| **Program:** B Tech (All Programs except CSE(DS)311(VT), CSBS, Civil and Mechanical ) / MBA Tech (All Programs) | | | | **Semester:** I/II | | |
|---|---|---|---|---|---|---|
| **Course:** Digital Manufacturing Laboratory | | | | **Code:** 702MEOC016 | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | |
| **Lecture (Hours per week)** | **Practical (Hours per week)** | **Tutorial (Hours per week)** | **Credit** | **Internal Continuous Assessment (ICA) (Marks-50)** | **Term End Examinations (TEE) (Marks -100)** | |
| 0 | 2 | 0 | 1 | Marks Scaled to 50 | - | |

**Pre-requisite: -**

**Course Objective**

The course aims to introduce digital fabrication tools and methods. It familiarizes the students with various principles of 3D printing along with solid modeling, part slicing and fabrication using Fused deposition modelling (FDM) process.

**Course Outcomes**

After completion of the course, students will be able to -
1. Describe FDM Technology
2. Prepare given model for 3D printing
3. Create products of complex geometries using 3D printer

**Detailed Syllabus**

| Unit | Description | Duration |
|---|---|---|
| 1 | **Introduction to Digital Manufacturing and Technical Design** Overview of 3D printing laboratory equipment, pre-fabricating requirements – printer bed size, hardware and materials required. | **02** |
| 2 | **3D Printing Process Steps** 3D printing concepts for converting CAD model into real parts, process steps involved in 3DP, creation of solid model, conversion to STL file, slicing the file or select a STL model from online resources, machine set up, build. | **06** |
| 3 | **3D Printing with Fused Deposition Modeling (FDM)** Operating principle and workflow of a Fused Deposition Modeling (FDM) 3D Printing machine, effect of layer thickness, infill density, part orientation and overhang angles on FDM printed parts, study of lithophane. | **10** |
| 4 | **Project Involving Ideation, Design and 3D Printing** Briefing of idea, designing of product, solid model creation, final fabrication using 3D printer. | **12** |
| | **Total** | **30** |

**Text Books**
1. Noorani, Rafiq, *3D Printing: Technology, Applications, and Selection*, 1st edition, CRC Press, 2017.
2. Filemon Schöffer, Ben Redwood, Brian Garret, *The 3D Printing Handbook: Technologies, design and applications*, 3D Hubs, 2017

**Reference Books**
1. Chua, C. L., Lim, K., *Rapid Prototyping: Principles and Applications*, 3rd Edition, World Scientific Publishing Co. Pte. Ltd., 2010

**Laboratory Work**

6 to 8 laboratory exercises (and a mini project) based on the syllabus.

**List of Experiments**

1) To design an object using an open source software (Tinkercad).
2) To understand the working of slicing software (Repetier Host)
3) To examine the effect of layer thickness, infill density and orientation on build time and material consumption.
4) To generate code for designed object using Repetier host software for 3D printing.
5) To study the components of a Fused Deposition Modeling (FDM) 3D Printing machine.
6) To prepare FDM machine for printing the given object.
7) To print object using FDM machine.
8) To carry out post processing on the printed object.
9) To evaluate the effect of overhang angles on build quality of polylactic acid (PLA) and Acrylonitrile butadiene styrene (ABS) parts made using FDM.
10) To build parts of same geometry in PLA and ABS and compare the bending strength.
11) To create an object using lithophane technique.
12) Mini project.

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Signature

(Head of the Department)

A.Y. 2024-25