GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (PRODUCTION ENGINEERING) (28)

ADVANCE CASTING TECHNOLOGY

SUBJECT CODE: 2712801

SEMESTER: I

Type of course: Production Engineering (Core I)

Prerequisite: Nil

Rationale: This course provides the knowledge and practice regarding different Foundry processes and their industrial importance. Also focused on efficient design of casting runner, riser and gating system with minimal casting defects and solidification process

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Casting Processes, classification, characteristics of sand casting processes, metal mould casting processes and casting processes using other mould/core materials, Pattern materials, types of patterns, Mould and core making materials and their characteristics.	7	16
2	Technology of Selected Casting Processes, clay bonded, oil bonded, synthetic resin bonded, inorganic material bonded mould and core making processes. Sand additives and mould coatings. Metal mould casting processes, centrifugal and continuous casting processes.	7	16
3	Casting for heterogeneous materials-FRP, quick casting , full mould casting, evaporative pattern casting	6	15
4	Solidification, Gating and Risering design & analysis, Nucleation and grain growth, Solidification of pure metals, short and long freezing range alloys. Rate of solidification, macrostructure and microstructure. Solidification contraction; Fluidity and its measurement. Mould-metal interface reactions	10	24
5	Melting and quality control of various steels and non-ferrous alloys - casting defects - fettling, inspection and testing of castings	6	15
6	Design for castability-process friendly design, castability analysis and collaborative engineering	6	15

Reference Books:

1. ScropeKalpakjian,, “Manufacturing processes for Engineering Materials”, Addision, Wesley, 1997.
2. Fundamentals of metal casting technology - P.C. Mukherjee, Oxford and IBH.
3. Mechanical Metallurgy, Dieter, Me Graw Hill, Kogakusha
4. Casting properties of metals and alloys - V. Korolkove.

5. Metal casting-B.Ravi-PHI

Course Outcome:

After learning the course the students should be able to:

1. understand the casting systems fundamentally
2. design the gating and riser design & analyze the metallurgical aspects of the solidified metals,
3. Performing Inspection and Testing of Different Castings
4. Design for castability-process friendly design
5. To Find out Practice on Casting Defects on Product

List of Experiments:

1. To Study about Metal mould casting
2. To Study about Continuous casting
3. To Study about Squeeze casting
4. To Study about Vacuum mould casting
5. To Study about Evaporative pattern casting
6. To Study about Ceramic shell casting

Open Ended Problems:

1. High Temperature Super alloy Prototype Castings Substitute for Forgings
2. E-Technology used to Optimize Product Design and Reduce Inventory Levels in casting industries

Major Equipments:

1) Ferrous Foundry
2) Foundry Equipments
3) Pattern Makers

List of Open Source Software/learning website:

1. PRO- CAST DESIGN SOFTWARE

2. Free online learning resources in Casting Design and Simulation:
   http://efoundry.iitb.ac.in/Academy/index.jsp