

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE

Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506015, TELANGANA, INDIA

काकतीय प्रौद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६०१५, तेलंगाना, भारत

కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, పరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము

(An Autonomous Institute under Kakatiya University, Warangal)





(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

Annual Report for Academic Year 2022-23

Center of Excellence

INDO-AMERICAN ARTIFICIAL HEART PROJECT (IAAHP)

IAAHP TEAM

			
Prof. K. Eswaraiah Dept. of <u>ME</u>	Prof. K. VenuMadhav Dept. of <u>EIE.</u>	Dr. G. Ganesh Kumar Dept. of <u>ME</u>	Dr. G. Saikumar Dept. of <u>ME</u>

Indo-American Artificial Heart Project (IAAHP) has been started in the year 2016 headed by **Dr. Pesaru Sudhakar Reddy**, MD, Professor of Medicine, University of Pittsburgh Medical Center (UPMC) and Chairman, Science Health Allied Research & Education (SHARE), Pittsburgh, PA, USA. Our Institute has joined the team in March 2018.

Objectives of IAAHP for AY 2022-23:

- To publish an abstract in ASAIO-2023
- Develop a prototype model of centrifugal pump using 3D Printer.
- To Perform Haemolysis Test and reach required Normalized index of Haemolysis using mock up loop test rig designed by IAAHP KITSW team.
- Perform Computational Fluid Dynamics (CFD) Analysis of fluid flow using ANSYS work bench for modelling.
- To study the properties of magnet
- To perform Animal test on Centrimag Pump
- To study the properties of Magnet

Outcomes:

1. **Published One Conference Paper in American Society of Artificial Internal Organs (ASAIO) Journal, USA.**

Rugveda Thanneeru, Sadia Alvi, **Sai K. Gadakary, Ganesh K. Gampa**, James Antaki, Harvey S. Borovetz, Naveen Chander Reddy, P. S. Reddy, (2023), "INDUS: Economical Maglev Centrifugal Blood Pump for Developing Countries- Preliminary In-Vitro Hemolysis Testing", ASAIO Journal June 23, Volume 69, ISSN 1058-2916, pp 63, Wolters Kluwer Publishers (**Published abstract in ASAIO SCI Journal**)

2. Department of Mechanical Engineering has generated theoretical Head-discharge (H-Q) curves for pump using Computational Fluid Dynamics (CFD) Analysis using ANSYS work bench for modelling and analysis of Heart
3. Mock up Loop Test rig was developed to study the characteristics of blood flow experimentally.
4. Performed Haemolysis Test and ran the mock up Successfully
5. Developed a centrifugal pump prototype model using 3D Printer.
6. The tongue groove design, was modified according to the glue dispensing requirements.
7. The dispensing of Dymax-1201 glue using Hyrel 3D printer was experimented and made success.

8. The effect of different curing times and curing methods were tested and made succeed.
9. KITSW is coordinating with the Animal experiments which are being performed at Palamuru Biosciences, Mahabubnagar.
10. Coordinated with Vasantha tool crafts Pvt Ltd., Balanagar in the manufacturing of the pump parts using Polycarbonate.
11. The effect on vWF due to the attachment of pump is currently being studied with the help of AIG hospital, Gachibowli.
12. Organized "A One Week Short Term Training Programme on **Hands on Programme on Additive Manufacturing (HPAM)** from 11-16 March , 2023", Kakatiya Institute of Technology and Science, Warangal. (Annexure report)


Details of Expenditure for Academic Year 2022-23:



S. No	Details of Expenditure	Amount in INR
1	Expenditure Spent on Major Equipment Purchased/ Purchase of Software:	Nil
2	Incentives/ Sponsorship/TA-DA/Rent Allowance etc., to Faculty	₹ 2,67,319.00 (Rupees Two lakhs Sixty Seven Thousand Three hundred and Nineteen Only)




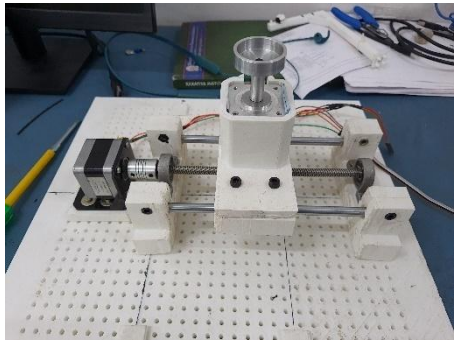
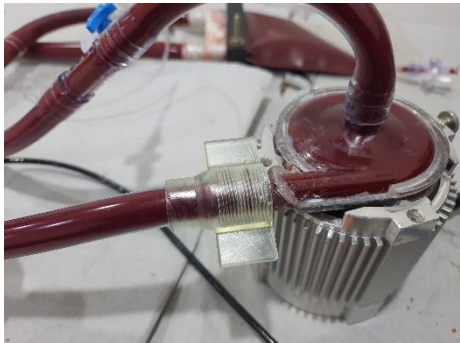
List of equipment available /Facilities Available in IAAHP Lab as on Date:




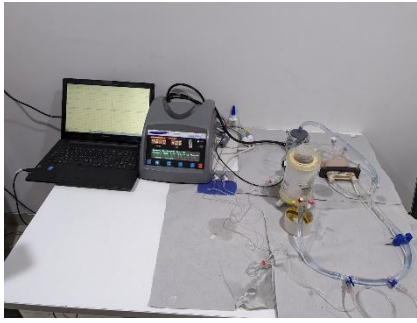
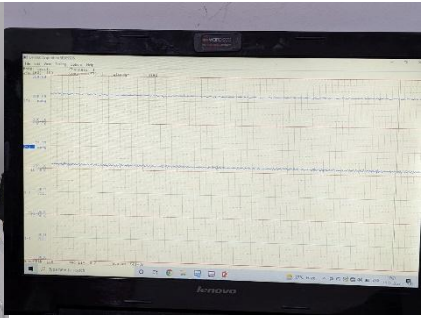
S. No	Name of the Equipment/ Software	Cost of the equipment/ Software in ₹	Purpose of the equipment
3D Printer			
1	<i>SLA Form 3B + Sponsored by Alumni -Class of 1996 Exit Batch</i>	6, 77, 000-00	To generate the working model of the pump with surface finish of less than 0.2 µm
2	Mark Forge Mark Two 3D printing machine	16, 22, 500-00	To generate the working model of the pump using Onyx Material
3	Flash forge Dreamer Dual Extruder -Think 3D	85,000-00	To generate the experimental models of an artificial heart pump
4	ANSYS 19.2	5, 01, 500-00	To Simulate the fluid flow through pump
5	WORKSTATION-HP Z8 Work Station	10,68,000-00	To Generate H-Q Curves of an Artificial Heart Pump
Approximately Total Cost Spent Till Now including Sponsored faculty is about Eighty Lakhs Fifty Five Thousand Rupees Only		₹80, 55, 000-00	

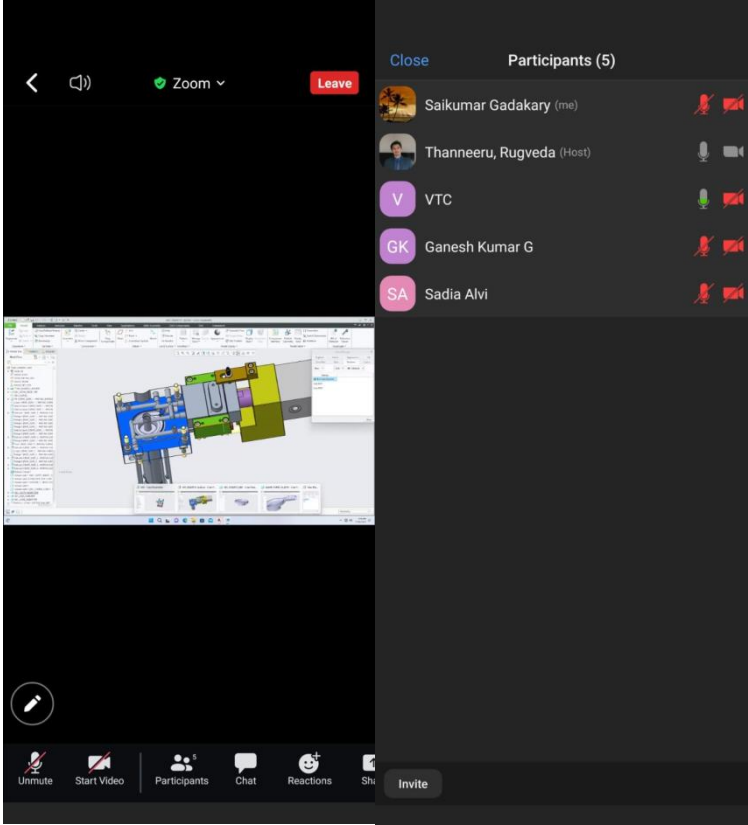

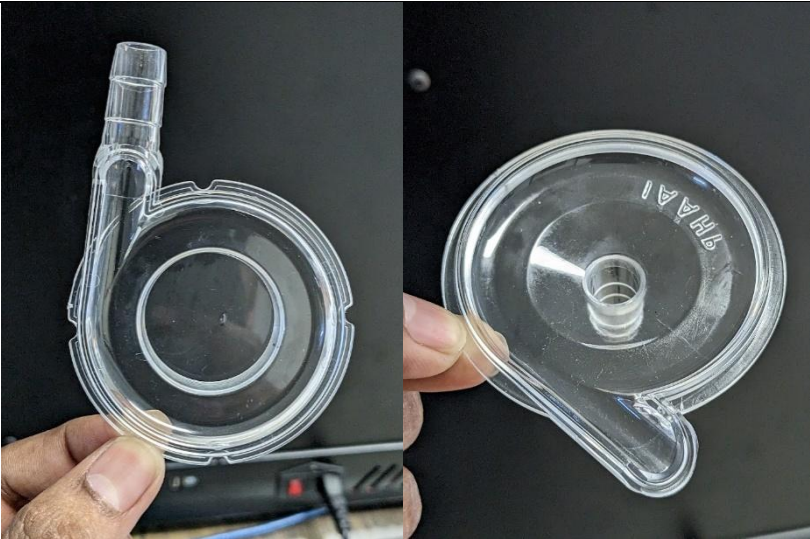
Mile Stones / Important Events during 2022-23

1	Collaboration with BITS Hyderabad for Von Willebrand Factor testing	 <p>PS REDDY Wed, Aug 10, 5:30 PM ☆ AGENDA for the meeting 1.Presentation by Sadia alvi 2. What is WWF?...</p> <p>Sadia Alvi Thu, Aug 11, 6:19 PM ☆ ↩ ⋮ to PS, Suman, Podduturi, me ▼</p> <p>Minutes of meeting Date and Time- 11th August 22, 4:00 pm (IST) 6:30am (EST) Attended by- Dr. P.S.Reddy, Dr. Naveen Reddy, Dr. Suman Kapur, Dr. Saikumar Gadakary, Sadia Alvi</p> <ol style="list-style-type: none">1. Sadia made a presentation about physiology and pathological syndromes related to VWF. She listed the types of tests to be done, equipment required and costs.2. Dr. Suman Kapur stated that she has all the equipment listed except item 11 and 12 from list 1 and items 13, 21, 22 and 24 (optional) from list 2. PFA both the lists in the excel sheet.3. Dr. Suman Kapur will provide the list of the supplies to be purchased, and their costs. She will either ask the items to be purchased and delivered or have costs reimbursed and she will purchase.4. Dr. Naveen Chander Reddy will discuss with Dr. Anuradha and Dr. Shashikala regarding available equipment, repairs required and feasibility of doing tests at AIG.5. Next meeting a week from now- 18th August, 4:00 PM(IST)/ 6:30 AM (EST)
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2	<p>Pump v5 with tongue and groove using Clear resin 19.08.2022</p>	
3	<p>24 Hour Animal Experiment conducted at PBS, Mahabubnagar with centrimag pump 08.09.2022 - 09.09.2022</p>	

			
4	<p>Visit to Laxven Systems 10.09.2022 and interacted with Ch. Ramesh Reddy Sir regarding study on Magnet Properties</p>		
5	<p>Ring thrombosis test on Centrimag and Injection moulded pump using Mickey Mouse connector for 24 hours each using human blood</p>		

	<p>23.09.2022- 26.09.2022</p>	
<p>6</p>	<p>3D printed modified design of ickey Mouse Connector for centrimag</p>	
<p>7</p>	<p>Hydrodynamic test of 3D printed V6 pump at 500 mmHg and 4LPM 12.11.2022</p>	  

8	<p>Discussion of the Die design over zoom meeting with Vasanta Tool Crafts, Balanagar</p>	
9	<p>Injection Moulded components with Tongue and Groove from KarthikMoulds and Dies, Balanagar 26.11.2022</p>	
10	<p>Injection moulded components manufactured by Vasanta Tool Crafts Pvt. Ltd.</p>	

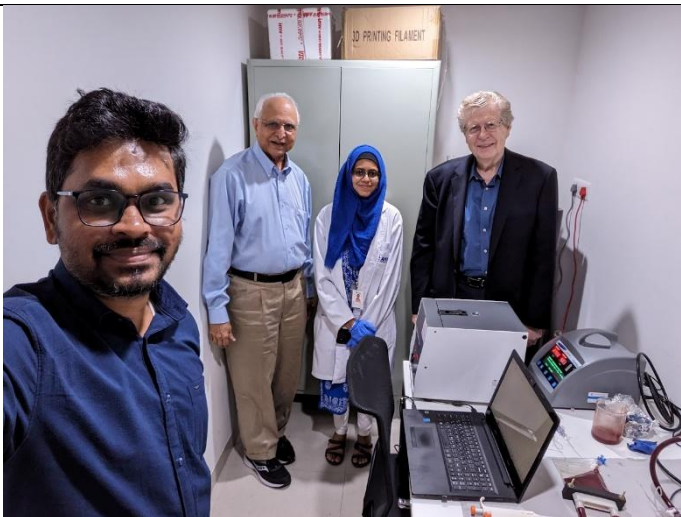
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Sheep study
conducted on
04.01.2023 at PBS.
The animal
survived for 30
Hrs.


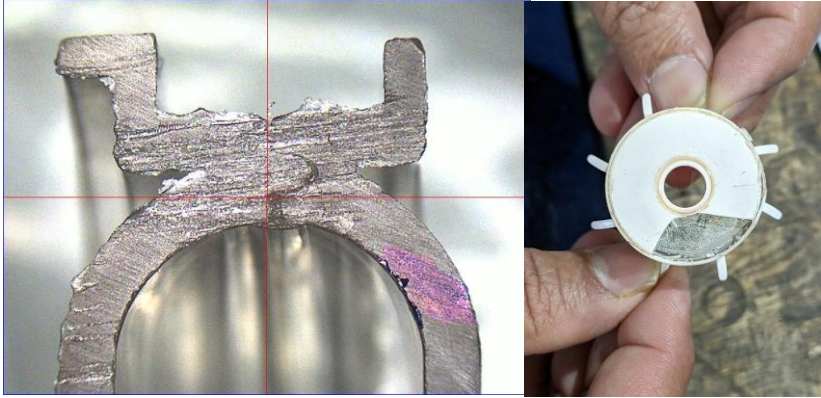
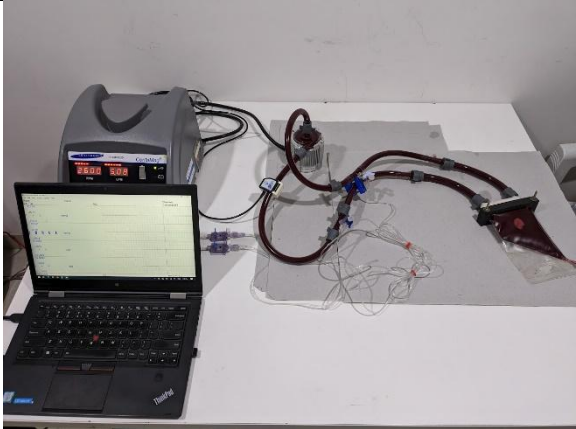
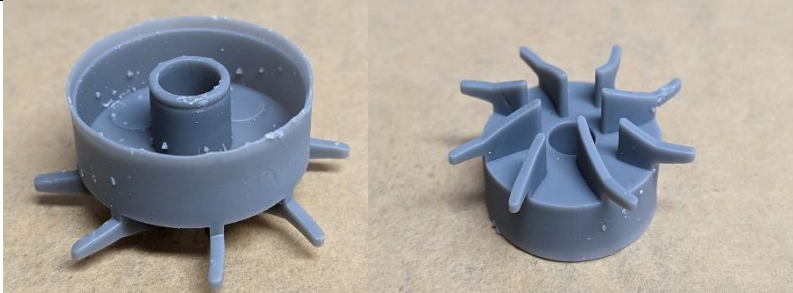




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Visit of Dr. James
Long to the lab at
AIG on 10.01.2023

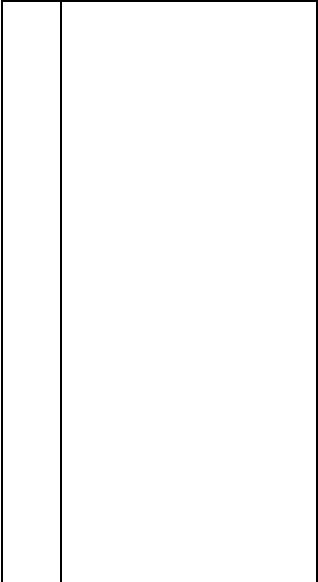


<p>13</p>	<p>Meeting held at Laxven systems on 11.01.2023.</p>	
<p>14</p>	<p>Meeting held at AIG Hospital on 12.01.2023</p>	
<p>15</p>	<p>Meeting at Vasanta Tool Crafts Pvt Ltd on 06.02.2023</p>	

		
16	<p>Observation of centrimag pump at Vasanta Tools.</p>	
17	<p>Ring thrombus test at AIG on 16.02.2023</p>	
18	<p>3d printed impeller with design modifications</p>	

		
19	<p>Visit of Mr. Suresh Kumar garu from Vasanta Tools to CBIT Hyderabad on 02.03.2023</p>	
20	<p>5 days animal experiment conducted during 7-14 March 2023. USA team visited and guided the experiment.</p>	

<p>21</p>	<p>Meeting at Laxven Systems 07.04.2023. Dr. PS Reddy has visited the facility and had a meeting with Mr. C. Ramesh Reddy. KITSW students Mr. Rahul and Mr. Nikhil are present along with Dr. Saikumar.</p>	
<p>22</p>	<p>Meeting at KITS Warangal on 20/04/2023. Dr. PS Reddy, Mr. C. Ramesh Reddy, Laxven systems and Mr. Suresh Kumar, VTC have visited KITSW.</p>	



23 Visit of Sri KTR,
Minister of IT,
Telangana to the
IAAHP lab on
05/05/2023



24

ASAIO 2023
conference
during 14-17
June, 2023
San Francisco,
CA, USA



25

One Week Short
Term Training
Programme on
**Hands on
Programme on
Additive
Manufacturing
(HPAM)** from
11-16 March ,
2023", at KITSW
(Annexure)



26	Installed Resin Type 3D printers in IAAHP lab	 A photograph showing three men standing in a laboratory setting. They are positioned around a wooden table that holds a resin 3D printer. The man on the left is wearing a light blue shirt and dark trousers. The man in the middle is wearing a light green shirt and dark trousers. The man on the right is wearing a blue and white plaid shirt and light-colored trousers. The printer is a yellow and black Anycubic model. The background is a plain wall with a power outlet.
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IAAHP KITSW team Members:

The following are the members involved in IAAHP in KITSW during 2022-23:

1. Dr. K. Eswaraiyah, Chairman, IAAHP, KITSW
2. Dr. K. VenuMadhav, Prof.&HoD, EIE, Member, IAAHP, KITSW
3. Dr. G. Ganesh Kumar, Assoc. Prof., Member, IAAHP, KITSW
4. Dr. G. Sai Kumar, Asst. Prof. Member, IAAHP, KITSW

Annexure



KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE : WARANGAL (TS), INDIA
(An Autonomous Institute under Kakatiya University, Warangal)

DEPARTMENT OF MECHANICAL ENGINEERING

One Week Faculty Development Programme on

“HANDS ON PROGRAM ON ADDITIVE MANUFACTURING”, March 11-16, 2023

One Week Faculty Development Programme on “*HANDS ON PROGRAMME ON ADDITIVE MANUFACTURING (HPAM-23)*” was organized from 11-16 March 2023, in the Department of Mechanical Engineering. A total of **Seven** resource persons have delivered lectures on various topics related to Hands on Program on Additive Manufacturing. Forty Seven (47) members have registered for the program.

Dr. Vivek Khatua, Ph. D. in Advanced Manufacturing, From Centre for Product Design and Manufacturing, Currently working for Multidisciplinary and Multiscale Device and Design Lab, Indian Institute of Science, Bengaluru was the chief Guest of the Inaugural Function of HPAM-2023. Capt. V. Lakshmikantha Rao, Secretary and Correspondent, KITSW and Member of Parliament, Rajya Saba, has presided over the function. Sri. P. Narayana Reddy, Treasurer, KITSW, has congratulated the organizers. Dr. K. Ashoka Reddy, Principal, KITSW, has emphasized the significance of the research towards fulfillment of needs of the society. He has further highlighted the achievements of Indo American Artificial Heart Project (IAAHP) team. Dr. K. Raja Narendra Reddy, Professor and Head, Department of Mechanical Engineering, Kakatiya Institute of Technology and Science, has appreciated the team HPAM-23 for organizing this event. He elaborated that, the program will provide a vast exposure towards Additive Manufacturing and its applications for participants. Dr. P Srikanth, Head I²RE & Professor of ME discussed about the significance of 3D Printing technology in the present scenario. Dr. G. Ganesh Kumar has given a brief introduction about HPAM and the proceedings of the five day program. Sri. A Hari Kumar has advocated the details of the participants from various institutes.

Subsequently, Dr. Vivek Khatua, Ph. D. in Advanced Manufacturing, From Centre for Product Design and Manufacturing, Currently working for Multidisciplinary and Multiscale Device and Design Lab, Indian Institute of Science, Bengaluru has delivered a key note address on “New challenges in additive manufacturing and beyond”. Dr. A. Hari Kumar has introduced the resource persons for FDP from various organizations.

One Week Faculty Development Programme on

“HANDS ON PROGRAM ON ADDITIVE MANUFACTURING”, March 11-16, 2023

Organized by Department of Mechanical Engineering

A one week FDP on Additive Manufacturing was organized from 11-16 March 2023

11-March-2023: 10.00am -10.45am
Inauguration Function





11-March-2023: 11.00am -12.00pm
Key Note Address

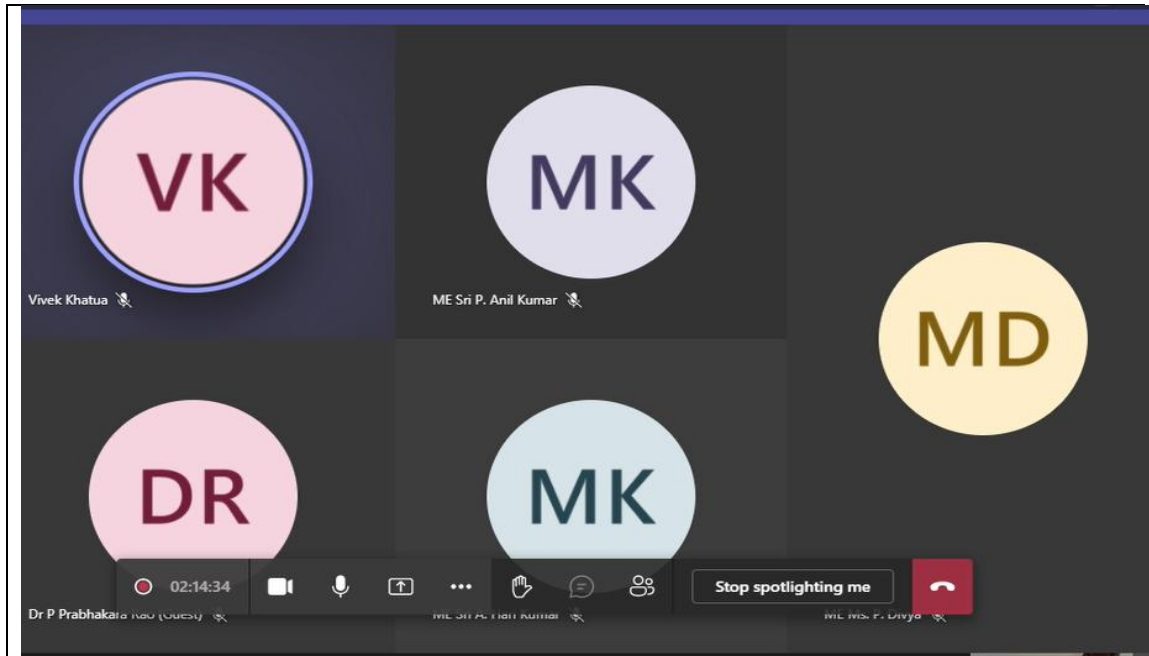
- Keynote address by Dr.VivekKhatua, Ph. D. in Advanced Manufacturing, From Centre for Product Design and Manufacturing, Currently working for Multidisciplinary and Multiscale Device and Design Lab, Indian Institute of Science, Bengaluru
 1. Why the Additive Manufacturing is needed?
He has discussed about
 - ✓ Rapid Prototyping
 - ✓ Rapid Tooling
 - ✓ Niche Requirement
 - ✓ Topology optimization and 3D printing

2. How the Composite Structures are built

- ✓ Fibre arrangement
- ✓ Designs with anisotropy

The collage consists of several key elements:

- Top Video Player:** A video player showing a presentation slide titled "New challenges in additive manufacturing and beyond..." by Vivek Khatua, Ph.D. The slide lists his affiliation with the Centre for Product Design and Manufacturing at the Indian Institute of Science, Bengaluru.
- Slide 1: Why Additive Manufacturing?** This slide features three circular icons:
 - Rapid Prototyping:** Quick to market, Feels the product, Avoids late shortcomings, Reduce mean time to failure.
 - Rapid Tooling and Rebuilding:** Design your own tools, Repair & rebuild your complex tools, Effectively reduce downtime.
 - Topology Optimization:** Realization of theoretically lighter and stronger parts, Multi-material inclusion and optimal arrangements.
- Slide 2: Landscape: How are composite structures built now?** This slide is divided into three columns:
 - Laminates and shells:** Shows various composite shell structures.
 - Filament wound:** Shows a filament winding process.
 - 3D Composite structures:** Shows 3D printed composite parts.
- Slide 3: Designs that do a better job with anisotropy!** This slide compares traditional manufacturing with additive manufacturing. It shows a "Manufacture" process with a "Microstructure Base cell" and a "3D Printing" process with "Optimized MBR beam" and "Optimized topology for better compliant mechanism". It notes that such designs are not currently printable with standard FFF/SLA and that 3D printing of such structures becomes important.
- Classroom Photos:** Two photographs showing a lecturer in a white shirt addressing a group of students in a lecture hall.
- Bottom Video Player:** A second video player showing the same presentation slide as the top player, with a progress bar and a timestamp of 0:00:39.



11-March-2023: 12.00pm -13.30pm

Session on **AWARENESS ON VARIOUS 3D PRINTING TECHNOLOGIES AND ITS APPLICATIONS** by **Dr. G. Ganesh Kumar**

In his lecture he has covered the following items:

1. Additive Manufacturing Technologies
2. History, evolution advantages and limitations of AM Technology
3. **Generic Steps of AM Process**
4. Additive Vs Subtractive Manufacturing
5. CAD Software
6. Slicing Software-Conversion of CAD to STL Files
7. Domestic and Industrial Applications
8. AM unique Capabilities

11-March-2023: 14.00pm -16.00pm

Hands on Experience on Flash Forge Flash Print FDM 3D printing machine by Sri. A. Hari Kumar

13-March-2023: 10.00pm -15.45pm

Hands on Experience on Flash Forge Flash Print FDM 3D printing machine

13-March-2023: 04.00pm -05.00pm

Session delivered on 3D Printing Technology by Mr. Somesh, Application Engineer, Shree Rapid Technologies, Bengaluru

13-March-2023: 05.00pm 06.00pm

Session delivered on Stereo lithography (SLA) Technology by Mr. Somesh, Application Engineer, Shree Rapid Technologies, Bengaluru

13-March-2023: 05.00pm 06.00pm

Session delivered on SLA Technology Process & Applications by Mr. Somesh, Application Engineer, Shree Rapid Technologies, Bengaluru

14-March-2023: 10.00pm -15.45pm

Hands on Experience on Flash Forge Flash Print SLA 3D printing machine

14-March-2023: 04.00pm -05.00pm

Session delivered on SLS Technology by Mr. Somesh, Application Engineer, Shree Rapid Technologies, Bengaluru

14-March-2023: 05.00pm 06.00pm

Session delivered on SLS Technology-Process and Applications by Mr. Somesh, Application Engineer, Shree Rapid Technologies, Bengaluru

14-March-2023: 06.00pm 07.00pm

Session delivered on Digital Light Processing (DLP) Technology by Mr. Somesh, Application Engineer, Shree Rapid Technologies, Bengaluru

15-March-2023: 10.00pm -15.45pm

Hands on Experience on Mark Forge Mark Two 3D printing machine

15-March-2023: 04.00pm -05.00pm

Session delivered on Introduction to Metal 3D Printing by Mr. MitheshNaik, Application Engineer, Shree Rapid Technologies, Bengaluru

15-March-2023: 05.00pm 06.00pm

Session delivered on Applications of Metal 3D Printing by Mr. MitheshNaik, Application Engineer, Shree Rapid Technologies, Bengaluru

15-March-2023: 06.00pm 07.00pm

Session delivered on Online demonstration on Metal 3D printer by Mr. MitheshNaik, Application Engineer, Shree Rapid Technologies, Bengaluru

16-March-2023: 10.00pm -12.45pm

Hands on Experience on SLA 3D printing machine by K. Durga Prasad, Application Engineer, Shree Rapid Technologies, Bengaluru

16-March-2023: 13.00pm -18.00pm

Hands on Experience on AKAR FDM 3D Mr. Siddhartha, Mekuva Technologies, Hyderabad

25-March-2023: 9.30am -10.30am Valedictory Function- venue: Mechanical Seminar Hall

The Valedictory Function was organized on 25.03.2023. All the participants were presented by the 3D printed models performed by participants during hand on experience.

- Then the vote of thanks was given by Sri. A. Hari Kumar, Asst. Professor, MED, KITSW

LIST OF REGISTERED CANDIDATES

A One Week ISTE-IIPE & ENTUPLE Sponsored
Short Term Training Programme (STTP) on
HANDS ON PROGRAMME ON ANSYS SOFTWARE (HPAS-18)
12-16, NOVEMBER 2018

S.No.	Name of the Participant	Name of the Institution	S.No.	Name of the Participant	Name of the Institution
1	Dr. K. Eswaraiiah	KITS, Warangal	45	KosuriRajitha	Kits,Warangal
2	Dr. K. Sridhar	KITS, Warangal	46	RavaliMedari	Kits,Warangal
3	Dr. P. Venkateswara Rao	KITS, Warangal	47	A. Jeevan Reddy	Kits,Warangal
4	Prof. R. Ravinder Rao	KITS, Warangal	48	BommineniSh arath Reddy	Kits,Warangal
5	Dr. K. R. Narender Reddy	KITS, Warangal	49	Morthad Shiva	Kits,Warangal
6	Dr. P. Srikanth	KITS, Warangal	50	GaddamKesh adri	Kits,Warangal
7	Dr. G. Ganesh Kumar	KITS, Warangal	51	Kola Ramesh	Kits,Warangal
8	Dr. U. ShrinivasBalraj	KITS, Warangal	52	Mood Sangeetha	Kits,Warangal
9	Sri P.S.S. Murthy	KITS, Warangal	53	GuntiBalaraju	Kits,Warangal
10	Sri J. Laxman	KITS, Warangal	54	DoddaManees ha	Kits,Warangal
11	Sri S. Chandramouli	KITS, Warangal	55	K.Ravi	Kits,Warangal
12	Dr. P. Prabhakar Rao	KITS, Warangal	56	B. Rajesh Naik	Kits,Warangal
13	Dr. G. Srinivasa Rao	KITS, Warangal	57	D. Rajkamal	Kits,Warangal
14	Sri Ch. Karunakar	KITS, Warangal	58	G. Chaitanya Devi	Kits,Warangal
15	Sri G.Vinod Kumar	KITS, Warangal	59	Rahul	Kits,Warangal
16	Sri S. Ramesh	KITS, Warangal	60	ErukullaGaya tri	Kits,Warangal
17	Sri A. Hari Kumar	KITS, Warangal	61	Thumetti Raj Kumar	Kits,Warangal
18	Sri S.Anil Kumar	KITS, Warangal	62	Manupati Vinay	Kits,Warangal
19	Sri K.Kishor Kumar	KITS, Warangal	63	Munigala Rahul	Kits,Warangal
20	Smt. P. Anitha	KITS, Warangal	64	PingiliRohit Suresh Kumar	Kits,Warangal
21	Sri S. Sripathy	KITS, Warangal	65	Rajeshkar Reddy Nallala	Kits,Warangal
23	Sri V. Srikanth	KITS, Warangal	66	Vodela Sai Sathya Prasad	Kits,Warangal
24	Sri V. Prasanna	KITS, Warangal	67	NanamSravan th	Kits,Warangal
25	Sri D. Sammaiah	KITS, Warangal	68	GolakondaSa mbashiva	Kits,Warangal

26	Ms. P. Divya	KITS, Warangal	69	KolluVaidehi	Kits,Warangal
27	Ms. V. Laxmi Priyanka	KITS, Warangal	70	BandariSrinath	Kits,Warangal
28	Sri V. Rakesh	KITS, Warangal	71	ThoutamPrashanth Kumar	Kits,Warangal
29	Sri P. Anil Kumar	KITS, Warangal	72	SatramSainath	Kits,Warangal
30	Sri S.K. AvezShariq	KITS, Warangal	73	K. Yakoob	CJITS
31	Sri P. Sreedhar	KITS, Warangal	74	P.PunnamChander	SVSIT
32	Sri V. Rajesh	KITS, Warangal	75	B.Naveen Kumar	SIET, Hyd.
33	Ms. G. Kavyasree	KITS, Warangal	76	B. Sahithya	KU
34	BashaboinaLaxman	Kits,Warangal	77	D. Nalini	KU
35	Md. Aslam Hussain	Kits,Warangal	78	D. Srinu	TKR College
36	MenguLohith	Kits,Warangal	79	G. Lingaiah	Research Scholar
37	G.Kheshadri	Kits,Warangal	80	V.Sampath	VBII, Hyd.
38	D.Rajkamal	Kits,Warangal	81	K.Ashwini	UCE&T, MGC
39	Dude Vinay	Kits,Warangal	82	V. Padmasri	WITS, Wgl
40	BanothuDevika	Kits,Warangal	83	N. Suresh	WITS, Wgl
41	Mood Sangeetha	Kits,Warangal	84	K. RajiniKanth	CMR Technical Campus
42	M.Anilkumar	Kits,Warangal	85	B. Sairam Prasad	CITS, HNK
43	N.Prabhu	Kits,Warangal	86	A. Harish	CITS, HNK
44	GollapalliSravani	Kits,Warangal	87	R.Suman	Kits,Warangal

Coordinators

Sri. J. Laxman

Sri. S. Chandramouli

Sri. A. Hari Kumar

Conveners

Dr. G. Ganesh Kumar

Sri. P. S. S. Murthy

Organizing Secretaries

Dr. K. Sridhar

Dr. K. R. N. Reddy

Dr. P. Srikanth

Chairman

Dr. K. Eswaraiah