



C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Mechanical Engineering
SEMESTER: - VII
CODE: -4TE07RPD1
NAME – Rapid Product Development

Teaching & Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE07RPD1	Rapid Product Development	3	0	2	5	4	30	1.5	70	3	---	20	30	150

Objectives:-

On completion of the course the students are expected to be knowledgeable in:

- The aim of the course is to provide the students, with an opportunity to conceive, design, and implement products quickly and effectively, using the latest rapid prototyping methods.
- Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.
- To educate students with fundamental and advanced knowledge in the field of Rapid Product Development and the associated Aerospace, Architecture, Art, Medical and industrial applications.
- Software associated with rapid prototyping techniques are explored.

Prerequisites: -Basic knowledge of Manufacturing Processes I & II, Advance Manufacturing and Product design and Development.

Course outline:-

Sr. No.	Course Contents	Hours
01	UNIT I Overview of Rapid Product Development:-Product Developing Cycle-Definition of Rapid Product Development-Virtual prototypical and rapid manufacturing technologies- Physical Prototyping & rapid manufacturing technologies-Synergic integration technologies.	06
02	UNIT II Basic concept- Digitization techniques – Model reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data requirements – Geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation	10

	and support generation, Support structure design, Model Slicing, Tool path generation- Software for AM- Case studies.	
03	UNIT III Stereolithography Apparatus (SLA): Principle, pre-build process, part-building and post-build processes, photo polymerization of SL resins, part quality and process planning, recoating issues, materials, advantages, limitations and applications. Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications. Laminated Object Manufacturing (LOM): Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.	12
04	UNIT IV Selective Laser Sintering (SLS): Principle, process, Indirect and direct SLS- powder structures, materials, post processing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping (LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.	08
05	UNIT V Three dimensional Printing (3DP): Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Shape Deposition Manufacturing (SDM), Ballistic Particle Manufacturing (BPM), Selective Laser Melting, Electron Beam Melting.	09

Learning Outcomes:-

- A variety of of Rapid prototyping technologies and their potential to support design and manufacturing.
- Apply the concept of RP Theory in real word application.
- Understand the process of RP standards for STL, File Format and create a manufacturing DATA.
- Rapid Product Development methods and case studies relevant to mass customized manufacturing.
- Able to create a database of tooling technique for different applications.

Text books:-

- 01 Rapid Prototyping: A brief Introduction, **Amitabh Ghosh**, EWP, New Delhi, 1997
- 02 Rapid Prototyping: Principles and applications, second edition, **Chua C.K., Leong K.F., and Lim C.S.**, World Scientific Publishers, 2003.
- 03 Rapid Prototyping: Theory and practice, **Ali K. Kamrani, Emad Abouel Nasr**, Springer, 2006.

Reference Books:-

- 01 Rapid prototyping materials by **Gurumurthi**. IISc Bangalore.
- 02 “Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing”, **Gibson, I., Rosen, D.W. and Stucker, B.**, Springer, 2010.
- 03 “Rapid Prototyping and Engineering applications : A tool box for prototype development”, **Liou, L.W. and Liou, F.W.**, CRC Press, 2011.

Research Reference:-

1. ASME – Journal of Manufacturing Science and Engineering
2. www.springer.com
3. www.sciencedirect.com
4. <http://www.academia.edu>