

DEPARTMENT OF INDUSTRIAL ENGINEERING AND MANAGEMENT  
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO

<b>Title of subject</b>	:	<b>Rapid Manufacturing Techniques INM-711 (2+0)</b>
<b>Disciplines</b>	:	Industrial Engineering and Management
<b>Semester</b>	:	(3 <sup>rd</sup> Semester 2 <sup>nd</sup> Year)
<b>Effective</b>	:	<b>21S</b> -Batch and onwards
<b>Credit Hours</b>	:	Th=02 & Pr=00
<b>Marks</b>	:	Th: 100 & Pr: 00
<b>Minimum Credit Hours</b>	:	<b>28</b> (For Theory)

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**Aims:** To provide knowledge of Rapid Manufacturing Techniques

**Objectives:** After completing this course,

- The student will be able to understand the overall knowledge of Rapid Manufacturing Techniques.
- To develop the 3D prototypes using Additive manufacturing techniques

**Contents:**

**Introduction and Basic Principles:** Additive Manufacturing, Freeform Fabrication or Solid Freeform Fabrication, Stereo lithography or 3D Printing, Rapid Prototyping.

**Development of Additive Manufacturing Technologies:** Classification of AM Processes, Liquid Polymer Systems, AM Around the World , Photopolymer-Based Systems, Powder-Based Systems, Molten Material Systems, Solid Sheets, Metal Systems, Design for AM 3.7.1 Part Orientation , Removal of Supports, Hollowing Out Parts, Inclusion of Undercuts and Other Manufacturing, Constraining Features, Interlocking Features, Identification Markings/Numbers Application Areas CAD Modeling, Medical Modeling,

**Printing Processes:** Evolution of Printing as an Additive Manufacturing Process, Historical Development of 3D Printing, Commercially Available Printing Machines, Advantages of Printing, Research Achievements in Printing Deposition, Polymers, Ceramics, Metals, Technical Challenges of Printing , Droplet Formation Technologies, Continuous Mode, Drop-on-Demand Mode, Other Droplet Formation Methods, Printing Process Modeling, Material Modification Methods, Hot Melt Deposition , Solution- and Dispersion-Based Deposition, Prepolymer Deposition , Three-Dimensional Printing, Technology Commercial Machines , Other Materials, Advantages of Binder Printing.

**Design for Additive Manufacturing:** ore DFAM Concepts and Objectives , Complex Geometry, Customized Geometry , Integrated Assemblies, Elimination of Conventional DFM Constraints, AM Unique Capabilities Shape Complexity, Hierarchical Complexity , Functional Complexity, Material Complexity , Exploring Design Freedoms, Part Consolidation and Redesign , Hierarchical Structures, Industrial Design, Challenges for CAD Solid-Modeling CAD Systems, Promising Technologies , Methods, Cantilever Beam Example.

**Guidelines for Process Selection:** Introduction , Selection Methods for a Part, Decision Theory, Approaches to Determining Feasibility, Approaches to Selection, Selection Example Challenges of Selection, Example System for Preliminary Selection, Production Planning and Production Planning, Pre-processing, Part Build, Post-processing.

**Recommended Books**

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing by Ian Gibson, David Rosen, et al., Latest Edition
  2. Additive Manufacturing: Foundation Knowledge For The Beginners by Sunpreet Singh, Chander Prakash, et al. Latest Edition
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<b>Approval:</b>	Board of Studies:	Res. No. 3.1	Dated: 27.08.2019
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	Academic Council	Res. No. _____	Dated: _____