

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME365	Advanced Metal Casting	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives <ul style="list-style-type: none"> To gain theoretical and practical knowledge in material casting processes To develops an understanding of the dependent and independent variables which control materials casting in a production processes. To impart knowledge on design of gating system for castings To know foundry practice of ferrous and non ferrous alloys 			
Syllabus Functional requirements of molding materials, gating - type of gating- gating design- factor involved in gating design, risers – primary function of a riser-theoretical consideration-riser design and placement, solidification, heat transfer during solidification, heat flow in solidification, ferrous and non-ferrous foundry practice, steel casting, aluminum and its alloys, magnesium and its alloys, casting design, defects and testing.			
Expected outcome: <ul style="list-style-type: none"> The students will have exposed to the different areas of foundry practices, gained idea about metal casting, scope and its applications. 			
Text Books/References <ol style="list-style-type: none"> A.K.Chakrabarti, Casting Technology and Cast Alloys, Prentice –Hall Of India Ltd, 2005 Beely, Foundry Technology, Newnes-Butterworths, 1979 Gruzleski, The Treatment of Liquid Aluminum-Silicon Alloys, the American Foundrymen’s Society Inc, USA, 1992 Heine, Loper and Rosenthal, Principle of Metal Casting, 2nd Edition, Tata Mc-Graw-Hill Publishing Company Limited, New Delhi, 1978 John Cambell, Casting, Butterworth-Heineman Ltd, Jordon Hill, Oxford, 1991 T.V.Rama Rao, Metal casting Principles and Practice, New Age International,2010 Gruzleski, The Treatment of Liquid Aluminum-Silicon Alloys, the American Foundrymen’s Society Inc, USA, 1992. 			
Course Plan			
Module	Contents	Hours	End Sem. Exam. Marks
I	Design of molds Functional requirements of molding materials, type of sands Properties of molding sand, sand testing techniques Effect of molding on sand properties,	2	15%

	Bonding material	1	
	Mould surface coating	1	
	Sand design and control	1	
	Thermal aspect of molding sand, mould wall movement	1	
II	Pouring and feeding Gating - type of gating- gating design	1	15%
	Factor involved in gating design-illustrative problems in determination of filling time and discharge rate	1	
	Aspiration effect- effects of friction and velocity distribution	1	
	Risers – primary function of a riser Theoretical consideration Riser design and placement Determination of dimensions of rise- blind risers	2	
	Internal risers-use of chills Use of insulators and exothermic compounds	1	
FIRST INTERNAL EXAMINATION			
III	Solidification		15%
	Freezing of pure metal Skin effects- nucleation and growth	1	
	Shrinkage- freezing of alloys	1	
	Effect of mould materials and alloy composition on casting	1	
	Fluidity- factor affecting fluidity- fluidity measurement and application of fluidity	1	
	Gases in metals- degassing	1	
	Grain refinement	1	
Illustrative problems related to determination of solidification time	1		
IV	Heat transfer during solidification		15%
	Methods of manipulating heat transfer	1	
	Experimental methods for the study of heat transfer during solidification		
	Crystal growth methods	1	
	Heat flow in solidification	1	
	Heat transfer with in the solid/liquid metal system	1	
	Heat transfer at the metal-mould interface	1	
	Heat flow in one dimensional solidification geometries	1	
	Freezing at mould wall	1	
Rapid freezing in contact with a cold substrate with initial melt super cooling	1		
SECOND INTERNAL EXAMINATION			
V	Ferrous and non ferrous castings Steel Casting – The family of cast iron	1	20%
	Melting of steels and cast irons–Grey iron Foundry practice – ductile iron – Malleable Iron casting	1	

	design		
	Aluminum and its alloys: Different Aluminum alloy systems Advantage and limitation of Aluminum alloy castings	1	
	Molding for aluminum castings - melting of Aluminum- degassing- grain refinement	1	
	Modification- effect of various melt treatment on the mechanical properties of Aluminum castings.	1	
	Magnesium and its alloys: different alloy systems- advantage and limitation of Magnesium alloy castings Molding for magnesium casting- melting of Magnesium- flux and flux less melting	1	
	Type and functions of fluxes used- degassing and grain refinement- pouring technique	1	
	Copper alloys: advantage of Copper alloys- melting- drossing-oxygen and hydrogen in Copper melting- control of gases- de oxidation	1	
V1	Casting defects and testing		20%
	Functional design- metallurgical design	1	
	simplification of foundry practice- economic considerations	1	
	design of junction- specification of castings	1	
	inspection of castings- analysis of casting defects	1	
	nondestructive testing of casting- dye penetrant testing	1	
	magnetic flaw detection, radiography, ultrasonic testing, etc.	1	
quality control and quality assurance	1		
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100

Time: 3 hrs

The question paper should consist of three parts

Part A

There should be 2 questions each from module I and II

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

There should be 2 questions each from module III and IV

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

There should be 3 questions each from module V and VI

Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.

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