



GOVERNMENT OF TAMILNADU
DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI
STATE PROJECT COORDINATION UNIT
(Established under Canada India Institutional Cooperation Project)
CURRICULUM

Course Name	RAPID PROTOTYPING AND MANUFACTURING
Course Code	ME/2020/039
Course Duration	100 Hours
Minimum Eligibility Criteria/	ITI/10th/+2/Diploma/Graduates
Pre-requisites (if any)	-
Course Objectives	<p>Training module has been designed to provide the participants to</p> <ul style="list-style-type: none"> • Gain Knowledge on different rapid proto typing systems and its application • Understand the techniques used for processing CAD models in RPT • Understand and apply the fundamentals of RPT techniques • Study the various materials used in RPT • Learn the fundamentals of reverse engineering
Course Outcomes	<p>At the end of training, the trainees will be able to</p> <ul style="list-style-type: none"> • Describe the various rapid prototyping machines and its principles • Import and convert the drawing models into working models • Choose the suitable materials for suitable process in RPT • Create physical model using RPT • Use reverse engineering techniques in rapid prototyping
Expected Job Roles	3D Printing and Processing Industries

TEACHING AND SCHEME OF ASSESSMENT						
Course Code	Course Name	Hours		Assessment Marks		Duration of the Examination
				Min	Max	
ME/2020/039	RAPID PROTOTYPING AND MANUFACTURING	Theory	40	10	20	3 Hours
		Practical	60	40	80	
		Total	100	50	100	

ME/2020/039 - RAPID PROTOTYPING AND MANUFACTURING
DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	INTRODUCTION AND HISTORY OF RP SYSTEMS	20 Hours	
1.1	Need for time compression in product development,	08	
1.2	Product development -conceptual design -development -detail design -prototype -tooling.		
1.3	Survey of application growth of RP industry, classification of RP systems.		
1.4	Practical: <ul style="list-style-type: none"> ➤ CAD modeling techniques in RPT ➤ Generating STL files from the CAD models and working on STL files ➤ Processing the CAD data in software - Selection of orientation ➤ Supports and Generation ➤ Slicing and tool path generation 		12
II	STEREO -LITHOGRAPHY SYSTEMS AND SELECTIVE LASER SINTERING	20 Hours	
2.1	Principle, process parameters, process details	08	
2.2	Data preparation, data files and machine details -application.		
2.3	Types of machines, principle of operation, process parameters, data preparation for SLS and application.		
2.4	Practical: <ul style="list-style-type: none"> ➤ Create the model using SLS ➤ Case Study – Process parameters 		12
III	FUSION DEPOSITION MODELLING AND SOLID GROUND CURING	20 Hours	
3.1	Principle, process parameters -path generation, application.	08	
3.2	Application of Rapid prototyping in Medical field.-		
3.3	Solid ground curing a) Principle of operation, machine details application		
3.4	b) 3D Printers : 3 -Dimensional printers -principles -process -parameters - process details -machine details, applications		
3.5	Practical: <ul style="list-style-type: none"> ➤ Fabricating the physical model on a FDM machine ➤ Demonstrate the three dimensional printing process 		12
IV	LAMINATED OBJECT MANUFACTURING AND SOFTWARE FOR RP	20 Hours	
4.1	Principle of operation, LOM materials, process details and application.	08	
4.2	Software for RP - List of Software used for various Rp machines -STL files, magic's, mimics.		

4.3	Practical: <ul style="list-style-type: none"> ➤ Demonstrate the laminated object manufacturing process with supportive elements ➤ Demonstrate the laminated object manufacturing process without supportive elements 		12
V	RAPID TOOLING AND REVERSE ENGINEERING CONCEPTS	20 Hours	
5.1	Indirect rapid tooling -Silicone rubber tooling.	08	
5.2	Direct rapid tooling -DMILS, Sand Casting tooling, laminate tooling.		
5.3	Vacuum casting techniques, process details -materials -applications.		
5.4	Reverse engineering concepts- Direct methods, Indirect methods - surface digitizing, Surface generation from point cloud, Surface modification, Data Transfer to Solid models.		
	Practical: <ul style="list-style-type: none"> ➤ Prepare a model using vacuum casting ➤ Demonstration the measurement of given part model using CMM 		12
Total Theory and Practical hours		40	60
Total hours		100	

HARDWARE REQUIREMENT

S. No.	LIST OF EQUIPMENTS
1	Selective Laser Sintering Machine
2	Fused Deposition Modeling
3	Stereo lithography
4	Laminated Object Manufacturing
5	3D Printer
6	Vacuum Moulding

SOFTWARE REQUIREMENT

S. No.	LIST OF SOFTWARE
1	AutocCAD
2	Pro-E
3	CATIA
4	Solidworks

REFERENCE BOOKS

S. NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Stereo lithography and other Rp & M Technologies	Paul F Jacobs	SME, Newyork
2	Rapid Manufacturing	Pham D T and Dimor S S	Verlag, London
3	Rapid Prototyping: Principles and Applications	Chu C K, Leong K F, Lin C S	World Scientific Publishers
4	3d Printing And Additive Manufacturing: Principles And Applications	Chu C K, Leong K F, Lin C S	World Scientific Publishers
5	Rapid Prototyping: Theory and Practice	Ali K. Kamrani, Emad Abouel Nasr	Springer Science & Business Media

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/2020/39 - RAPID PROTOTYPING AND MANUFACTURING

(Maximum Marks: 20)

(N.B: Answer any **Twenty** questions)

20x1= 20 Marks

1. What is rapid prototyping?
2. Write any two advantages of rapid prototyping.
3. What is the need of rapid prototyping?
4. Write the applications of rapid prototyping.
5. Define stereo lithography.
6. Write the process parameters of stereo lithography.
7. Write any two advantages of stereo lithography.
8. What is selective laser sintering?
9. What is the power source (heat source) used to heat-up the material in SLS?
10. Write the process details of selective laser sintering
11. List the application areas of selective laser sintering.
12. Write any two specification of SLS Machine.
13. What is fusion deposition modeling?
14. Write any two advantages of fusion deposition modeling.
15. List the application areas of fusion deposition modeling.
16. What is the meaning of the term fusion?
17. What is solid ground curing?
18. State the steps involved in producing a part by solid base curing.
19. List the applications of the solid ground curing.
20. What is meant by the term curing?
21. What is laminated object manufacturing?
22. What is the material used to form a prototype in LOM process?
23. Define rapid tooling.
24. Write short notes on indirect rapid tooling.
25. Write a short note on STL files.
26. Write short notes on influence of building orientation.