COURSE CODE	3D PRINTING	L	T	P	C
1154ME111		3	0	0	3

1. Preamble

This course addresses the principle behind rapid prototyping techniques, variety and its concept, scope 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	H	L										L	H	
CO2	H	L										L	H	
CO3	H	L										L	H	
CO4	H	L										L	H	
CO5	H	L										L	H	

H- High; M-Medium; L-Low

7. Course Content

UNIT I-INTRODUCTION **L-9**

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

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

Basic Concept –3D Scanning Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology – Part Orientation and support generation – Model Slicing –Tool path Generation.

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

Classification – Stereo lithography Apparatus (SLA)- Principle, process, advantages –Fused Deposition Modeling – Principle, process, advantages.

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

Selective Laser Sintering – Principle, Process, advantages, Three Dimensional Printing – Principle, process, advantages - Laser Engineered Net Shaping (LENS)

UNIT V- APPLICATIONS OF 3D PRINTING. **L-9**

Customized implants and prosthesis: Design and development, Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Applications of 3D Printing 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.
2. Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006. 3. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC press, 2000.
3. DouglesBryden, "CAD and Protyping for Product Design", 2014