COURSE CODE	3D PRINTING AND TOOLING	L	T	P	C
1153ME108		3	0	0	3

1. Preamble

This course addresses additive manufacturing principles, variety and its concept, scope of additive manufacturing and areas of application.

2. Prerequisite

NIL

3. Links to other courses

Project Work

4. Course Educational Objectives

Students undergoing this course are expected to

- Know the principles, methods, areas of usage, possibilities and limitations as well as environmental effects of the additive manufacturing technologies
- Be familiar with the characteristics of various materials that are used in additive manufacturing.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Describe the differences and of the application of a range of additive manufacturing processes	K2
CO2	Select and use correct CAD formats in the manufacture of a 3D printed part.	K2
CO3	Understand the operating principles, capabilities, and limitations of liquid and solid based additive manufacturing system, including fused deposition modeling and stereolithography.	K2
CO4	Appreciate the operating principles, capabilities and limitations of powder based additive manufacturing system, including 3D printing and laser sintering.	K2
CO5	Describe the important process parameters for bio-manufacturing and determine the suitable additive technique for bio-manufacturing.	K2

(K2 – Understand)

6. Correlation of CO's with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M				M		M					L	L	
CO2	M				M		M					L	L	
CO3	M				M		M					L	L	
CO4	M				M		M					L	L	
CO5	M				M		M					L	L	

H- High; M-Medium; L-Low

7. Course Content

UNIT I-INTRODUCTION **L-9**

Overview – History – Need-Classification –Additive manufacturing Technology in product development–Additive manufacturing - Materials for Additive Manufacturing.

UNIT II-CAD & REVERSE ENGINEERING **L-9**

Basic Concept –3D scanning- Digitization techniques – Model Reconstruction – Data Processing for Reverse Engineering- Additive Manufacturing Technology: CAD model preparation – Part Orientation and support generation – Model Slicing –Tool path Generation.

UNIT III-LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS **L-9**

Classification – Liquid based system – Stereo lithography Apparatus (SLA)- Principle, process, advantages and applications – Solid based system –Fused Deposition Modeling – Principle, process, advantages.

UNIT IV-LASER BASED ADDITIVE MANUFACTURING SYSTEMS **L-9**

Selective Laser Sintering – Principles of SLS process – Process, advantages and applications, Three Dimensional Printing – Principle, process, advantages - Laser Engineered Net Shaping (LENS)

UNIT V- RAPID TOOLING AND APPLICATIONS OF ADDITIVE MANUFACTURING. **L-9**

Principles and typical process for quick batch production of plastic and metal parts through quick tooling —Applications of Additive manufacturing in Aerospace, Automotive, Manufacturing and Architectural Engineering.

TOTAL: 45 PERIODS

8. Text Books

1. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third Edition, World Scientific Publishers, 2010.
2. Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003.

9. References

1. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2007.
   Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
2. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC press, 2000.
3. Dougles Bryden, "CAD and Prototyping for Product Design", 2014