



IIT Mandi

Proposal for a New Course

Course number	: ME-524
Course Name	: Additive Manufacturing
Credit Distribution	: 3-0-0-3, Elective
Intended for	: B.Tech./M.Tech/Ph.D
Prerequisite	: None
Mutual Exclusion	: None

1. Preamble:

The objective of this work is to introduce different Additive Manufacturing (AM) processes for various material systems (polymer, metal, ceramics etc). Further, in addition to discussing unusual and emerging applications of AM, the course focusses on medical and aerospace sectors as well. The course also deals with guidelines for AM process selection, design for AM, associated software systems, issues therein and recent developments.

2. Course Modules with quantitative lecture hours:

Introduction to Additive Manufacturing, Data formats and Preprocessing

History, Comparison, Evolution, Methodology, Process chain, Classification, AM file formats, Part orientation, Support structure generation, slicing, Contour and tool path generation and build file preparation [05]

Additive Manufacturing Methods

AM equipment and Materials including Bio-active materials, Vat photo polymerization, Material jetting, Binder jetting, Material extrusion, Sheet lamination, Powder Bed fusion, Direct energy deposition, Thermal spray direct writing, Liquid phase direct deposition, PCB printing, Bioprinting, Concrete 3D printing, 4D printing and Hands on experience on the available AM machines [22]

Design for AM

DFMA, Part replacement, Adapt for AM, Design guidelines (part, support structure, Hole size, layer and wall thickness, residual stresses, optimization), Case studies [05]

AM equipment and materials

Laser, Electron beam, Arc, Beam, In situ monitoring, Polymer, Metal, Ceramics, Recent advances, Powder production and characterization [05]

Post processing, Safety considerations, applications and Industry 4.0

Quality evaluation, Surface finish and geometry improvement, Potential hazards, Powder and chemical hazards, Applications – Aerospace, Defence, Automobile, Biomedical, Rapid tooling, Reverse engineering, Industry 4.0 and future scope of AM [05]

3. Text books:

1. Andreas Gebhardt, Jan-Steffen Hötter, Additive Manufacturing: 3D Printing for Prototyping and Manufacturing, Hanser Publications, 2016.
2. Chua Chee Kai, Leong Kah Fai, 3D Printing and Additive Manufacturing: Principles and Applications, World Scientific, 2014.
3. Hod Lipson, Melba Kurman, Fabricated: The New World of 3-D Printing, Wiley 2013.

4. Patri K. Venuvinod, Weiyin Ma, Rapid Prototyping - Laser-based and Other Technologies, Kluwer Academic Publishers, 2003.

4. Similarity with the existing courses: Partially YES
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.	Manufacturing Engineering	ME 308	Fused deposition modeling, Laminated object manufacturing and Stereo-lithography	4%

5. Justification of new course proposal if cumulative similarity content is >30%:

Not Applicable