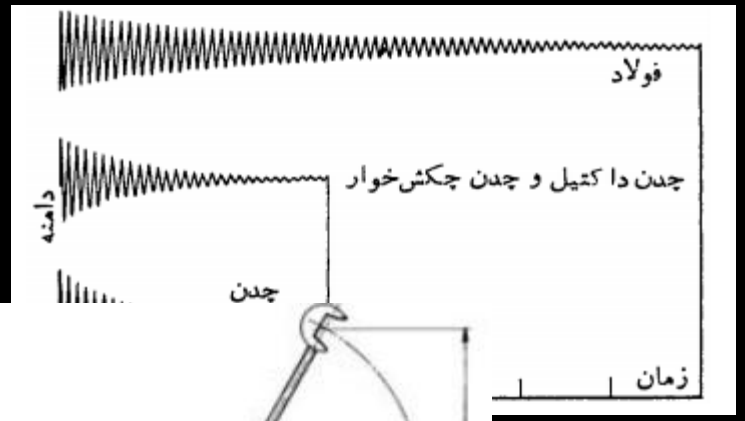
FIGURE 6.7 *Hot chamber die casting machine.*

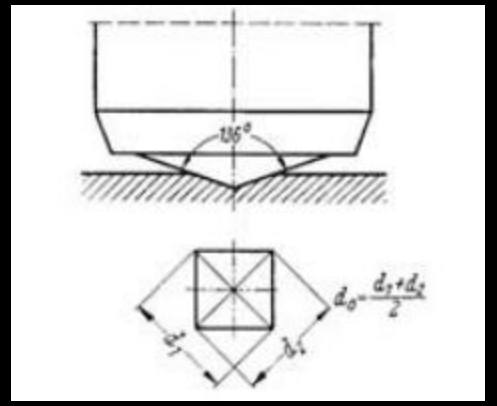
جلسه پنجم و ششم

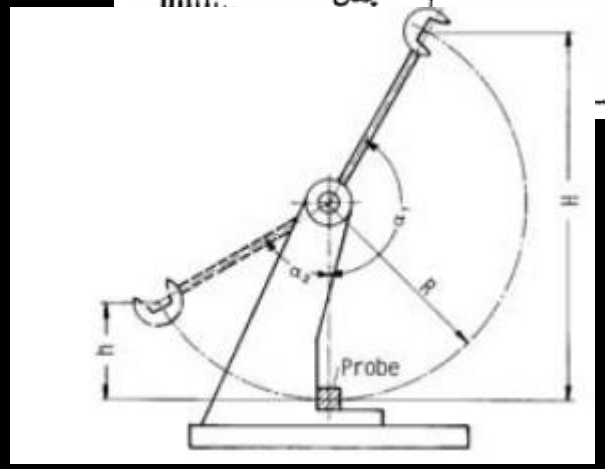
- **Duralumin**
- **Antimonial lead, hard lead**
- **antifriction metal**
- **scrap (metal)**
- **bought scrap**
- (foundry) returns, return scrap, remelt, home scrap
- Briquetted scrap, bundled scrap, packeted scrap, baled scrap
- **sprue**
- **Turnings**
- **borings**
- **Swarf**
- **runouts**
- **splashings**
- Steel scrap, scrap steel
- (cast) iron scrap, scrap iron, foundry iron

- file hardness test
- brinell hardness
- Vickers hardness, diamond pyramid hardness
- rockwell hardness
- hardness tester, hardometer
- indenter, penetrator
- standard hardness block
- damping capacity
- Impact test
- Charpy (impact) test
- Izod (impact) test









Present simple

1.1 THE PRESENT SIMPLE

To make the present simple of most verbs, use the base form (the infinitive without "to").

I eat lunch at noon every day.

The base form of the verb "to eat."

Adverbs of frequency are often used with the present simple.

She eats lunch at 2pm every day.

With "he," "she," and "it," add "-s" to the base form.

FURTHER EXAMPLES

We drink coffee every morning.

She drinks coffee every morning.

We start work at 9am.

He starts work at 11am.

They leave work at 5pm.

Rob leaves work at 7pm.

HOW TO FORM

The base form of the verb.

SUBJECT	VERB	REST OF SENTENCE
I / You / We / They	eat	lunch at 2pm every day.
He / She / It	eats	

With "he," "she," and "it," "-s" is added.

1.2 "-S" AND "-ES" ENDINGS

With some verbs, "-es" is added for "he," "she," and "it."
These include verbs ending with "-sh," "-ch," "-o," "-ss," "-x," and "-z."

I go to bed.

He goes to bed.

"-es" is added to verbs ending with "-o."

I finish work.

He finishes work.

"-es" is added to verbs ending with "-sh."

I watch TV.

She watches TV.

"-es" is added to verbs ending with "-ch."

I cross the road.

She crosses the road.

"-es" is added to verbs ending with "-ss."

I fix cars.

She fixes cars.

"-es" is added to verbs ending with "-x."

Their phones buzz all day.

His phone buzzes all day.

"-es" is added to verbs ending with "-z."

COMMON MISTAKES FORMING THE PRESENT SIMPLE

When the present simple is used with "he," "she," "it," or one person's name, it always ends in "-s" or "-es."

An "s" is added to the base form "start."

He starts work at 11am. ✓

He start work at 11am. ✗

"Start" without an "s" is only used for "I," "you," "we," and "they."

There is no need to add the auxiliary verb "do" when forming the present simple. It is only used to form questions and negatives.

I eat lunch at noon every day. ✓

I do eat lunch at noon every day. ✗

"Do" is only used as an auxiliary verb when forming negatives or questions.

1.3 "BE" IN THE PRESENT SIMPLE

"Be" is an important verb with an irregular present simple form.

I am 25 years old.

You are a chef.

"Are" also follows "we" and "they."

He is happy.

"Is" also follows "she" and "it."

HOW TO FORM

SUBJECT	"BE"	REST OF SENTENCE
I	am	happy.
You	are	
He / She / It	is	
We / They	are	

1.4 "HAVE" IN THE PRESENT SIMPLE

"Have" is an irregular verb. The third person singular form is "has" not "haves."

I have a garage.

"Has" is used for the third person singular: "he," "she," and "it."

She has a yard.

HOW TO FORM

SUBJECT	"HAVE"	OBJECT
I You We They	have	a garage.
He She It	has	

FURTHER EXAMPLES

I have a car. 

You have a sister. 

I have a painful back. 

They have the same dress. 

They have a new baby. 

The cat has a new collar. 

He has a cold. 

Thomas has a driving lesson today. 

Jack has a bad headache. 

Sarah has coffee with Tom every Tuesday. 

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Words To Learn This Week

abandon
keen
jealous
tact
oath
vacant
hardship
gallant
data
unaccustomed
bachelor
qualify

Words To Learn This Week

corpse
conceal
dismal
frigid
inhabit
numb
peril
recline
shriek
sinister
tempt
wager

Perposition

In:

in January	in 1980	in summer
in the afternoon	in Iran/Tehran	in the sky
in the morning	in ink	
in order to	in my presence	in my absence
in spite of	in the end	in front of
interested in	believe in	fall in love with

On:

on my birthday	on Friday	on foot
on bicycle	on my vacation	on the whole
on time	on the contrary	insist on
depend on	based on	spend on
rely on	concentrate on	congratulate on
on vacation	on the phone	on business

At:

at ten o'clock	at night	at play
at sunset	at Christmas	at first
at full speed	at the table	at the door
at war/peace	at dawn	at sunrise
smile at	look at	laugh at