

## 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 2019-20

## Centre of Excellence

# INDO-AMERICAN ARTIFICIAL HEART PROJECT (IAAHP)

### IAAHP TEAM

			
<b>Prof. K. Eswaraiah</b> Dept. of <u>ME</u>	<b>Prof. K. VenuMadhav</b> Dept. of <u>EIE.</u>	<b>Dr. G. Ganesh Kumar</b> Dept. of <u>ME</u>	<b>Dr. A. Madhukar Rao</b> Dept. of <u>EEE</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:**

1. To execute Haemolysis Test and run mock up loop at AIG Hospitals under the supervision of Dr. P. Naveen Chander Reddy, MD, AIG Hospitals to reduce the NIH to 0.0001
2. Design a 3-D Centrifugal pump in CATIA used in Centrimag pump.
3. Perform Computational Fluid Dynamics (CFD) Analysis using ANSYS Fluent software (Research Version purchased by KITSW) and run the program in Work station (purchased by KITSW) to generate H-Q Curves.
4. Plot the Simulation curves and 3-D printing models of a Centrimag Pump used in Total Artificial Heart (TAH).
5. Develop a 3-D printed models using Mark forge Mark Two/Form 3B+ 3D-Printing Machine
6. Perform the trail runs (both hydrodynamic and Haemolysis test) on the mock up setup.
7. Support PBS to perform an Animal Testing at Palamuru Bio Sciences (PBS) to modify and remodel the designed pump

**OUTCOMES**

**Published One Patent on the Name of Principal, KITSW**

<b>S. No</b>	<b>Name of the Patent/ Technology Transfer/ product/process</b>	<b>Details ( Number, year)</b>	<b>Organization (National/ International)</b>	<b>Status</b>
1.	Left Ventricular Assisted Device with Magnetic Levitation	Appl. No 20201041609 A Date of Publication: 09.10.2020	National	Published and is awaiting for Grants

### Research Publications by Faculty and Students:

1. **Ganesh Kumar, G., Ashoka Reddy, K., VenuMadhav K., Eswaraiah. K.,** (2020), "Mathematical and Experimental Studies On Effect of Number of Blades On Centrifugal Pump Used in Left Ventricular Assisted Device (LVAD), ASAIO Journal June 20, Volume 66, ISSN 1058-2916, pp 83, Wolters Kluwer Publishers **(Published abstract in ASAIO SCI Journal).**
2. Organized "A One Week Faculty Development Programme on **Disruptive "Disruptive Technologies in Digital Manufacturing (DTM-19)"**, from 25-29 November, 2019"
3. **Karthik Naganathan, Lavanith Togaru,** "Design Of Exoskeleton For Musculoskeletal Support Of Human Body Under Low Gravity Conditions And Its Performance Evaluation By Fluid Dynamic Analysis", TFAWS 2020 - August 18-20, 2020.
4. **Karthik Naganathan, Lavanith Togaru,**"Design, Thermal and Computational Fluid Dynamic Analyses On Loop Heat Pipe Wick and Manufacturing with Selective Laser Melting", TFAWS 2019 - August 26-30, 2019.
5. **Karthik Naganathan, Lavanith Togaru,** "Thrust Performance Evaluation of Chemical Rocket Engine by Thermal and Fluid Dynamic Analysis for Exhaust Gas Flow Subjected to Cooling", TFAWS 2020 - August 18-20, 2020.

### Seminars/ Symposia attended / presented by IAAHP team KITSW in USA

1. **G. Ganesh Kumar, K. Venu Madhav,** (2019), Presented a Seminar on "Left Ventricular Assisted Device", 4<sup>th</sup> International Symposium on Indo-American Artificial Heart Project Symposium", held on 24.06.2019 at San Fran Cisco, USA

#### Details of Expenditure for Academic Year 2019-20:

S. No	Details of Expenditure	Item Details	Amount in INR
<b>Expenditure Spent:</b>			
1	Major Equipment Purchased/ Purchase of Software:	Mark Forge Mark Two 3D printer , Inkjet Colour Printer,	₹ 16, 39, 600.00
2	Incentives/ Sponsorship/TA- DA/ Rent Allowance etc., to Faculty/others	Eg. Visit to USA by Dr. K. VenuMadhav and Dr. G. Ganesh Kumar, Onyx Material	₹8, 87, 257.00
<b>Total (Twenty Five Lakhs Twenty Six Thousand Eight hundred Fifty Seven Only)</b>			<b>₹25, 26, 857.00</b>

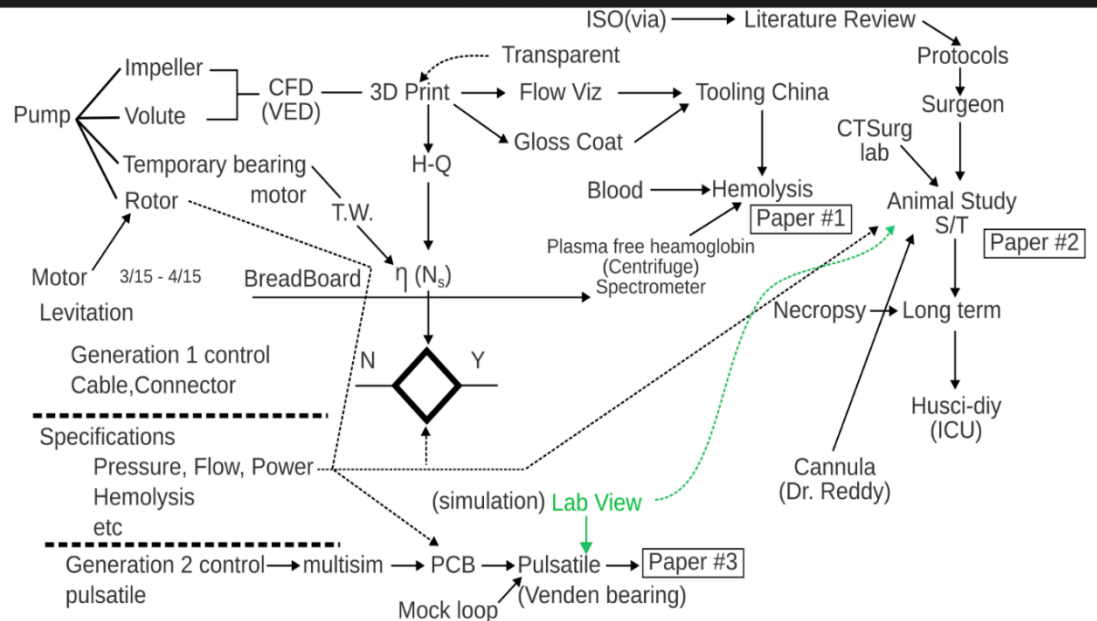
**1. List of Major equipment available /Facilities Available in IAAHP Lab till This academic Year:**

S. No	Name of the Equipment/ Software	Cost of the equipment/ Software in ₹	Purpose of the equipment
<b>3D Printer</b>			
1	Mark Forge Mark Two 3D printing machine	16, 22, 500-00	To generate the working model of the pump using Onyx Material
2	Flash forge Dreamer Dual Extruder -Think 3D	85,000-00	To generate the experimental models of an artificial heart pump
3	ANSYS 19.2	5, 01, 500-00	To Simulate the fluid flow through pump
4	WORKSTATION-HP Z8 Work Station	10,68,000-00	To Generate H-Q Curves of an Artificial Heart Pump
<b>Approximately Total Cost Spent Till Now including Sponsored faculty is about Twenty Five Lakhs Twenty Six Thousand Eight hundred Fifty Seven Only</b>			<b>₹ 25, 26, 857.00</b>

**Activities performed as a part of IAAHP:**

1. Developed a CAD model for three different types of centrifugal pumps.
2. Generated H-Q curves for the designed models of the pumps
3. Prepared a detailed work plan for Proceedings of IAAHP project.

Schedule plan for Artificial Heart Programme presented by Dr. James F. Antaki at Laxven Systems, Hyderabad on 15 March 2018



by team of Kakatiya Institute of Technology and Science, Warangal

4. Developed a three different prototypes of pumps (Six Bladed and Four Bladed Pumps)

5. Generated H-Q curves (Simulated as well as Experimental) for the centrifugal pump by using water as a fluid.
6. Developed and Installed a Mock Loop Test rig at KITSW for performing Hydrodynamic test for centrifugal pump.
7. Developed Protocol for Hemolysis and Animal Testing
8. Performed a vast Literature Survey on Patents and publications pertaining to development of Centrimag pump.
9. Developing a Von Willebrand Factor (vWF) test rig for evaluation of vWF with the collaboration of Dr. Suman Kapoor, BITS, Hyderabad

**Mile Stones:**

<p>9</p> <p>IAAHP team Meeting at BITS Pilani, Hyderabad Campus to perform First hydrodynamic and Hemolysis test using Mock up loop test setup developed by IAAHP Team (10 January 2019)</p>	   
--	---





<p>10</p>	<p>Meeting at AIG to exhibit the Mock-up Loop Test Set up installed by KITSW and CBIT Team on 16 Jan 2019 to IAAHP Team Delegates from USA and Germany</p> <p>Training at IAG by Prof. James Long, – Integris, OK, Medical Director for the Institution: NazihZuhdi Transplant Institute, USA</p>	
-----------	---	---

IAAHP India Team has exhibited the Mockup loop test setup to Delegates on 25.01.2020. Further, Hydrodynamic Test was conducted on pump designed by Enmodes (Germany) to check the performance of mock up designed by KITSW and CBIT Team



Training Sessions were conducted to team by Experts from USA and Germany from 26-27 Jan 2020



11)	Purchase of Work Station on 07.11.2019 and Purchase of 3 D printing machine 05 Nov-2019		
-----	---	---	--

**IAAHP KITSW team Members:**

The following are the members involved in IAAHP:

1. Prof. K. Eswaraiyah, Prof.&HoD, ME, IAAHP, Chairman, KITSW
2. Dr. K. VenuMadhav, Prof.&HoD, EIE, IAAHP, Member, KITSW
3. Dr. G. Ganesh Kumar, Assoc. Prof., of ME, IAAHP, Member, KITSW
4. Dr. A. Madhukar Rao, Assistant Prof., of EEE, IAAHP, Member, KITSW