

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING**ADDITIVE MANUFACTURING AND ITS APPLICATIONS**

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E VI Semester

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|------------------------------|---------------|---------------------------|
| L:T: P (Hrs./week): 3: 0 : 0 | SEE Marks: 60 | Course Code : U23OE620ME |
| Credits: 03 | CIE Marks: 40 | Duration of SEE : 3 Hours |

| Course objectives | Course Outcomes |
|--|--|
| The objectives of this course are to: understand the fundamentals of various additive manufacturing technologies and their applications in Engineering Industry. | <p>On completion of the course the student will be able to:</p> <ol style="list-style-type: none"> Understand the fundamentals of prototyping and the various data formats used in Additive Manufacturing. Study the principle, process, advantages, limitations and case studies of liquid based AM systems. Study the principle, process, advantages, limitations and case studies of solid based AM systems. Study the principle, process, advantages, limitations and case studies of powder based AM systems. Study the applications of AM in various engineering industries as well as the medical field. |

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | | |
|--------------------------|------------|---|---|---|---|---|---|---|---|----|----|----|-------------|---|---|
| CO | PO mapping | | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO1 | 2 | 3 | 2 | | 2 | 1 | | | | | | | | | |
| CO2 | 3 | 2 | 2 | | 3 | 2 | | | | | | | | | |
| CO3 | 3 | 2 | 2 | | 3 | 2 | | | | | | | | | |
| CO4 | 3 | 2 | 2 | | 3 | 2 | | | | | | | | | |
| CO5 | 1 | 3 | 3 | | 3 | 3 | | | | | | | | | |

UNIT-I

Introduction, Prototyping fundamentals, Historical development, Advantages of AMT, Commonly used terms, **Fundamental Automated Processes**, process chain, 3D modeling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, **Newly Proposed formats**, Classification of AMT process.

UNIT-II

Liquid based 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.

UNIT-III

Solid based 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.

UNIT-IV

Powder Based Systems: Selective laser sintering (SLS): Models and specifications, process, materials, working principle, applications, advantages and disadvantages, case studies.

Three dimensional printing (3DP): Models and specification, process, working principle, applications, advantages and disadvantages, case studies.

UNIT-V

Applications of AM systems: Applications in Design, aerospace industry, automotive industry, jewellery industry, coin industry, GIS Application, arts and architecture.

RP medical and bio engineering Application: planning and simulation of complex surgery, customized implant and prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bio-molecules.

Learning Resources:

1. Chua C.K., Leong K.F. and LIM C.S Rapid prototyping: Principles and Applications, World Scientific publications, 3rdEd., 2010
2. D.T. Pham and S.S. Dimov, "Rapid Manufacturing", Springer, 2001
3. Terry Wohlers, "Wohlers Report 2000", Wohlers Associates, 2000
4. Paul F. Jacobs, "Rapid Prototyping and Manufacturing"–, ASME Press, 1996
5. Ian Gibson, David Rosen, Brent Stucker "Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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|---|------------------------|----|------------------------------------|----|
| 1 | No. of Internal Tests: | 02 | Max. Marks for each Internal Test: | 30 |
| 2 | No. of Assignments: | 03 | Max. Marks for each Assignment: | 05 |
| 3 | No. of Quizzes: | 03 | Max. Marks for each Quiz Test: | 05 |

Duration of Internal Test: 90 Minutes