GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (PRODUCTION ENGINEERING) (28)
RAPID PROTOTYPING, TOOLING AND SYNERGIC INTEGRATION
SUBJECT CODE: 2742803
M.E. 4TH SEMESTER

Type of course: Major Elective - V

Prerequisite: NIL

Rationale: NA

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)		
						ESE	OEP	PA	RP	
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Product Development Cycle**	**02**	05%
2	**Influence of Innovations on Product Development:** Impact on economy, export competitiveness, design as a strategy to win international market and Innovation process	**04**	10%
3	**Rapid Product Development - As Overview** virtual prototyping and testing technology, Physical Prototyping and Rapid Manufacturing technologies and Synergic Integration Technologies	**02**	05%
4	**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 discritization, steps in FEA and automatic mesh generation. Design for X: Design for manufacture and design for assembly and other facets of DFX.	**12**	30%
5	**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 Plannig:** Methodology, evaluation, types, CAD/CAM Integration and CAPP Features **Rapid Prototyping:** dawn of slice age, benefits, applications, important issues and popular RP process **Rapid Tooling:** Indirect rapid tooling process	**12**	30%

6	**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	**04**	10%
7	**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	**04**	10%

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 Outcome:
After learning the course the students should be able to Understand what is virtual prototyping and testing of technology, the importance of Physical Prototyping, Rapid Manufacturing technologies and Synergic Integration Technologies in the present technological era

List of Tuturials:

1. Introduction to Rapid prototyping and Tooling.
2. Study of Layered Manufacturing (LM).
3. Study of Laminated Object Manufacturing (LOM).
4. Study of Selective Laser Sintering (SLS).
5. Study of Three Dimensional Printing (3DP).
6. Study of Fused Deposition Moulding (FDM).
7. Study of Shape Deposition Manufacturing (SDM).
8. Study of Stereolethography (SLA).
9. Study of Solid Ground Curing (SGC).
10. Study of Metal Rapid Prototyping.

Major Equipments:

3 D Printing, Fused Deposition Moulding, RP Systems

List of Open Source Software/learning website:

https://en.wikipedia.org/wiki/Rapid_prototyping
http://www.factoryoffactories.com/rapidprotot.htm

Review Presentation (RP): 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. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.