22ME205 MANUFACTURING SCIENCES

Source: https://www.thomasnet.com/articles/custom-manufacturing-fabricating/types-of-casting-processes/

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Workshop Technology .

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the concepts of casting technology, metal forming operations, metal joining techniques and 3D printing techniques. The objective of this course is to make the students understand and perform conventional and advanced primary shaping processes.

MODULE-1

UNIT-1 **6L+0T+6P=12 Hours**

CASTING:

Introduction: Casting -Scope, steps in casting, pattern materials and types, methods in casting process, solidification, introduction to special casting process, furnaces used for melting.

UNIT-2 **10L+0T+10P=20 Hours**

Casting: Pattern allowances, elements and design of gating system, design of pattern, practice on metal casting: Investment casting, die casting, centrifugal casting, shell molding, continuous casting, stir casting, metal melting - cupola, electric resistance furnace, crucible furnaces. casting defects and inspection, analysis of melting, pouring and solidification phenomenon.

PRACTICES:

- To design pattern using Auto Cad and fabricate physical model.
- To prepare a sand mould and cast product.
- To prepare sand mould and cast alloy product using Stir-Casting Technique.
- To design a Riser and Gating system for sand moulding.
- To Determine the sand properties of the given sand mould.

MODULE-2

UNIT-1 **6L+0T+6P=12 Hours**

Metal Forming Process: Forming-scope, hot, cold, and warm working, introduction to bulk and sheet metal forming; rolling, forging, extrusion, wire drawing.

Welding: Welding-scope, classification, fundamental of welding, heat affected zone, basics of additive manufacturing and classification.

UNIT-2 **10L+0T+10P=20 Hours**

Metal Forming Process: Rolling, forging.

Welding: Manual metal arc welding, submerged arc welding; TIG and MIG welding, thermit welding, resistance welding, welding metallurgy and its effect on performance of weldments, residual stresses and distortion of weldments weld joint design, cooling rate and joint properties, and calculations, welding defects and inspection.

3D Printing: Introduction, Application of FDM for preparation of various shapes.

SKILLS:

- ✓ *Use and evaluate various manufacturing techniques.*
- ✓ *Design and analysis of various patterns, risers, and gating system.*
- ✓ *Operate various welding and casting equipment.*
- ✓ *Develop CAD models for printing the objects using rapid prototype technologies.*

PRACTICES:

- To perform Butt joint using Arc welding and testing of hardness of weldment.
- To perform Butt joint using Gas welding and testing of hardness of weldment.
- To perform Soldering and Brazing operations.
- To perform spot and projection welding for sheet metal joining.
- To perform blanking and piercing using compound and progressive dies.
- To execute RPT program and fabricate product using FDM.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Implement the concept of basic manufacturing science.	Apply	1	1, 2, 12
2	Evaluate and prepare various elements in conventional and special casting techniques.	Evaluate	1	1, 2, 5, 12
3	Explain capabilities and applications of bulk metal forming processes and sheet metal work.	Analyze	2	1, 2, 3, 5, 12
4	Acquire knowledge about various fabrication techniques.	Analyze	2	1, 2, 12
5	Create various prototypes using rapid prototype technology.	Analyze	2	1, 2

TEXT BOOKS:

1. Serope Kalpak Jian, “Manufacturing Processes for Engineering Materials”, Pearson 6th Edition, 2018.
2. G. S. Sawhney, “Manufacturing Science”, Dreamtech Press, WILEY, Vol I, 2019.

REFERENCE BOOKS:

1. Richard L.Little, “Welding & Welding Technology”, Tata Mc Graw Hill, 1st Edition, 2017.
2. E. PaulDeGarmo, J.T.Black, Ronald A.Khoser, “Materials and Processes in Manufacturing”, Wiley, 9th Edition, 2002.
3. P.N.Rao, “Manufacturing Technology”, Tata Mc Graw Hill, 5th Edition, 2018.