GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**CASTING DESIGN AND SIMULATION**
Course Code	ME/2020/038
Course Duration	80 Hours
Minimum Eligibility Criteria	ITI/10th/+2/Diploma/Graduates
Pre-requisites (if any)	-
Objectives	The Training module has been designed to provide the participants to • Understand the basics of design, development, modeling and simulation • Understand the various components of gating and risering systems • Gain knowledge on Part modeling and geometry analysis • Knowledge of Core print design and Mould cavity layout • Understand the Feeder design and solidification simulation • Get knowledge of Gating design and mould filling simulation • Give hands on practice on Modeling and Simulation of Casting iron, Steels, aluminum and non ferrous metals.
Training Outcomes	At the end of training, the trainees will be able to • Design the components of gating system using simulation software • Simulate the casting components of various metals such as Cast iron, Steel and non-ferrous metals • Describe the various concept of Manufacturing, safety process and handling of Personal protective equipments • Enumerate the types of pattern making techniques • Choose the suitable process for core making and mould making • Apply the correct melting equipment and process • Select the appropriate post casting process for achieved desired quality
Expected Job Roles	This role is to design and develop the casting component of all types of metals like ferrous or non-ferrous with the given customer requirements.

TEACHING AND SCHEME OF EXAMINATION

Course code	**Course**	**Hours**		**Assessment Marks**		**Duration of Examination**
				Min	**Max**	
ME/2020/038	**CASTING DESIGN AND SIMULATION**	Theory	20	10	20	4 Hours
		Practical	60	40	80	
		Total	80	50	100	

ME/2020/038 - CASTING DESIGN AND SIMULATION

DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	**Basics of Casting Design - Theory**	**20 Hours**	
	Gating System - Requirements, pouring basin, sprue and runners. Types of gating system - Top, bottom and parting gating systems. Risering of Castings: Need for Risers - Basic Requirements of a Feeding System for a Casting - Description of Riser Shape, Types of Risers, Location of the Rise.	20	-
II	**Casting Design and Simulation – Practical**	**60 Hours**	
2.1	Introduction of Design, development and Modeling	-	60
2.2	Part modeling and geometry analysis: New casting project and layouts, inputs – model, material, process, mould and mesh, display layout and controls, part properties, thickness and radiography, identifying cored holes		
2.3	Core print design and Mould cavity layout: casting orientation and parting, core print design, plugging drilled hole, mould cavity layout and optimization		
2.4	Feeder design and solidification simulation: Feeder location, design & modeling, Feed aids - Sleeves, chills, padding & vents, importing feeder and sleeve models.		
2.5	Gating design and mould filling simulation: gating layout and design, mould filling simulation, results, gating design optimization.		
2.6	Modeling and Simulation of Simple part models for CI – 300, Al – 222 and Steel metals.		
2.7	Modeling and Simulation of sand casting for Cast Iron		
2.8	Modeling and Simulation of sand casting for steel		
2.9	Modeling and simulation of Non ferrous metal – Aluminium Alloy in GDC process		
2.10	Modeling and simulation of Non ferrous metal – other alloys – in investment casting process.		
	Total Theory and Practical hours	**20**	**60**
	Total hours	**80**	

HARDWARE REQUIREMENTS

S. NO.	LIST OF TOOLS /EQUIPMENTS
1	Computers
2	LAN connectivity

SOFTWARE REQUIREMENT

Any one of the software's:

AutoCAST, SOLIDCast, FLOWCast and OPTICast, ProCAST, CastCAE, CAPCAS, Flow-3D **Cast**, MAGMASoft, and Nova- Solid/Flow

REFERENCE BOOKS

S. No.	Name of the Book	Author	Publisher & Year
1	Principles of Foundry Technology	Jain P L	Tata McGraw Hill Publishing Company Ltd., 2017
2	Metal Casting – Computer-Aided Design and Analysis	Ravi B	PHI Learning Private Ltd., 2015.
3	Metal Casting Principles and Practice	Ramana Rao T V	New Age International Pvt. Ltd. Publishers, 2017
4	Casting Technology and Cast Alloys	Chakrabarti A K	Prentice Hall of India, 2016

ASSESSMENT AND CERTIFICATION

S. No.	Criteria for Assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training, Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max.Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Aim and Procedure	20
	b)Demonstration / Execution	25
	c) Result & Viva Voce	15
	d)Record	20
	Total Marks	**100**

THEORY MODEL QUESTION PAPER

ME/2020/038 - CASTING DESIGN AND SIMULATION

(Maximum Marks: 20)

(N.B: Answer any **Twenty** questions) **20x1= 20 Marks**

1. List various tooling features in sand castings.
2. Write two advantages of solid modeling techniques.
3. Write two limitations of solid modeling techniques.
4. List various test conducted on moulding sand.
5. Write different types of blow holes.
6. What is the purpose of runner extension?
7. State the types of gas porosity.
8. Differentiate between cold shut and misrun.
9. What are the different ways to control ingate velocity?
10. What are the main considerations in selecting a suitable casting process for a given product?
11. List the parameters that affect solidification time.
12. What is difference between an external and internal chill?
13. Write the advantages of top feeders.
14. List the advantages of side feeders.
15. Write the limitations of top and side feeder.
16. What is the ideal shape of maximizing feeding efficiency?
17. Define optimal filling time.
18. What are advantages of vertical gating system?
19. What are advantages of horizontal gating system?
20. Define macro shrinkage.
21. Compare the boundary conditions for analyzing castling solidification in green sand mould with shell mould.
22. Write two parameters in yield calculation.
23. What are advantages of gravity die casting?
24. Write two points about pressure die casting.
25. What is the difference between a base feature and local feature in casting model?