GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3162106
Semester – VI
Subject Name: Foundry Technology

Type of course: Science & Engineering

Prerequisite: Basic knowledge of materials engineering and science skill

Rationale: Metallurgical Engineers need to know different types of foundry processes for the production of an intricate part in combination with the accuracy, tolerance & surface finish. The hands-on skill as regards to Foundry Technology is must be it at a scale of mass, batch, or unit production. The present course focuses on giving the exposure of various Foundry processes for a product whose scale ranges from miniature to extra-large, molding and coring practice, melting inoculation practices, quality control of the casting. This course will help Metallurgical engineer to understand the basic underlying principles in various casting processes & apply his/her knowledge in the field of metal casting.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hours
1	**Module 1:** Introduction to metal casting and foundry industry in a modern industrial scenario. Advantages and limitations of casting methods. Classification of foundries. Different sections in a foundry and their functions. Important cast metals and alloys-their composition, properties, and uses.	**4**
2	**Module 2:** Patterns: Types of patterns, brief classification of pattern-making materials, consideration in the selection of pattern materials, color coding, pattern allowances, core boxes, types of core boxes.	**4**
3	**Module 3:** Moulding and core making: ingredients of the common type of molding and core making sands, their properties and behavior, testing of sands, and clay. **(Laboratory)** Classification of molding processes and casting processes, a brief description of all processes such as green sand dry sand, loam sand floor, pit, and machine molding	**6**
4	**Module 4:** Thermodynamics of solidification, Nucleation, and growth, undercooling, dendritic growth, the structure of castings and ingots	**4**
5	**Module 5:** Metal mold casting, melting practice, gating, and risering, An overview of CAD-CAM for foundry practices. Introduction to heat treatment of cast products.	**8**
6	**Module 6:** Casting defects and quality control	**2**
	Total	**28**

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**15**	**05**	**00**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Reference Books:

1. Principles of Metal Casting, R. W. Heine, C. R. Loper, and P. C. Rosenthal, (Tata McGraw Hill)
2. Principles of Foundry Technology, P. L. Jain, (Tata McGraw Hill).
3. Fundamentals of Metal Casting Technology, P. C. Mukherjee, (Oxford & IBH)
4. Foundry Technology, P. R. Beeley
5. Foundry Engineering, H. F. Taylor, M. C. Flemings,(Wiley Eastern)
6. Foundry Technology, D. Kumar & S. K. Jain, (CBS Pub.) Semiconductor Materials, Devices, and Fabrication, Parasuraman Swaminathan, Wiley 2017.

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	To compare the foundry process with other manufacturing processes.	**40**
CO-2	To understand the basics of the foundry.	**35**
CO-3	To select the suitable casting process for defect-free engineered cast products.	**25**

List of Experiments:

1. The scenario of Indian foundries and classification of the foundry.
2. To determine AFS fineness no. and distribution coefficient of a given sand sample.
3. To study the different molding practices and prepare the sand mold of a sand sample.
4. To determine the clay content of a given sand sample.
5. To prepare standard samples by using a sand rammer for the determination of various physical properties of foundry sand.
6. To calculate the elements of the gating system for given casting.
7. To demonstrate melting, casting of a given metal.
8. To identify the casting defects and their remedies.
9. To perform the heat treatment of the prepared casting sample.
10. To determine the microstructure-property relationship of as-cast and heat-treated samples.
11. Industrial Visit.

Major Equipment:

1. Mechanical Sieve shaker with a sieve set
2. Weighing balance
3. Sand Muller
4. Clay washer
5. Sand rammer
6. Centrifugal casting machine
7. Universal Strength Machine
8. Shatter Index Tester.
9. Permeability meter
10. Rapid Moisture teller.
11. Core hardness tester
12. Mould hardness tester
13. Resistance Melting Furnace
14. Muffle Furnace
15. Metallurgical Microscopes
16. Microhardness Tester

List of Open Source Software/learning website:

1. http://nptel.iitm.ac.in/
2. www.ocw.mit.edu