

Course Title	PROTOTYPE DEVELOPMENT TECHNIQUES (ELECTIVE-I)
Course Code	MD912
Course Credit	Lecture : 04
	Practical : 01
	Tutorial : 00
	Total : 05

Course Objective

The objectives of the course are:

- To provide students with an understanding of the principles of various prototyping systems and usability methodologies.
- To Design and develop a prototype user interface to client and design requirements
- To apply the prepare prototype as per real industrial application.

Detailed Syllabus

Sr. No.	Name of chapter & Details	Hours Allotted
SECTION – I		
1	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: Fundamental Automated Processes, Process Chain	07
2	Liquid-based Rapid Prototyping Systems:- Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies	08
3	Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.	07
4	Powder Based Rapid Prototyping Systems:- Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three	06

	dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, 3D scanners, Case studies.	
	Total	28
SECTION – II		
5	Rapid Tooling:- Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.	05
6	Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats.	08
7	Rapid Prototyping Software's:- Features of various RP software's like Magic, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.	08
8	RP Applications: Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.	07
	Total	28

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

Students Learning Outcomes:

At the end of the course the students will be able to

- Plan and complete a prototype by the application of various techniques.
- Perform appropriate component selection based on the functional definition of the prototype.
- Isolate and identify faults that will be applied to the completed prototype.
- Document and present the final prototype..



SYLLABUS

Reference book:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S, World Scientific publications , Third Edition, 2010.
2. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001 Wohlers Report 2000 – Terry Wohlers, Wohlers Associates, 2000
3. Rapid Prototyping & Manufacturing – Paul F.Jacobs, ASME Press, 1996.
4. Ghosh A., “Rapid Prototyping: A Brief Introduction”, Affiliated East West,
5. Kenneth G. Cooper, “Rapid Prototyping Technology: Selection and Application”, CRC Press, 2001.

Additional Resources

- www.nptel.iitm.ac.in