9.	Subject: MM-141 12/05/24
4	Exp:04
1	( - 1 3 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
9	Casting & solidification:
9	
4	Casting begins with molding. Molds are of sand, ceramics, metals
7	
1	and plaster. There two types of molds.
4	DOpen mold:
9	In this molten metal is poused directly in the
9	mold from it's open mouth.
4	
7	2) Closed mold:
7	In this molten metal is poused through an
4	opening (downspace/sunnex) that connects to the shape of
1	
1	material. There is a riser that compensates for shrinkage.
9	
4	After some time, the material cools down & is removed.
7	
1	Further processing may be required.
4	
0	Casting types:
9	
9	
7	1) Expandable casting:
7	In this, the mold must be sacrificed in
4	order to recover the material. Examples include sand casting.
1	Dieces is second in the indicate states and cashing
9	
9	2) Permanent casting:
4	In this, the mold is divided in two
7	
7	sections that open to recover the material. The mold
4	is made of metal, cexamic refactory material.
4	Examples include die casting.
1	
90	
9	
7	
1	

Subject:	//
Sand casting:	
. The mold consists of two parts: cope and drace is the upper portion of mold and the drag is the lower	1. The cope postion of
the mold. These are contained in box called flask.	
. The shape is created in the mold by pressing the	e shape made
of wood, plastic into the sand.	
. The pattern is made oversized to allow for e	hain kage of
metal.	
The internal pattern can be created by placing	g a cose in
the cavity.	
· molten metal is poused through an opening /sunnex) that connects to the shape of mate	(down-spaue
(sunner) that connects to the shape of mate	exial. These
is a rises that compensates for shrinkage of the	e metal as
94 cooks down.	
Puxe metals:	
A Burgled temb	
noted noted	
- Greates Comple	
Tempo local solidification asolid cools	
Temp local solidification 750	
Total solidification	
Time >	
Investment casting:	
. Maild created with wax.	
· Wax coated with ceramic.	
· Wax melted to get mold.	

4	
9	Subject:
2	Centeifugal cactinge
T	· Molten metal poused in sotating down at high speeds
9	to long pipes. The molten metal sticks to wall. The speed of sotation
4	affects thickness of final material.
7	
4	Allows
9	Alloys:
7	Most alloys freeze over a femp range rather than a engle temp
4	
4	Exp: 07
9	Tensile testing of Engineering materials
7	
4	
4	6 Yeld Gurs
9	
7	
T	necking)
9	The state of the s
4	
2	
4	UTS: Max strength that can be beared by a mat
9	Yeld: Elastic of plastic exist simultaneously.
7	·1Ductile & Necking1
T	Ly pure metals -> alloys-> ceramics
9	Strain Rate: 1mm/min
7	Englis Pale. Third in
7	<del></del>
4	Tensile strength st = $\frac{F_{max}}{A_0}$
9	
7	% € = <u>l-lo</u> x voo
T	lo lo
9	
7	$^{\prime\prime}A = A_0 - A$
1	/•11 — 150-11
4	<u>+\0</u>

4	Subject:
7	Exp:08
1	CRP:00
4	Hardness testing of engineering materials
1	
9	Hardness Test:
9	
4	La Resistance to deformation
7	
1	i) Brinell's test:
To	1) Dolliell'S 1est.
1	
1	Indenter: Hardened steel/tungsten carbide ball
9	· Load applied
4	
7	· Diametre of shape created measured. Hardness formulated
1	· Can't tell hardness of components.
To	
1	1101.1.1.1.1.
9	2) Vicker's test:
9	
7	Indenter: Diamond pyramid
1	· Load applied 3/ess required
1	· Length of shape created measured. Hardness formulated
9	
9	· Can tell hardness of components.
*	
7	3) Rockwell's test:
1	3) KOCKWE 113 1E51:
4	
1	Indentex: Otamond Cone/steel ball
9	· Load applied - Major & Minor. For breaking thin layer (10kg)
4	
7	· Length of shape created measure
1	· Can tell hardness of components.
\$	Scale lood Mark
4	A 60 Cone
7	B 100 sphere
4	
1	c 150. Core

0	9	Subject:
0	9	4) Nano Polentation:
9	9	For measuring hardness of thin film.
0	-	100 110001119
3	9	Exp:09
2	-	Impact testing of Engineering materials
0	0	Impact resting of cigineering materials
0	9	T 1 + 1 . 11- 1-001 P 1 21
0	9	Toughness: Impact absorbtion ability of a material.
	9	
0	2	Coitical temperature:
0	9	Temperature at which a material becomes
0	9	brittle from ductile.
0	9	
9	9	Toughness x brittle.
0	-	
0	9	If fracture I yield point are done then material
0	9	is brittle otherwise ductile.
0	9	10 Por 1190 0 11 1000 0 100 100 100 100 100 10
0	•	leinfoxement:
0	-	
2	9	1) Whisker bridging
5	2	2) Frbre
2	9	3) (heart bridging
0	9	TC 1 - 1 - 1
0	9	· If exack is along grain boundaries then material is
3	9	ductile.
0	9	If across, then brittle.
0	9	
9	9	Two common types of testing:
0	9	· A notch is made to create stress concentrated region. To make sure that
3	9	materials are tested along a standard.
0	9	

•	
1	Subject:
1	s Charpy testing:
0	JOHNOP JESHI -
1	
7.	· Sample is horizontally placed.
1	
7	For metals used in constructions
7	
7	
7	2) Izod testing:
7	
7	
7	· Sample is vextically object.
7	To be a simple of the same of
7	· Sample is vestically placed.  For plastics & wimposites.
7	
7	G 1h
4	Exp 10:
7	Atomic force microscopy
4	THOMAS TODGE THESE SUPY
4	
4	Tells topography of a material.
4	icis istabatis of a marcolate
4	
4	.) Contact mode:
4	<u> </u>
4	
4	. The tip is in continues contact with
4	
4	matexial.
4	. The force is kept worstant adjusting
4	The loce is nept wistain as as my
4	height.
4	
4	
9	2) Tapping mode:
4	
4	
4	Top is tapping on material.
4	7
1	The amplitude is kept constant
0	
0	11/2 1
0	3) Non-untact mode:
1	
1	To 1
0	· Tip houses over sample

4		
K	•	Subject:
D	9	. The interaction of forces changes tip's oscillation frequency
4	9	miles of indicate
4	9	ox amplitude.
9	•	
X	•	4) Force modulation:
X		
K	•	
D	9	·Tip occilates at a certain frequency
$\triangleleft$	•	· Changes in amplitude of phase of oscillation tells
4	•	about stiffness & adhesion foxes.
9	•	about stilliess a dollesion toxces.
4	•	
K		Exp 11:
K	•	X-ray diffraction
1	•	1 seg Girioserior
4	9	
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