GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3730809
Semester – III
Subject Name: Rapid Prototyping

Type of course: Program Elective V

Prerequisite: Nil

Rationale:
The idea of building a three dimensional object using two dimensional cross sections is done by Rapid Prototyping (RP). Rapid Prototyping is present demand of Industry that defined as a group of techniques used to quickly fabricate a scale model of a part or assembly using three-dimensional computer aided design (CAD) data. Many designers and companies use prototypes and models for the purpose of product and functionality testing of new designs they can also be used to obtain customer feedback for new products. This subject helps students to visualize product and its features and analysis for new product development.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Contents	Total Hrs
1	**Product Development Cycle and Influence of Innovations on Product Development:** Impact on economy, export competitiveness, design as a strategy to win international market and Innovation process	08
2	**Rapid Product Development - As Overview** virtual prototyping and testing technology, Physical Prototyping and Rapid Manufacturing technologies and Synergic Integration Technologies	08
3	**Virtual Pro-typing and Testing:** Geometric modeling: Types of Geometric models and Solid Models Reverse engineering: Acquiring Point Data, Constructing 3D model and Applications. Virtual augmented reality: Requirement of devices and technologies and applications Computer Aided Engineering: Application of FEA in Engineering, the concept of discretization, steps in FEA and automatic mesh generation. Design for X: Design for manufacture and design for assembly and other facets of DFX.	08
4	**Physical Prototyping and Rapid Manufacturing** **Computer Numerical Control:** Comparison between NC and conventional machines, features of CNC Machine Tool and programming **Robotics:** classification, programming, sensors and applications **Computer Aided Process Planning:** Methodology, evaluation, types, CAD/CAM Integration and CAPP Features	08

	Rapid Prototyping: dawn of slice age, benefits, applications, important issues and popular RP process **Rapid Tooling:** Indirect rapid tooling process	
5	**Synergic Integration:** **Concurrent Engineering:** Benefits, methodology, integration and transactions **Product Data Management:** Product data classifications, Process Management and benefits **Computer Integrated Manufacturing:** Components, barriers to CIM. Implementation, case study, development and research	06
6	**Rapid Prototyping and Rapid Tooling:** Methods, Stereo-lithography, Fused-deposition modeling, Selective laser sintering, Laminated-object manufacturing, Ballistic particle Manufacturing, Solid base curing and Direct manufacturing and rapid tooling	07
	Total Hours	**45**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**30**	**20**	**20**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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.

Reference Books:

(1) Rapid Product Development- Synergic integration of time-compression technologies K. P. Karunakaran, V. P. Bapat, Sreenath Babu Akula P. D. Solanki Gaurav Gupta, V.R. Prasanth, Saket Anand, Arnab Sarkar and S. Venkatkrishnan
(2) Manufacturing Processes for Engineering Materials Serope Kalpakjion and Steven R. Schmid- Pearson Education

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Able to Understand virtual prototyping and testing of technology.	30
CO-2	Able to understand the importance of Physical Prototyping,	40

CO-3	Able to understand Rapid Manufacturing technologies and Synergic Integration Technologies in the present technological era	30

Term Work: Nil

List of Experiments: Nil

Major Equipment: Nil

List of Open Source Software/learning website:

1. The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester.
2. NPTEL
3. https://en.wikipedia.org/wiki/Rapid_prototyping
4. http://www.factoryoffactories.com/rapidprotot.htm