Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech.	Rapid Prototyping & Manufacturing	MEM 605	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
III	3	3-0-0	3 Hours

Unit - I

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. **(06 Hours)**

Unit - II

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 Hours)**

Unit - III

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. **(08 Hours)**

Unit - IV

Powder Based Rapid Prototyping Systems: Selective LASER sintering (SLS)- models and specifications; Process; Working principle; Applications; Advantages and disadvantages; Case studies. Three dimensional printing (3DP)- models and specifications; Process; Working principle; Applications; Advantages and disadvantages; Case studies.

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. **(08 Hours)**

Unit - V

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.

Rapid Prototyping Software's: Features of various RP software's like Magics; Mimics; Solid View; View Expert; 3 D View; Velocity 2; Rhino; STL View 3 Data Expert and 3 D doctor. **(08 Hours)**

Unit - VI

RP Applications: Application – 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. **(07Hours)**

Recommended Books:

1. Rapid Prototyping: Principles and Applications; C. K. Chua;K. F. Leong and C. S. Lim; World Scientific publications; Third Edition; 2010.
2. Rapid Manufacturing; D.T. Pham and S.S. Dimov; Springer; 2001
3. Rapid Prototyping & Manufacturing; Paul F.Jacobs; ASME Press; 1996.
4. Rapid Prototyping of Digital Systems; James O Hamblen; Springer.
5. Rapid Prototyping of Digital Systems: A Tutorial Approach; Hamblen James O.; Kluwer Aca.
6. Rapid Prototyping: Principles and Applications; Kai Chua Chee; World Science.
7. Rapid System Prototyping With Fpgas: Accelerating The Design Process; R C. Cofer Newnes.