



(Approved by AICTE, New Delhi / Affiliated to Anna University / Accredited by NAAC) Dindigul — Palani Highway, Dindigul — 624 002

INSTITUTION'S INNOVATION COUNCIL

WORKSHOP ON PROTOTYPE DESIGN & DEVELOPMENT

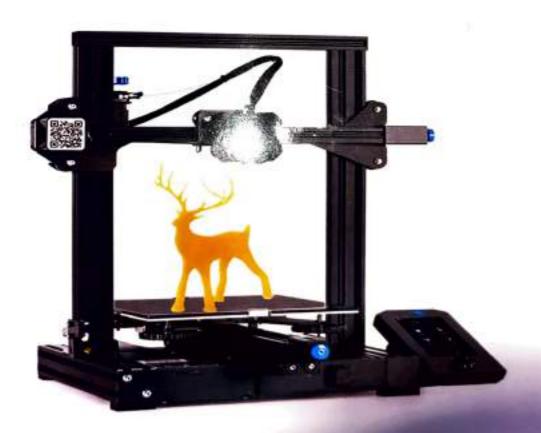
(3D PRINTING)



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DEPARTMENT OF MECHANICAL ENGINEERING

TECHNOLOGY TRAINING ON 3D PRINTING



REPORT CONTENTS:

- About the Training Program.
- Objectives and Outcomes of the Program.
- Event brochure.
- Introduction to 3D Printing.
- Event Schedule.
- Glimpses of the Training.
- Students Attendance.
- Assessment Sheet.
- Student's Feedback.

About the Event:

SSM Institute of Engineering and Technology is keen on giving the latest technologies to students. The aim of this training is to make students design their own prototype model with the latest 3D printing Technology. A total of 38 students from the department of Mechanical Engineering have actively participated in the training program. Mr. P. Dheenathayalan (AP/Mechanical) and Mr. M. Selwin (AP/Mechanical) have coordinated the event. The event was conducted in Mechanical CAD Lab from 28.03.2023 to 03.04.2023. Students have learnt to design their own model from Tinker CAD and fabricated their model using Fused Deposition Modelling machine.

Objectives of the event:

- Apprise the students of emerging trends in 3D printing technology and its applications in various fields.
- Impart the students with the fundamentals of various 3D printing techniques, such as liquid based, powder based, and solid based.
- Enable the students to use software tools for 3D printing, such as CAD modeling, G code generation, and data conversion.
- Help the students to optimize their design files for 3D printing, such as reducing material
 usage, ensuring print quality, and dealing with common issues.
- Enhance the student's creativity, design thinking, critical thinking, and collaboration skills by working on 3D printing projects.

Outcomes of the 3D printing Technology Training:

- Students have learnt about the materials, designing of CAD models, working of a 3D printer, and how to build and calibrate a 3D printer.
- Students have understood the basics of G code generation, which is a language used to control the movement and operation of a 3D printer.
- Students have got their own 3D printed models that were designed and fabricated by themselves which helped them to develop their creativity and design thinking skills.
- Enhanced the critical thinking and collaboration skills of the students by working on the
 3D printer with other students.
- Students have explored the applications and benefits of 3D printing in various industries such as aerospace, automobile, biomedical, electronics, fashion, and education.

Event Brochure:

SSM INSTITUTE OF ENGINEERING AND TECHNOLOGY DEPARTMENT OF MECHANICAL ENGINEERING



TECHNOLOGY TRAINING on

3D PRINTING



Resource Persons Mr. P. Dheenathayalan (AP/MECH) Mr. M. Selwin (AP/Mech)

28.03.2023

TO

03.04.2023

CONVENORS

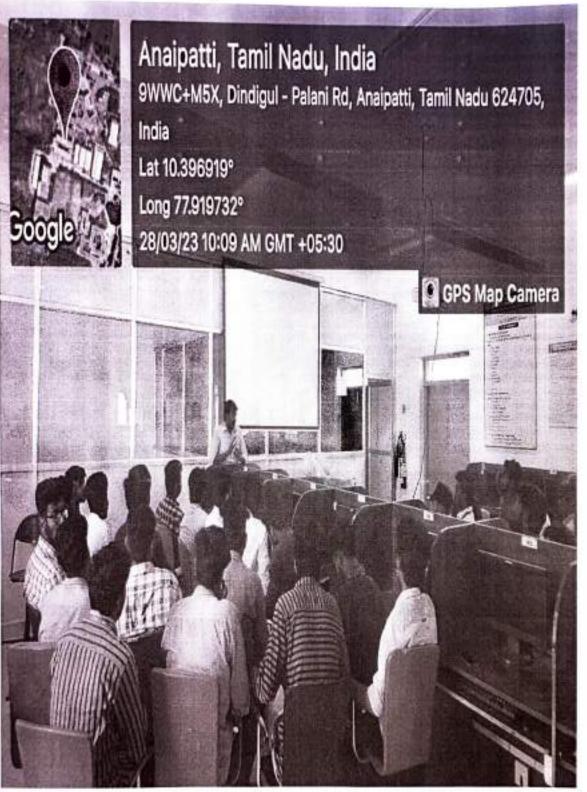
Dr. G. Sankaranarayanan HOD/Mechanical

Dr. D. Senthil Kumaran Principal

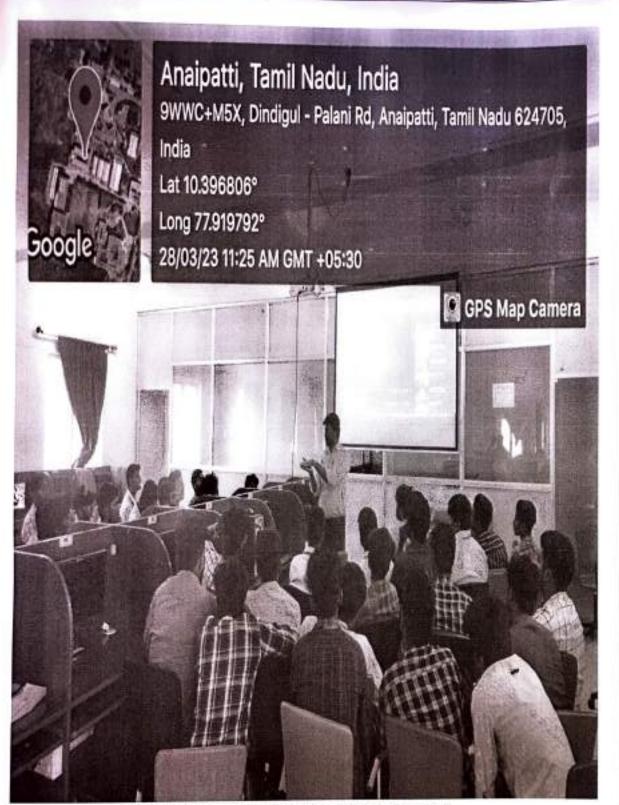
Event Schedule:

S,NO	DATE	SESSION	MODE OF TRAINING	CONTENT TO BE DELIVERED	
1			Lecture	Introduction: Subtractive vs Additive Manufacturing- History of Additive Manufacturing- Evolution of Additive Manufacturing- Advantages- Applications	
2	28.03.2023	FN	Video Demonstration	Additive Manufacturing Techniques: Vat photopolymerization, Material Extrusion, Material Jetting, Binder Jetting, Powder bed fusion, Direct energy deposition and Sheet lamination, Selective Laser Sintering, Direct Metal Selective Laser Sintering.	
3		AN	Hands on Training	AUTODESK TINKER CAD: Object Modeling using Basic	
4		FN	Lecture	Types of FDM printer: Cartesian, Polar, delta, Robotic (SCARA) Main Parts and Construction of FDM printer: Frame, Linear rods, Linear motion bearings, Slider/Carriage, V slot extrusion, Pulley, belt, Lead screw Arduino processor, Controller board, Limit Switch, Hot end, Extrusion system:	
5	29.03.2023		Lecture	Principle of FDM/FFF printing, Basic steps to perform FDM printing, Significant process parameters of FDM printing, layer height, raster angle, raster width, build temperature, Nozzle temperature, orientation, printing speed etc.	
6		AN	Hands on Training	Ultimaker CURA: Add Printer, Manage Printer, Machine Settings, Modifying G Codes, Customizing Material & Nozzle Size, Importing STL file, Aligning object to Printing Position, Quality Settings, Infill Settings, Printing Temperature, Support Settings, Build Plate Adhesion, Fan Cooling Settings, Slicing: Generating G Code Files. FDM Machine Operations: Filament Loading and Unloading, Manu Control System.	
7				Lecture	FDM Materials: PLA, ABS, PETG, Nylon, PVA, PC, TPU, Carbon reinforced nylon, ceramics, metals, Dual and multi- material etc. Introduction to 3D Scanning
8	31.03.2023	03.2023 FN	Lecture	Applications of FDM printer in AM, Applications of AM: Aerospace, Biomedical, Automotive, Bio-printing, Tissue & Organ Engineering, Architectural Engineering, Surgical simulation, Art, Health care	
		AN	Hands on Training	Make a cube of any dimension using FDM 3D Printer.	
9		FN	Hands on Training	Download a .stl file of simple object from internet, convert into Gcode and print with FDM 3D Printer at 30% infill density. Download a .stl file of simple object which require support material from internet, convert into G-code and print with FDM 3D Printer.	
				Design and print objects containing moving parts withou assembly.	
13760	03.04.2023	757	Hands on	Design the Coupling in 3D modeling software and print it using PLA material. Design the Key ring of your own name in 3D modeling software and print it using PLA material.	
10		AN	Training	Emboss / Engrave your name on a 3D object and print it will PLA material.	
				Print your photo with the help of LITHOPLANE. ASSESSMENT	
11	03.04.2023	AN		ASSESSMENT	

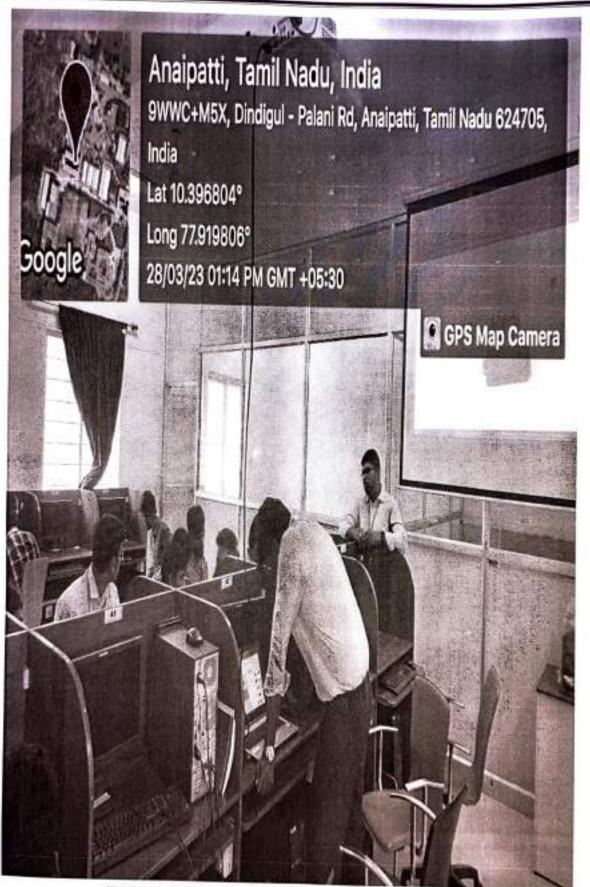
Glimpses of the Training:



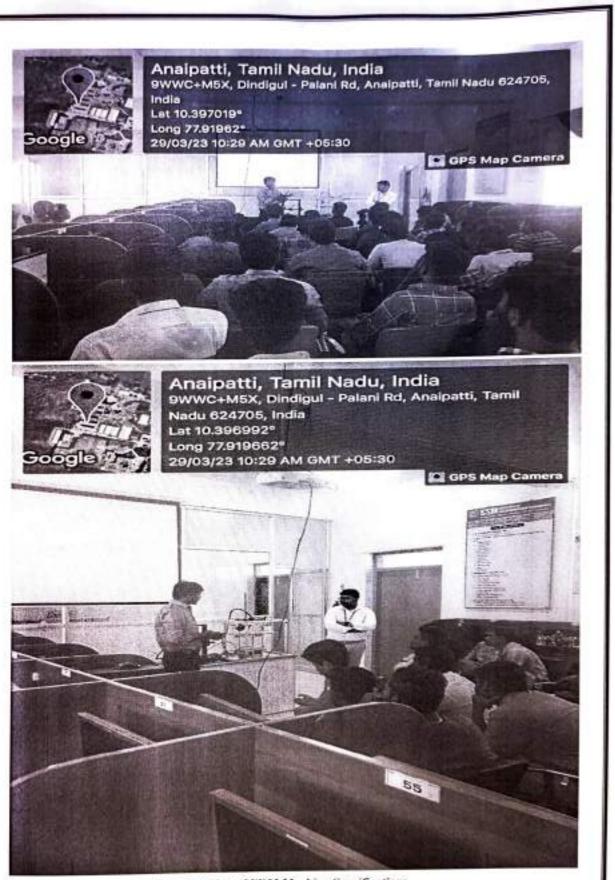
Introduction to Additive manufacturing by Mr. P. Dheenathayalan (AP/Mech)



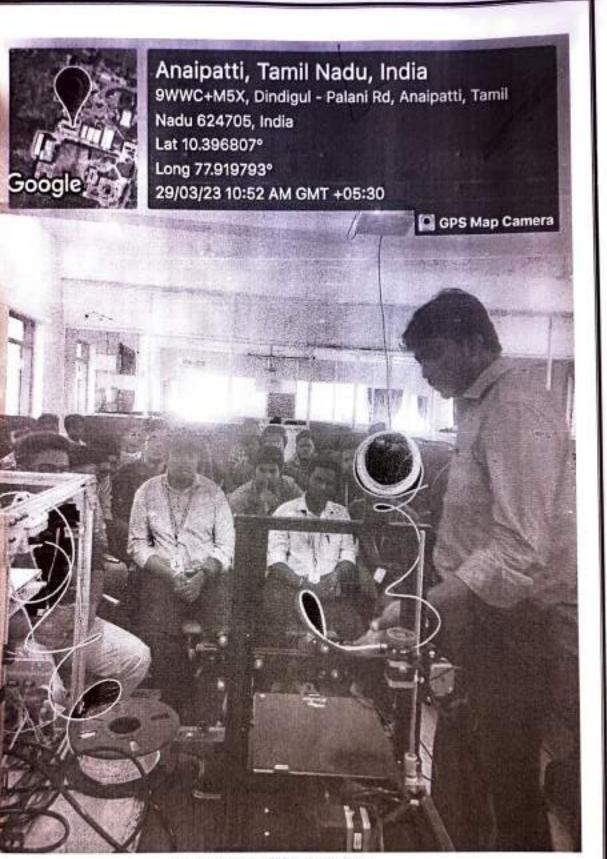
Video Demonstration on Additive Manufacturing Techniques



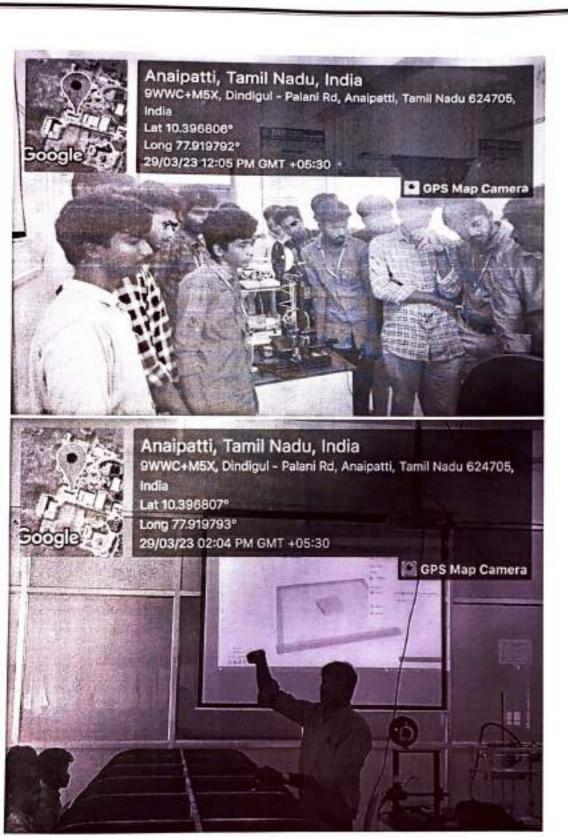
Hands on Training on TINKER CAD by Mr. M. Selwin (AP/Mech)



Demonstration of FDM Machine Specifications



Demonstration of Material Feeding



Demonstration on slicing using Ultimaker Cura



Machine Parameter setting on creality ender 3 machine



Students creating their own model using tinker cad

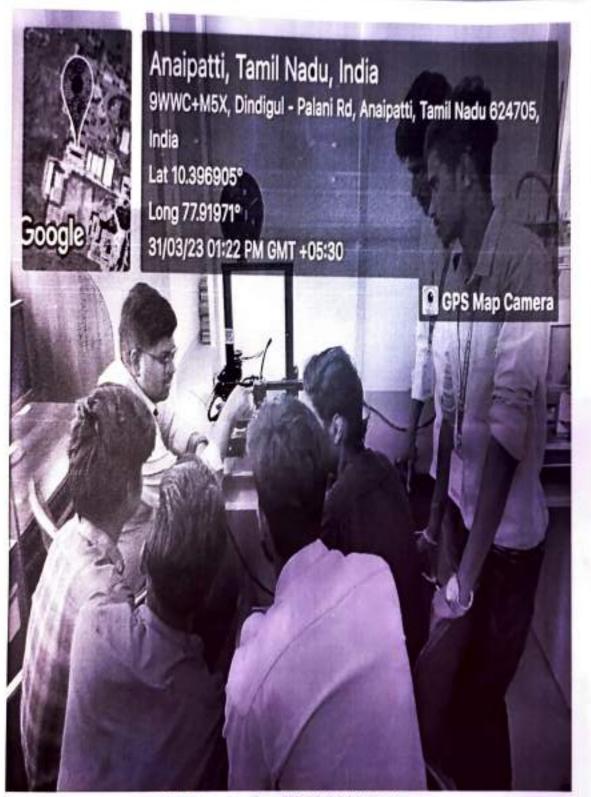
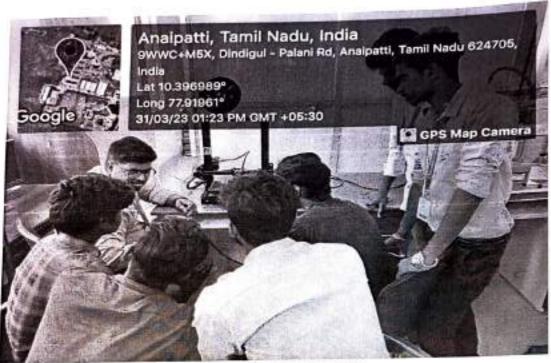
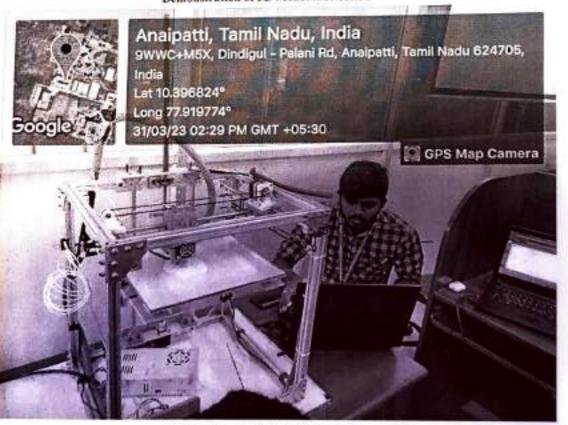


Fig 8. Demonstration of 3D Model fabrication



Demonstration of 3D Model fabrication



3D Model preparation by a student



Anaipatti, Tamil Nadu, India

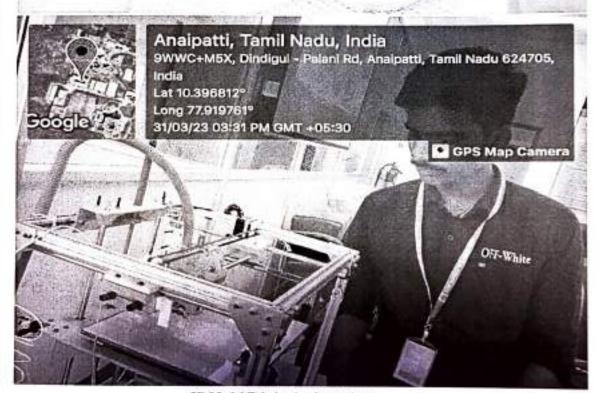
9WWC+M5X, Dindigul - Palani Rd, Anaipatti, Tamil Nadu 624705, India

Lat 10.396873°

Long 77.919788°

31/03/23 03:31 PM GMT +05:30

GPS Map Camera



3D Model Fabrication by students

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FACULTY INCHARGES

Mr. P. Dheenathayalan

Mr. M. Selwin

HOD/MECHANICAL

Dr. G. Sankaranarayanan



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NAME: A. RAKUL RAJ

RIGHO: 92212/114021

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DEPARTMENT OF MECHANICAL ENGINEERING

. Additive manufactur	Frinting Technology Training Assessment sheet
processes.	ring uses much less material than other subtractive manufacturing

a True

b) False

2. Which of the following is typically the cheapest type of 3D printer?

DISLA

c) Powder-based

d) SLM

3. What material is not used in 3D printing? a) Nylon b) ABS

c) PLA

4. What does SLS stand for?

*) Selective laser sintering

b) Selective lithographic solution

c) Separated light sintering
 d) None of the above

Cura is a software which is primarily used for

a) Designing

b) Slicing

c) Post Processing your 3D Printed Model

d) Changing the colour of your model.

6. In Cura, after loading an object, if the object is yellow in colour, it means

a) The object will get printed in yellow colour.

b) The object is way too big to be 3D Printed.

c) There are design errors in the model.

d) The object can be 3D Printed as it is smaller than the build volume of the 3D Printer.

What is an STL?

The initial pre-sliced file.

b) The final sliced file.

c) A type of filament.

d) The coding program.

8. What is infill?

Extra material printed inside to avoid collapse. We usually print at 20%,

b) The designed object is turned into layers.

e) Extra material printed on the outside of the object to support overhangs.

d) The filament is cut.

9. What happens during slicing?

a) The filament is cut.

★f) The designed object is turned into layers.

Extra material is printed inside the object.

d) Extra material is printed outside to support overhangs.

10, Name this paperof the 3D printer ...

a) Extruder 6) Nozzle

er Print Bed d) Axis

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	a) :	D obje	cts are	made in	layers, it	Is all acre	process.			36
	D) :	D obje	cts are:	created t	ising a su	Ditter				E
	c) :	3D obje	cts prin	it from the	he compu	ter.	om the in	ternet.		
	d) :	3D obje	cts are	downloa	ided and t	printed ii	om the in			
1		at is a C								
- 3				March 6	le.	-de				
	200	The fin	al slice	d file tha	t the print	ter reads.				
	~	A type	of Glar	nent						1
	d)	The co	ding pr	ogram.						
	1,000				mean?					
- 1	3. Wh	at does	layer r	esolution	Inches					
	a)	A kind	of fila	ment						
100	b)	The sh	ape of	the object	L.					
1	c)	How d	ctailed	the object	et prints.					
ð.	d)	A file	types.							
5		hat are s	nnorf	s?		100000	u-se W	e usually pri	nt at 20%.	
	14. WI	Eutro :	materia	1 printed	inside to	avoid co	napse. "			
	a)	The	winned	object is	turned in	ito layers	i. biod	t to support o	verhangs.	
	b)	Inc de	signed	Lorinted	on the ou	itside of	the object	(to seebbare	30 000 000 000 000 000 000 000 000 000	
1	(F)	Extra	materia	in out						
,	d)	The fi	lament	15.000						
	15 W	hat is a	n extruc	ter?		See Man	Glament			
	13. W	Ou is th	e part o	of the pri	nter that r	melts the	filament. e filamen	ot down.		
	10)	It is th	e nart o	of the pri	nter that p	pushes th	e filamen 3D objec	et ac it prints	98	
	D)	It is the	o part o	of the pri	nter that h	holds the	3D objec	et as it prints		
	c)	It is to	ented to	a lower	temperate	ure.				
	10000									
	16 W	hat type	e of 3D	Printer o	lo we hav	re?		d) Robo	arm	
	100. 11	rtesian	b) Po	lar	c) Delta		d) Kobo	carrier.	
1	ay Cas	(CSIA)	.,,,,						oo dimensio	nal formats
20	17. Sc	oftware	that en	ables use	rs to crea	te model	s in eithe	r two- or un	ee-dimensio	
	(Tink	er cad)								
	(11111)	Comr	uter Ai	ded Des	ign / CAI)				
	b)	Polyle	actic A	cid (PLA)					
1	- 1	Funnd	Dance	ition Mo	delling (I	FDM)				
100	c)	ruseo	lue Ma	nufacturi	neumb (Dirij				
	d)	Addit	ive Ma	nutacturi	ng					
	18. T	he inter	ior stru	cture of	3D print	ted mode	el.			
9210	- 1	Nozz		B) Infi	11	c	x-axis	d) y-ax	is	
1-		4	(A)	3500000	10					
	19. T	he base	materia	al that's u	ised to 31	print o	bjects via	a fused depo	sition model	ling.
	a) No			ament		bed d				
	20 11	/high (1)	la tress	e most -		C C.	D			
			e type	is most e	xported 1	from CA	D softwa	are?		
	a) SL									
	b) JP									
1	e)/ST	L								
	d) X3	Ci								

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DEPARTMENT OF MECHANICAL ENGINEERING

FEED BACK FORM TECHNOLOGY TRAINING ON 3D PRINTING

	ement. Your views are very important and will help us to imp		-	_	1	1 - 1		7
	Scoring Example		5	4	3	2	1	1
1.	The 3D Printing Training provided at this event is relevant to you.	High	V					Lov
2.	You are likely to use this information in the future	High			/			Lov
3.	Presentations and Hands on Training were interesting and useful.	High	/					Lov
4.	How would you rate the proficiency of the resource persons?	High	V					Low
5.	Overall, the event was worthwhile	High		/				Low
6.	The venue and facilities was suitable	High	~					Low
7.	Are you confident of creating your own model, Slice it and print using a 3d printer.	High	V					Low
7. 8.			V 3d ared	perent	teis .	Shoul	ld .	Lo

Jivaran Signature

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FEED BACK FORM TECHNOLOGY TRAINING ON 3D PRINTING

Name	of the Student :_	/	1 VIGNESH			(Opti	ional)				
	f the Event:		28-03-23								
please r improve	respond to the following ement. Your views are v	questions ery import	by ticking one box ant and will help us	only fo	r each que ove our ev	stion. if y ents, faci	rou have lities, etc	any crit	icism or	sugges	tions for
	Sco	ring E	cample			5	4	3	2	1	Ţ
1.	The 3D Printing Tr is relevant to you.	aining p	rovided at this ev	vent	High	/					Low
2.	You are likely to u	se this ir	formation in the	. [High						Low
3.	Presentations and I interesting and use		Training were	[High						Low
4.	How would you rat resource persons?	e the pro	ficiency of the	[High	/					Low
5.	Overall, the event v	vas worti	nwhile	[High						Low
6.	 The venue and facilities was suitable 				High		1				Low
7.	Are you confident of Slice it and print us			lel, [High		/				Low
8.	Comments/ sugges (If any)	tions	Experient 14 makes	es if	a ne b it i	very	lar possi	thfu for ble	busn by	ess \); clince
			<u> </u>						٨.	كسهدا	L

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FEED BACK FORM

lease	respond to the following questions by ticking one box only frement. Your views are very important and will help us to imp	or each qu	estion. if	you have	any criti	icism or	sugges	tions fo
15.77	Scoring Example	iore our c	5	4	3	2	1]
1.	The 3D Printing Training provided at this event is relevant to you.	High	1					Low
2.	You are likely to use this information in the future	High	1					Low
3.	Presentations and Hands on Training were interesting and useful.	High	1					Low
4.	How would you rate the proficiency of the resource persons?	High	1					Low
5.	Overall, the event was worthwhile	High		V				Low
6.	The venue and facilities was suitable	High	V					Low
7.	Are you confident of creating your own model, Slice it and print using a 3d printer.	High	1					Low
8.	Comments/suggestions (If any) To continue students.	houl box	go upi	r m onui	e a cng	nd	Br nio	iena Y

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FEED BACK FORM TECHNOLOGY TRAINING ON 3D PRINTING

Scoring Example		22.50	4	3	4		1
		-					
3D Printing Training provided at this event levant to you.	High		V				Lov
are likely to use this information in the	High	V					Low
entations and Hands on Training were esting and useful.	High	V					Low
would you rate the proficiency of the urce persons?	High	N					Low
all, the event was worthwhile	High		V				Low
venue and facilities was suitable	High	1					Low
you confident of creating your own model, it and print using a 3d printer.	High		1				Low
	erant to you. are likely to use this information in the entations and Hands on Training were esting and useful. would you rate the proficiency of the arce persons? rall, the event was worthwhile venue and facilities was suitable you confident of creating your own model, it and print using a 3d printer.	erntations and Hands on Training were esting and useful. High would you rate the proficiency of the arce persons? Fall, the event was worthwhile High wenue and facilities was suitable you confident of creating your own model, it and print using a 3d printer.	erntations and Hands on Training were esting and useful. High High would you rate the proficiency of the arce persons? Fall, the event was worthwhile High High	ereant to you. If are likely to use this information in the recentations and Hands on Training were esting and useful. If would you rate the proficiency of the arce persons? If all, the event was worthwhile If and facilities was suitable If you confident of creating your own model, are and print using a 3d printer.	are likely to use this information in the entations and Hands on Training were esting and useful. High High Would you rate the proficiency of the arce persons? Fall, the event was worthwhile High Would you confident of creating your own model, it and print using a 3d printer.	are likely to use this information in the entations and Hands on Training were esting and useful. High High Wall High Wall High Wall High Wall High Wall High Wall Wenue and facilities was suitable wou confident of creating your own model, it and print using a 3d printer.	are likely to use this information in the entations and Hands on Training were esting and useful. High High High High High High High High

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ONE PAGE WRITE UP TECHNOLOGY TRAINING ON 3D PRINTING

me of the Student	: SIVARAM. TV	(Optional)
e of the Event:	3-5 FRINTING	
INSTITUTE Conducted It is Mr. I doing leigh 3 d P all created	On the OF ENGINE d an works works where their Phid works where and the students a model on After this acquired a acquired	Augost of 2023, the SSM ERINA & TECHNOLOGY has shop on 3.d parenting by Mr. SELWIN and Since both of them are work in 3d printers they have that field. Ity have two creatity ender self made 3.d printer. So, have designed and their own. workshop most of our basic knowledge in 3.d printing
		Signature

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(Optional)

Signature

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ONE PAGE WRITE UP TECHNOLOGY TRAINING ON 3D PRINTING

f the Event: 30 Printing
On march 2023 the institution
conducted workshop on 30 printing. by Mr. Salwi
and Mr. Dhayalan, During the workshop all students
are active we all learned a new
skill and gain knowledge about 30 prinates
and slicing softwate, and designing software
Chusion 360, on shape), workshop was conducted
for 4 day but it is not enough for
us. So next time conduct work shop
minimum 10 days. Nowadays 3d printing
technology is growing well . So thankyou
for initiating the workshop on ar printing.