

Program Code: ET201	
Subject Code: 1ET2010205	Subject Title: RAPID PROTOTYPING AND TOOLING (Elective-II)
Pre-requisite Subject	Zeal to learn the subject.

Course Objective: This course provides knowledge in the areas of Industrial metallurgy, advanced materials and selection of materials for industrial applications.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	2	4	60	40	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
01	Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain and applications.	04	16
02	Methods for Rapid Tool Production: Process Technology, Basic concept & process detail of RP process like Stereolithography (SL), Solid foil polymerization, Selective laser sintering, Selective powder binding, Ballistic particle manufacturing both 2D and 3D, Fused Deposition Modelling, Shape Melting, Laminated Object Manufacturing, Solid Ground Curing, Repetitive Masking and deposition, Beam Inference Solidification, Holographic Interference Solidification.	07	28
03	CAD Modelling and Data Processing for RP: CAD model preparation, Data Requirements, Data formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.	06	24
04	Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling methods, Soft and Hard Tooling methods.	04	16
05	Reverse Engineering: Basic concept, Digitization techniques, Model Reconstruction, Data Processing for Rapid Prototyping, Reverse Engineering (RE) Methodologies and Techniques, Selection of RE systems, RE software, RE hardware, RE in product development.	04	16

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.

Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (5) ieeexplore.ieee.org (6) scholar.google.co.in or others of similar repute.

Course Outcome:

The students will be able to:

1. Understand and use techniques for processing of CAD models for rapid prototyping.
2. Understand and apply fundamentals of rapid prototyping techniques.
3. Use appropriate tooling for rapid prototyping process.
4. Use rapid prototyping techniques for reverse engineering.

List of Experiments:

1. Review of CAD Modeling Techniques and Introduction to RP
2. Generating STL files from the CAD Models & Working on STL files
3. Processing the CAD data in Catalyst software (Selection of Orientation, Supports generation, Slicing, Tool path generation)
4. Simulation in Catalyst Software.
5. Fabricating the physical part on a RP machine.
6. Learning techniques for fabricating an assembly.
7. Prepare a CAD model with complex geometry and study effect of slicing parameters on final product manufactured through RP.

List of References:

1. Paul F. Jacobs, Rapid prototyping & Manufacturing Fundamental of sterolithography, SME Publications
2. Amitabh Ghosh, Rapid Prototyping, East West Press Pvt. Ltd
3. Chua C. K., Leong K. F. and Lim C. S., Rapid Prototyping, Principles and Application, World scientific publishing Co. Pvt. Ltd., Singapore
4. Andreas gebhardt, Rapid prototyping, Hanser gardner publications, USA
5. Kenneth g. cooper, Rapid prototyping technology.
6. Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons.