



FIRST SEMESTER, 2022-2023
COURSE HANDOUT (PART-II)

Date: 29-08-2022

In addition to Part-I (General Handout for all courses appended to the time table), this portion gives further specific details regarding the course.

Course Code: ME F416

Name of the Course: Reverse Engineering and Rapid Prototyping

Instructor-In-Charge: KURRA SURESH

Practical Instructor: NA

I. Course Description:

Reverse engineering (RE): introduction, methodologies and techniques, hardware and software, selection of reverse engineering system. Rapid prototyping (RP): introduction, relationship with reverse engineering, different rapid prototyping techniques. Case studies on reverse engineering applications in various industries, project work.

II. Scope and Objective of the Course:

This course introduces the students with principles, techniques and application areas of RE and RP. Moreover, it enables learners to acquire a minimum level of skills for applying reverse engineering to develop prototypes of the targeted products.

III. Textbooks

- Vinesh Raja and Kiran J Fernandes, “Reverse Engineering: An Industrial Perspective”, Springer Series in Advanced Manufacturing, Springer-Verlag London Limited, UK, 2008.
- Chee Kai Chua, Kah Fai Leong and Chu Sing Lim, “Rapid Prototyping: Principles and Applications”, World Scientific Publishing Company, 3rd Edition, 2010.

III. References

- Kathryn A. Ingle, “Reverse Engineering”, McGraw-Hill, 1994.
- Andreas Gebhardt, “Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing”, Hanser Publishers, 2011.



IV. Course Contents

Lec. No.	Topics to be covered	Learning Objectives	Chapter in the Text Book
1-2	Application of computers in Mechanical Engineering	Applications in CAD/CAM/CAE, FEA, Automation, IOT, AR/VR	Class Notes
3	Reverse Engineering	Understand Need, advantages, limitations	T1-Ch1
4	Methodologies and Techniques for RE	TOF, Triangulation, Active and passive methods, structured light methods etc.	T1- Ch 2
5	Hardware for RE : CMM	Working and construction features of CMM and CMM probes	T1- Ch 3
6	Hardware for RE : 3D Scanners	Different types of scanners in the market and their specifications	T1- Ch 3
7	Software for RE : Open source and Commercial	Softwares that will be used at different phases of RE	T1- Ch 3
8	Process for RE system selection	Able to select appropriate RE system based on application	T1- Ch 4
9	Legal aspects and Barriers in adopting RE	Understands legal aspects in reconstructing the objects	T1- Ch 10&11
10	Scanning with Artec Spider	Hands on experience in scanning	Class notes
11	Scanning with David SLS	Hands on experience in scanning	Class notes
12	3D model reconstruction by passive methods	Hands on experience in scanning	Class notes
13-14	Geomagic software demonstration	Hands on experience in RE software	Class notes
15	Mesh generation from 3D point cloud data	Steps in mesh generation from point cloud	Class notes
16	Rapid Prototyping	Classification of RP techniques, Advantages and limitations	T2-Ch 1&2
17	Resin 3D printing	Principle, Process variants, Materials	T2-Ch 3
18-19	Fused Deposition Modeling	Principle, Process variants, Materials	T2-Ch 4
20	Laminated Object Modeling	Principle, Process variants, Materials	T2-Ch 4
21-22	Metal Additive Manufacturing	Principle, Process variants, Materials	T2-Ch 5
23	Sheet metal prototyping: ISF	Principle, Process variants, Materials	Class notes
24-25	STL format and its manipulation, Slicing of STL files	File structure, slicing and contour organization	Class notes
26-27	Softwares for slicing	Hands on practice on slicing softwares	Class notes
28	3D printer programming using Gcodes	Differences in G-code file and slicing file	Class notes
29	Demonstration of FDM printer	Hands on practice on FDM printer	Class notes
30	Demonstration of Resin printer	Hands on practice on resin printer	Class notes



Lec. No.	Topics to be covered	Learning Objectives	Chapter in the Text Book
31	Assembly of 3D printer	Understand the parts in printer	Class notes
32-33	RP in Orthopaedic	Applications of RP and RE in ortho	Class notes
34-36	3D modeling from CT and MRI	DICOM images to 3D models	Class notes
37	AM for Scaffolds	Scaffolds, materials, AM applications	Class notes
38	AM for Dental	Different dental applications of AM	Class notes
39	AM in Maxillofacial surgery	Use of AM in maxillofacial surgery	Class notes
40	AM in Bio-Manufacturing	Other AM application in Bio	Class notes
41	Demonstration of Bio 3D printer	Hands on practice on Bio printer	Class notes
42	Other application fields of AM	Automotive, Aero, Jewelry, Tableware, coin industry	T2-Ch7

V. Evaluation Scheme and Schedule

Component	Duration	% Weightage	Date	Nature of Component
Mid-Test	90 min	25	02/11 9.00 - 10.30AM	CB
Project/Presentations/ Report		25		OB
Practical test		10		OB
Comprehensive Examination	180 min	40	22/12 FN	CB

VI. Chamber Consultation Hour: It will be announced in the class.

VII. Notices concerning the course: All notices concerning the course are displayed in CMS only.

Make-up Policy: Make up for any component of evaluation will be permitted only in genuinely serious cases only after production of necessary medical certificates and with prior permission.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-In-Charge
ME F416