



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Mechanical Engineering)

Semester: VII

Course Code: 202090704

Course Title: Rapid Prototyping

Course Group: Professional Elective Course - III

Course Objectives: The main objective of this course is to understand that in recent era, producing new products faster to remain competitive in this fast-moving modern-day consumer market, since faster product development and technology innovation are vital to a company's success, rapid prototyping becomes the most crucial element of new product development as it offers fast fabrication of physical part from CAD data.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25 / 9	25 / 9	150 / 53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction: History of RP, Need of RP in context of modern production methods, Traditional Prototyping Vs Rapid Prototyping (RP), Classification of Rapid Prototyping Processes	6
2	Pre-processing in RP: CAD File Preparation, Conversion of Part File to STL File (Binary/ASCII), STL File Problems, Importance of Part Orientation & Support Structure, Slicing strategies	5
3	Liquid based systems: Stereolithography Process (SLA), Solid ground curing (SGC), Solid Object Ultraviolet-Laser Printer (SOUP), Rapid Freeze Prototyping	8
4	Solid based systems: Laminated object manufacturing (LOM), Fused Deposition Modeling (FDM), Paper Lamination Technology (PLT), Multi-Jet Modelling System (MMM), Melted Extrusion Modelling (MEM), Ultrasonic Consolidation	8



5	Powder Based Systems: Selective laser sintering (SLS), Three-dimensional printing (3DP), Laser Engineered Net Shaping (LENS), Electron Beam Melting (EBM), Direct laser deposition (DLD)	8
6	Post-processing in RP Processes: Accuracy issues in RP, Strength issues of RP Parts, Surface roughness problem in RP, Support material removal, Part building errors in different RP processes	4
7	Rapid Prototyping Applications: Rapid Tooling, Reverse Engineering, Design, Engineering Analysis and planning applications, Medical Applications of RP, Forensic Science and Anthropology, Aerospace Industry, Automotive Industry etc.	6
Total		45

List of Practicals / Tutorials:

1	Introduction to Rapid Prototyping
2	Cad modelling of mechanical component
3	STL file conversion
4	Processing the CAD Data in slicing software (CURA – Free slicing software)
5	Study Various Liquid Based RP Processes
6	Study Various Solid Based RP Processes
7	Study Various Powder Based RP Processes
8	Post-Processing issues in RP
9	Reverse Engineering
10	Applications of Rapid Prototyping Processes with Case Study

Reference Books:

1	Rapid Prototyping: Principles and Applications in Manufacturing, Chua C K, Leong K F, Chu S L, World Scientific.
2	Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Gibson D W Rosen, Brent Stucker., Springer.
3	Rapid Prototyping: Principles and Applications in Manufacturing, Noorani R, John Wiley & Sons.
4	Rapid Prototyping and Engineering applications: A tool box for prototype development, Liou W L, Liou F W, CRC Press.
5	Rapid Prototyping: Theory and practice, Kamrani A K, Nasr E A, Springer
6	Additive Manufacturing, Andreas Gebhardt Hanser Publications (2016)
7	Additive Manufacturing Handbook, Adedeji B. Badiru, CRC Press (2017)

Supplementary learning Material:

1	NPTEL resources
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Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
10%	15%	25%	20%	20%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students can acquire knowledge about the scope and recent trends in rapid prototyping with compared to traditional manufacturing processes	10
CO-2	Students can learn the conversion of CAD models to STL file and further gcode file generation using CAD softwares	25
CO-3	Students can explore about various RP processes	50
CO-4	Students can learn about different applications of RP	15

Curriculum Revision:

Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025