



ANDHRA LOYOLA INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, New Delhi & Affiliated to JNTU-Kakinada)
An ISO 9001:2008 Certified Institution, Vijayawada

DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

A.Y. : 2020-2021

Subject: ADDITIVE MANUFACTURING

Class : IV B.Tech I Semester, Section-A

Faculty: Dr. M. Geeta Rani

Course Objectives:

1. The course aims at the importance of Additive Manufacturing, classifications, models, specifications of various Additive Manufacturing Techniques.
2. To learn the different tools, soft-wares required of various Additive Manufacturing Techniques.
3. To learn the applications of Additive Manufacturing.

Course Outcomes:

LESSON PLAN - DAY WISE

Course Outcomes:

S. No	Outcomes	Lesson Objectives
1	Factual	Understanding the principle of 3D printing, fundamentals of additive manufacturing
2	Conceptual	Description of the working process of SLA,SLS,FDM,LOM
3	Procedural	USE OF Direct and Indirect Rapid Tooling Methods, Additive Manufacturing Data Formats
4	Applied	Application of Rapid Tooling techniques in real time industries

1Schedule and Sequence: Day Plan for Lesson-1

Lesson: 1 Introduction

Session/ Module/ Day	Topic	Objectives	Before Class (Videos, E-Books, Case Studies)	In Class (Activities, Quiz, Solving Problems)	Post Class (Assignment, Discussion Forum)
Day - 1	Introduction to Rapid prototyping	To know the rapid prototyping introduction, importance.	https://www.youtube.com/watch?v=NkC8TNts4B4	The basic introduction of rapid prototyping and its importance explanation-55 mins	To study and make a note of the topic
Day - 2	Prototyping fundamentals, historical development	To understand the prototyping fundamentals and its history.	Text book by Chua C.K., Leong K.F World scientific.	<ul style="list-style-type: none">• Previous class revision-5 mins• Prototyping fundamentals-30 mins• History-20 mins	Doubts and Discussion
Day-3	fundamentals of rapid prototyping	To understand the fundamentals of rapid prototyping	<ul style="list-style-type: none">• https://www.youtube.com/watch?v=0bPhs3BJbc4	<ul style="list-style-type: none">• Previous class revision-5 mins• Explanation of current topic -45 mins.• Discussion of the topic-5 mins	Doubts and Discussion
Day-4	fundamentals of rapid prototyping	To know the importance and usage of fundamentals of rapid prototyping	<ul style="list-style-type: none">• https://www.youtube.com/watch?v=0bPhs3BJbc4	<ul style="list-style-type: none">• Previous class revision-5 mins• Explanation of current topic -45 mins.• Discussion of the topic-5 mins	Quiz program

Day-5	commonly used terms ,classification of RP process	To know the terms and classification of rapid prototyping	Text book by Chua C.K., Leong K.F World scientific.	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-6	LIQUID-BASED RAPID PROTOTYPING SYSTEMS	To understand the concept of liquid based rapid prototyping systems	Text book by Chua C.K., Leong K.F World scientific.	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-7	Stereo lithography Apparatus (SLA): models , specifications	To know the concept of Stereo lithography Apparatus (SLA): models , specifications	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=yW4EbCWaJHE 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-8	Stereo lithography process, working principle	To understand the process, working principle	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=cTR71TaWrOU 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	To study and make a note of the topic
Day-9	photopolymer s, photo polymerization	To understand the photopolymers, photo polymerization	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=Y8hBGDhC0CE 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	To study and make a note of the topic

Day-10	layering technology, laser and laser scanning,	To understand the concept of layering technology, laser and laser scanning	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=TL2uncdat8I 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Quiz
Day-11	applications, advantages and disadvantages. Applications,	To know the Applications, advantages and disadvantages.	Text book by Chua C.K., Leong K.F World scientific..	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Assignment
Day-12	Solid Ground Curing (SGC): models and specifications	To know the concept of SGC method	Text book by Chua C.K., Leong K.F World scientific.	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 	To study and make a note of the topic
Day-13	process, working principle	To know the concept of SGC method	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=8MjvfrM1r6U 	<ul style="list-style-type: none"> • Previous calss revision-5 mins • Explanation of current topic -50 mins. • 	Doubts and Discussion
Day-14	applications, advantages and disadvantages,	To know the concept of SGC method	Text book by Chua C.K., Leong K.F World scientific.	<ul style="list-style-type: none"> • Previous calss revision-5 mins • Explanation of current topic -50 mins. 	Doubts and Discussion

Day-15	case studies	To gain knowledge by observing the case studies.	To search the different case studies	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	quiz
Day-16	Introduction to SOLID-BASED RAPID PROTOTYPING SYSTEMS	To learn the all solid based rapid prototyping systems	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	Doubts and Discussion
Day-17	Laminated object manufacturing (LOM) - models and specifications,	To Know the models and specifications of LOM method	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Previous class revision-5 mins Explanation of current topic -45 mins. Discussion of the topic-5 	Doubts and Discussion
Day-18	(LOM) process, working principle applications, advantages and disadvantages	To understand the concept of working LOM process	<ul style="list-style-type: none"> https://www.youtube.com/watch?v=DFb49UpqqY 	<ul style="list-style-type: none"> Previous class revision-5 mins Explanation of current topic -45 mins. Discussion of the topic-5 	Doubts and Discussion
Day-19	Fused deposition modelling (FDM) models and specifications	To Know the models and specifications of FDM method	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Previous class revision-5 mins Explanation of current topic -45 mins. Discussion of the topic-5 	Doubts and Discussion

Day-20	process, working principle applications, advantages, Disadvantages	To understand the concept of working FDM process	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=DFb49UpqqY 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 	Doubts and Discussion
Day-21	POWDER BASED RAPID PROTOTYPING SYSTEMS	To learn the all powder based rapid prototyping systems	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 	Quiz
Day-22	Selective laser sintering (SLS): models and specifications, process,	To Know the models and specifications of SLS method	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 	Quiz
Day-23	working principle, applications, advantages and disadvantages	To understand the concept of working SLS process	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=Ks5c8r8UfPY 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 	Doubts and Discussion
Day-24	case studies	To gain knowledge by observing the case studies	<ul style="list-style-type: none"> • To search the different case studies 	<ul style="list-style-type: none"> • Explanation of the topic -55 mins 	Assignment

Day-25	three dimensional printing (3DP): models and specifications,	To Know the models and specifications of 3DP method	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-26	process, working principle,	To understand the concept of working 3DP process	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=GV8zPtqOyqg 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -50 mins. • 	Doubts and Discussion
Day-27	,Applications. advantages and disadvantages	To understand the advantages ,disadvantages and applications	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Quiz
Day-28	case studies.	To gain knowledge by observing the case studies	<ul style="list-style-type: none"> • To search the different case studies 	<ul style="list-style-type: none"> • Explanation of the topic -55 mins 	Assignment
Day-29	Introduction to rapid tooling (RT)	To know the basic concept of Rapid tooling	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion

Day-30	conventional tooling Vs RT	To know the difference between conventional and rapid tooling	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-31	Need for RT.	To know the basic need of Rapid tooling	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-32	rapid tooling classification	To know the classification of rapid tooling	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Study and make a note
Day-33	indirect rapid tooling methods: spray metal deposition	To understand the concept of indirect rapid tooling methods.	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=4wrc3_SQnBY 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-34	RTV epoxy tools, Ceramic tools	To know the usage of different tools	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=PYg7Qeo5-QY 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Quiz

Day-35	investment casting, spin casting,	To know the concept of casting methods in additive manufacturing	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	Doubts and Discussion
Day-36	die casting, sand casting, 3D Keltool process	To know the concept of casting methods in additive manufacturing	Text book by Chua C.K., Leong K.F World scientific	Explanation of the topic -55 mins	Doubts and Discussion
Day-37	Direct rapid tooling: direct AIM	To understand the concept of direct rapid tooling methods.	Text book by Chua C.K., Leong K.F World scientific	Explanation of the topic -55 mins	Doubts and Discussion
Day-38	LOM Tools, DTM Rapid Tool Process	To know the concept of LOM Tools, DTM Rapid Tool Process	Text book by Chua C.K., Leong K.F World scientific	Explanation of the topic -55 mins	Doubts and Discussion
Day-39	EOS Direct Tool Process and Direct Metal Tooling using 3DP.	To know the concept of EOS Direct Tool Process and Direct Metal Tooling using 3DP.	Text book by Chua C.K., Leong K.F World scientific	Explanation of the topic -55 mins	Assignment

Day-40	RAPID PROTOTYPING DATA FORMATS	To know the rapid prototyping data formats	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=mpE_tsnDu_w 	<ul style="list-style-type: none"> • Explanation of the topic -55 mins 	Quiz
Day-41	STL Format, STL File Problems	To understand the concept of STL format, STL file problems	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=mpE_tsnDu_w 	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Study and make a note
Day-42	EOS Direct Tool Process and Direct Metal Tooling using 3DP.	To know EOS Direct Tool Process and Direct Metal Tooling using 3DP.	<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=PaZtFff9Mw 	<ul style="list-style-type: none"> • Explanation of the topic -55 mins 	Doubts and Discussion
Day-43	Generic Solution, other Translators	To understand and solve the Generic Solution, other Translators	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Explanation of the topic -55 mins 	Doubts and Discussion
Day-44	Newly Proposed Formats	To know the concept of newly proposed formats	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Explanation of the topic -55 mins 	Doubts and Discussion

Day-45	RAPID PROTOTYPING SOFTWARES	To know the concept of rapid prototyping softwares	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	Doubts and Discussion
Day-46	Features of various RP software's	To know the Features of various RP software's	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	Doubts and Discussion
Day-47	Magics, Mimics, Solid View	To understand the Magics, Mimics, Solid View	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	Quiz
Day-48	View Expert, 3 D View, Velocity 2	To understand the concept of View Expert, 3 D View, Velocity 2	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Explanation of the topic -55 mins 	Assignment
Day-49	Rhino, STL View 3 Data Expert and 3 D doctor	To understand the concept of Rhino, STL View 3 Data Expert and 3 D doctor	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> Previous class revision-5 mins Explanation of current topic -45 mins. Discussion of the topic-5 mins 	Doubts and Discussion

Day-50	Introduction to RP APPLICATIONS	To learn the basic concept of basic RP applications	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Quiz
Day-51	Application in engineering, analysis and planning,	To know the Application in engineering, analysis and planning	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-52	aerospace industry, automotive industry, jewellery industry, coin industry	To know the aerospace industry, automotive industry, jewellery industry, coin industry	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-53	GIS application, arts and architecture	To know the GIS application, arts and architecture	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-54	RP medical and bioengineering applications	To know the RP medical and bioengineering applications	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion

Day-55	planning and simulation of complex surgery	To know the application of planning and simulation of complex surgery	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-56	customized implants & prosthesis,	To know the application of customized implants & prosthesis,	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-57	customized implants & prosthesis,	To know the applications of customized implants & prosthesis,	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Doubts and Discussion
Day-58	forensic science and anthropology	To know the applications of forensic science and anthropology	Text book by Chua C.K., Leong K.F World scientific	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	quiz
Day-59	visualization of bimolecular	To know the applications of visualization of bimolecular	Text book by Chua C.K., Leong K.F World scientific.	<ul style="list-style-type: none"> • Previous class revision-5 mins • Explanation of current topic -45 mins. • Discussion of the topic-5 mins 	Assignment

Day-60	UNIT-1	To clear any doubts regarding unit-1	<ul style="list-style-type: none"> • To prepare unit-1 	<ul style="list-style-type: none"> • Revising basic concepts of unit-1 	preparation
Day-61	UNIT-2	To clear any doubts regarding unit-2	<ul style="list-style-type: none"> • To prepare unit-2 	<ul style="list-style-type: none"> • Revising basic concepts of unit-2 	preparation
Day-62	UNIT-3	To clear any doubts regarding unit-3	<ul style="list-style-type: none"> • To prepare unit-3 	<ul style="list-style-type: none"> • Revising basic concepts of unit-3 	preparation
Day-63	UNIT-4	To clear any doubts regarding unit-4	<ul style="list-style-type: none"> • To prepare unit-4 	<ul style="list-style-type: none"> • Revising basic concepts of unit-4 	preparation
Day-64	UNIT-5	To clear any doubts regarding unit-5	<ul style="list-style-type: none"> • To prepare unit-5 	<ul style="list-style-type: none"> • Revising basic concepts of unit-5 	preparation

Day-65	UNIT-6	To clear any doubts regarding unit-6	<ul style="list-style-type: none"> To prepare unit-6 	<ul style="list-style-type: none"> Revising basic concepts of unit-6 	preparation
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Text Books:

1. Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications.

References:

2. Additive manufacturing Innovations, Advances and Applications by T.S.Srivatsan and T.S.Sudharshan by CRC press.

3. Additive manufacturing technology by Hari Prasad and A.V. Suresh by CENGAGE publications.



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DEPARTMENT OF MECHANICAL ENGINEERING
EMBEDDED LESSON PLAN

A.Y. : 2020-2021

Subject: Additive Manufacturing

Class : IV B.Tech I Semester, Section-A

Faculty: Dr.M.Geeta Rani

Programme	B.TECH-MECHANICAL ENGINEERING
Semester	VII
Subject Title	ADDITIVE MANUFACTURING
Code	R164103D
Hours	6
Total Hours	63

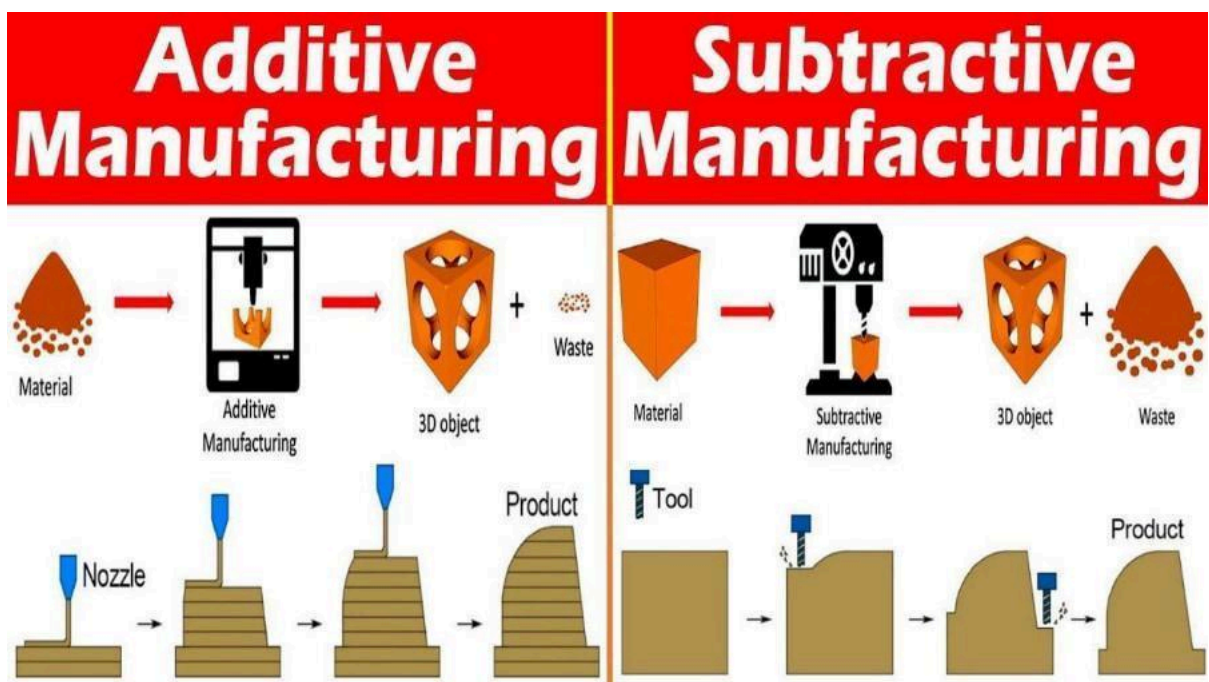
Credits	3
Max Marks	100
Unit & Title	Unit-1: Introduction to 3D printing and its importance
T-L tools	Lecture method, Audio Visual aid: Discussing about 3D printing importance and its applications by offline class teaching, video lectures, industrial examples.

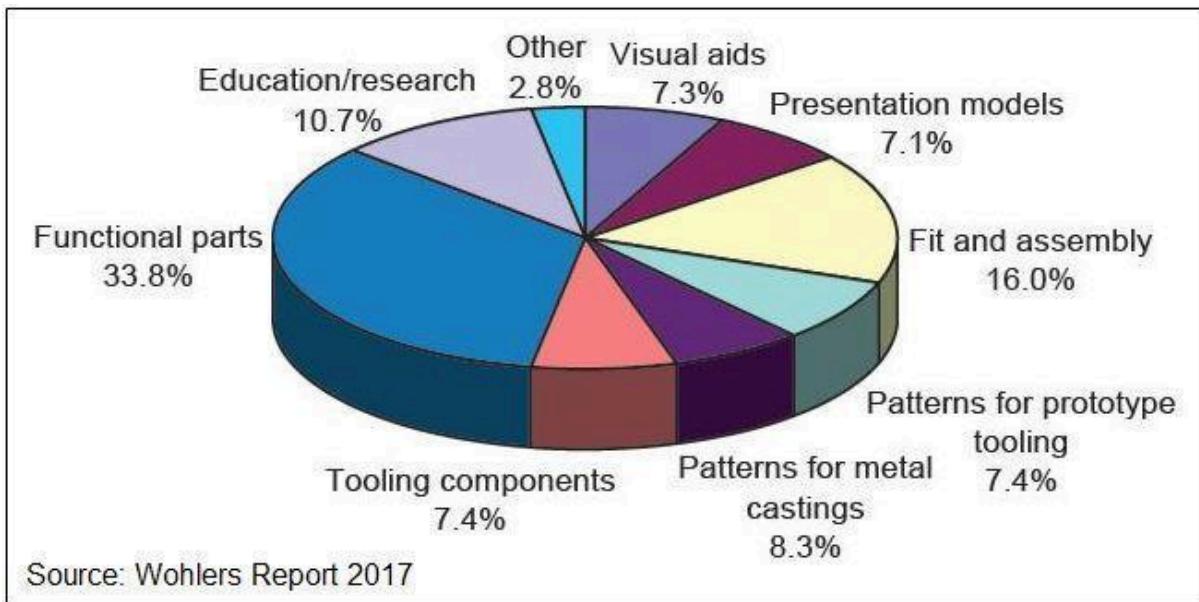
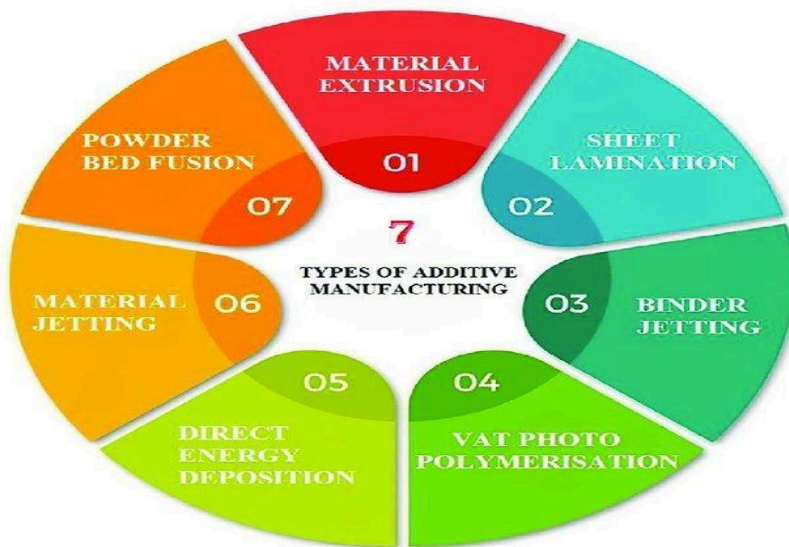
Prerequisite Knowledge: Introduction to 3D printing and its importance and applications

1. Topic for Learning through evocation;

Video lecture-<https://www.youtube.com/watch?v=KQ-Ikmm-1YA>

2. Topic Introduction: Introduction to 3D printing and its importance and applications



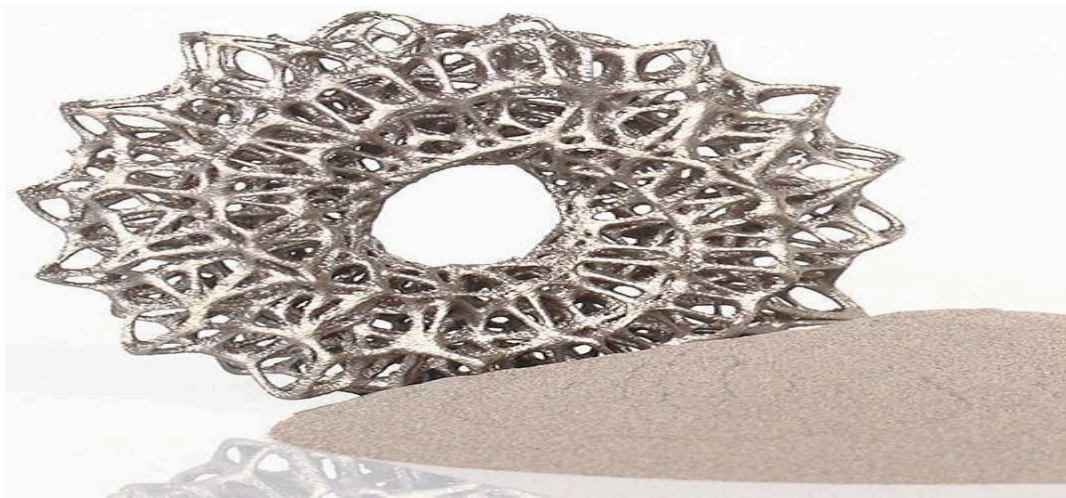
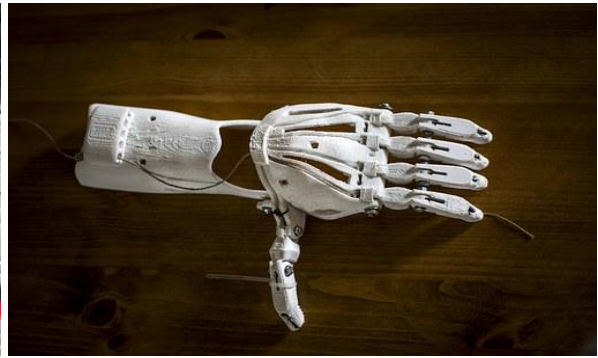
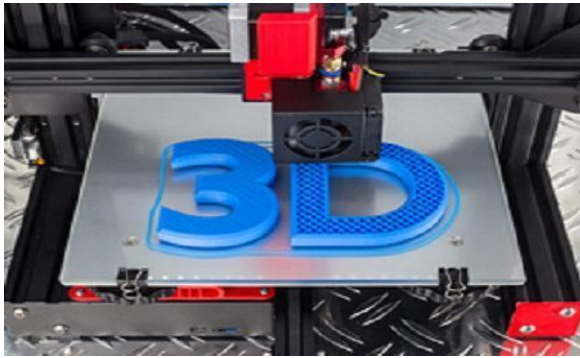


3.Discussion.

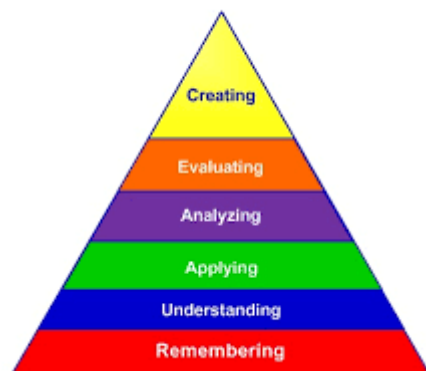
The students should know the importance of 3D printing, where it is used, the basic applications.

4.Summary. “Additive manufacturing” (AM) describes the use of 3D printing to make functional components, including tools and end-use production parts. Unlike “subtractive manufacturing” processes such as machining, where parts are created by removing material, additive manufacturing builds geometries by “adding” feedstock such as filament, wire or powder.

Depending on the 3D printing process and application, additive manufacturing can utilize a growing catalog of materials including metal alloys, thermoplastics, thermoset polymers and composites



Blooms Taxonomy - Revised



Taxonomy of Objectives

Taxonomy of Objectives						
Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual Knowledge	1,2	1,2,3				
B. Conceptual Knowledge	1,2,3	1,2,3				

5.FAQ's:

1.Additive mfg uses much less material than other subtractive mfg processes.

True False

0. You can send a file through a usb cable, thumb drive, or cloud server to the machine.

True False

**3. File type most commonly exported from CAD SLDRT
JPG STL X3G**