

Subject Code: 01ME0703
Subject Name: Rapid Casting – 1
B. Tech. Year - III (Semester - 7)

Type of course : Under Graduate

Prerequisite : Manufacturing Process, Computer aided Manufacturing

Rationale : The course aims to impart skills required in pattern making and mold making for metal casting

Course Outcome :

After learning the course, the students will be competent

1. To calculation of pattern allowances applicable for different material.
2. To choose pattern making using different methods.
3. To Analyze moulding process for metal casting.
4. To Analyze filling and feeding system for metal casting

Teaching and Examination Scheme :

Teaching Scheme			Credits C	Examination Marks					Total Marks
Theory	Tutorial	Practical		Theory Marks			Practical Marks		
				ESE(E)	IA	CSE	Viva (V)	Term Work (TW)	
2	0	4	4	50	30	20	25	25	150

Content :

Sr. No.	Content	Total Hrs
1	Pattern Making and Design Types of pattern, allowances for patterns, pattern materials (metal, wood, plastic, thermocol, etc.) pattern making methodologies (Machining, and 3D printing), Use of VMC in pattern making, specification of VMC machine, control of VMC machine, Introduction of G codes/ M codes used in VMC; Introduction of parametric programming. Types of 3D printing technologies, applications of 3D Printing technology in pattern making, use of 3D printer in pattern making, specification of 3D printing machine, working of 3D printing machine.	15
2	Moulding Process Design Types of sand used in metal casting, sand testing, properties of sand, types of molds, core making, design consideration in core making, Design considering in mold making	08
3	Pouring and Feeding Feeder/riser design, optimum cavity layout, different feed aids, effect of feed aids on metal casting. Types of furnace, calculation on heat required for melting, design of furnace (Resistance heating furnace), comparison of various furnaces for efficiency on melting, Methods of pouring: manual, semi-automatic, automatic pouring, effect of different pouring methods on quality of casting, gating system design	06

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E` Level	C Level
10	20	25	25	10	10

Legends: R: Remember; U: Understand; A: Apply; N: Analyze; E: Evaluate; C: Create

List of Experiments :

1. Study of different types of pattern materials used in metal casting
2. Pattern making using 3D Printer and CNC Router (Modeling of pattern will be part of assignment)
3. Study of different types of sand used in metal casting
4. Sieve analysis and Permeability test of sand used in metal casting.
5. Design of feeder for sand casting
6. Design of filling system for sand casting
7. Mold making using 2 parts and 3 parts binder system
8. Demonstration of 3D scanner and its application in metal casting
9. Study of advanced techniques in pattern making

List of Assignment :

1. Moulding Process Design
2. Pouring and Feeding
3. Pattern Making and Design
4. 3D Printing Process fundamental.

Major Equipment :

1. 3D Scanner
2. 3D Printer
3. VMC Engrave Machine
4. Induction Furnace
5. Sieve Shaker
6. Permeability tester.

Reference books :

- 1 Joan Horvath (auth.) - Mastering 3D Printing-Apress (2014)
- 2 D.T. Pham and S.S Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping & Rapid Tooling, Springer, 2001.
- 3 Peter Hilton and Paul F Jacobs, Rapid Tooling Technologies and Industrial Applications, Marcel Dekker Inc, New York, 2001
- 4 Wanlong Wang, Henry W. Stoll and James G. Conley, Rapid Tooling Guidelines for Sand Casting, Springer, 2010.
- 5 Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific.
- 6 Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer.

- 7 Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons.
- 8 Hilton P, Jacobs P F, Rapid Tooling: Technologies and Industrial Applications, CRC press.
- 9 RafiqNoorani - 3D Printing_ Technology, Applications, and Selection-CRC Press (2017)
- 10 Metal casting-B.Ravi-PHI
- 11 PRINCIPLES OF METAL CASTING 2nd Edition by Richard W. Heine,,CarlLoper,Philip c Rosenthal
- 12 Manufacturing Science 2nd Edition Ghose and Mallik

List of Open Base Software/learning website :

1. <https://nptel.ac.in/courses/112104195/30>
2. <https://nptel.ac.in/courses/112102103/16>
3. <https://nptel.ac.in/courses/112107258/>
4. <https://www.autodesk.com/products/fusion-360/students-teachers->