



భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్  
भारतीय प्रौद्योगिकी संस्थान हैदराबाद  
Indian Institute of Technology Hyderabad

# किर IITH

the crowning glory

A quarterly e-newsletter of IITH Issue – 10 | April 2022

**#AdditiveManufacturing@IITH**



# Editorial Epistle

Dear Readers,

We hope you are doing well!

Inspired by your continuous support, we are pleased to present the 10<sup>th</sup> issue of किरIITH.

Alike every time, this issue of किरIITH is also being dedicated to one of thrust research areas of IITH. We are glad to release seven theme-based issues of किरIITH, namely, COVID-19, AI, Healthcare, IITHinJapan, 5G & Next-Gen Tech, NanoTech. Energy & Integrated Computational Engineering. Following this precedence, किरIITH is back with yet another critical area of research at IITH "Additive Manufacturing".

We hope this issue of किरIITH - The Crowning Glory, Issue-9, January 2022 #AdditiveManufacturing@IITH will give you a stimulating experience about exceptional research work being carried by the IITH fraternity.

This issue of किरIITH is released on **World Intellectual Property Day (WIPO) - April 26** underlining the importance we give to Invent & Innovate in Technology for Humanity (IITH) to ensure IITH is 'A Dream Destination for Students, Academicians, Researchers & Collaborators'.

किरIITH will be back next quarter with another trending research area. So, stay connected.

We wish everyone a safe and healthy stay.

Have a great year ahead...

Enjoy reading!



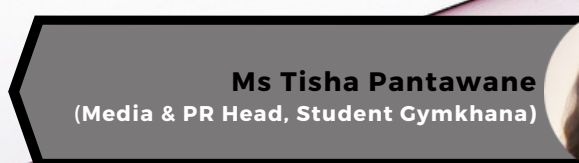
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(Dean - Public & Corporate Relations)  
{Editor-in-Chief}



**Prof Deepak John Mathew**  
(Head of the Department - Design)



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(Media & PR Head, Student Gymkhana)



**“Consistency is one of the biggest factors to accomplishment and success.”**

- Byron Pulsifer

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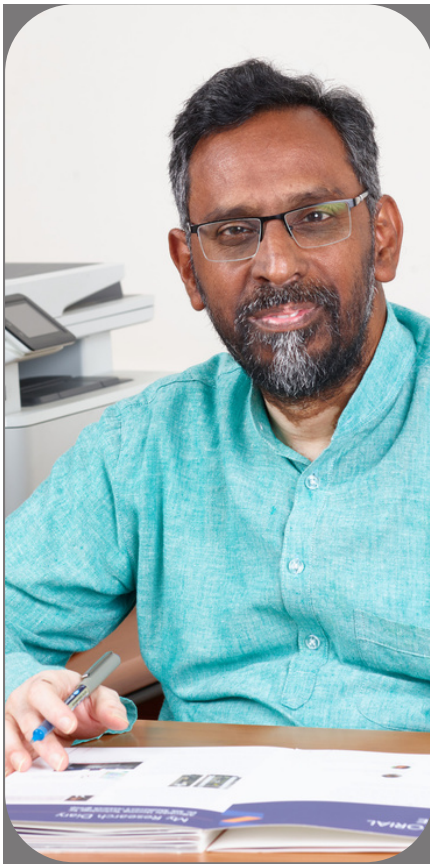
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# Director's Desk

Prof B S Murty



Dear Friends,

**We hope you are doing well & had a great start to the year!**

I am glad to share that IITH is gradually coming back to the normalcy of offline life. We had some in-person gatherings to celebrate the new entrants to our architecturally wonderful campus. This includes **Married Students' Housing, Primary Health Centre, and 1,50,000 Sqft Technology Research Park** being already operational with eminent industry experts taking place in it.

IITH is known for pathbreaking research. To fuel it further, we have added 14 faculty members & invited brilliant minds in the country & abroad via various Postgraduate & Doctoral programs. IITH and WiSig Networks jointly announced a maiden 5G data call using indigenously developed **5G ORAN technology**, and IITH's Researchers worked on how antioxidants improve the inhibitory nature of Triclosan on Acetylcholinesterase enzyme **to protect ourselves from the toxic effects of Triclosan.**

Principal Scientific Adviser to the Govt of India Prof. Vijay Raghavan Soft Launched (Beta-Version) of **'Swarajability'**, India's 1st AI triggered Job Platform for Persons with Disabilities. IIT Hyderabad has jointly developed this platform with Youth4Jobs & Visual Quest with Kotak Mahindra Bank Ltd support. I am happy to share that one of our Incubatee could successfully launch India's one of the most affordable & reliable **portable ventilators - Jeevan Lite**. Honorable Governor of the State of Telangana & Puducherry Dr (Smt) Tamilisai Soundararajan has launched is & was handed over ten free units to each state.

Continuing to be uniquely distinctive, we have also expanded our academics with **four new PG Programs, namely, MTech in Techno-Entrepreneurship, MTech in Semiconductor Materials and Devices MTech in Transport Technology, and an MA program in Health, Gender & Society** to be launched from August 2022.

To support the Semiconductor ecosystem, we are also launching **BTech in Microelectronics in August 2022**. As part of digital transformation, IIT Hyderabad has upgraded **eight classrooms to Hybrid classrooms with a CSR initiative by Cyient foundation** under the vision of Inventing & Innovating in Technology for Humanity. Cyient, a global engineering, manufacturing, and digital technology solutions company, has also launched its **Private 5G Networks Center of Excellence (CoE) at IITH.**

To accelerate the research in Advanced Automotive Technologies, IITH joined hands with **Mobis India**. IITH has also signed an MoU with **Basavatarakam Indo American Cancer Hospital & Research Institute (BIACH&RI)** for Academic & Research Collaboration, **APUNA** to promote UN objectives of the 2030 SDGs agenda, **ECIL** for Enhancing Academic & Intellectual Interaction to promote Mutual Intellectual Growth & Indigenous Technological Solutions and with Centre for Adivasi Research and Development Odisha (**CARD**) for Promotion, Awareness & Empowerment of Marginalized Communities.

Dept of Entrepreneurship and Management & ITIC Incubator has jointly organized the **Certificate Course on Deeptech Entrepreneurship**. I am happy to see the campus energized via the myriad enthusiasm of Students during the 13th edition of 3 Day **'ELAN & ηVision 2022 - Zora-e-Sukoon', E-Summit 2K22**, a flagship **entrepreneurship conclave by ECell**, and what an end of the quarter with the **Milan, Championship of Champion - A 5-day inter-hostel tournament.**

I am happy to bring to you the **10<sup>th</sup> issue of किरIITH on Additive Manufacturing @IITH**. I hope you will all enjoy going through this informative issue.

**Stay Safe, Healthy & Happy...**

“

**The only way to do great work is to love what you do.**

**- Steve Jobs**

# Dean's Diary

## Creating a motivating workplace

Dean (Faculty) - Prof Kanchana V

### Greetings from the Dean's Desk.....

It gives me great pleasure to address the whole IITH community in my new role as Dean of Faculty Affairs, having served the Institute for over 12 years in various roles, including the Head of the Physics department. I hope everyone is safe and back to their routines after the pandemic that has set back all of us for nearly two years.

We at IITH have resumed the offline classes, and the students are getting back to restoring the vibrant campus life. Quite a few courses are still running in hybrid mode to ensure flexibility and safety while the students are transitioning back to campus. The charm of dynamic learning with recreational activities and informal and social gatherings with serendipitous encounters is back enriching the campus life and educational experience.

Today IITH has a strength of approximately **264 faculty, 276 non-teaching staff, and nearly 3900 students**. IITH is quite dynamic and successful in offering several online and offline academic programs in niche areas of engineering, science, and technology, attracting high potential candidates. Teaching and research are two sides of a coin for any faculty, and the faculties at IITH are certainly at the forefront bringing several externally funded research projects that have consistently placed IITH in the top ten NIRF-ranked institutes, 8th position in India in QS ranking within the engineering stream and 7th position in ARIIA - 2021. All of these certainly demand efficient administration and support of employees at various offices of IITH, striving hard to cater the best to the faculties.

The recognition that IITH has secured over the past is a testimony to the rigor and hard work that our faculty have put into our programs and its continuous improvement, which certainly deserves appreciation. IITH has initiated Faculty teaching/research excellence awards since 2020. These awards would certainly elevate productivity and enhance the competitive spirit, enabling every faculty to set their goals much higher. Six awards were announced during the Foundation day of IITH, identifying the excellence in two categories, one below 40 years (3 awards) and the other above 40 years (3 awards) together with teaching excellence awards.

IITH is looking forward to maintaining a student-teaching ratio close to 10:1. We follow proactive hiring policies looking out for dynamic young talented minds with dedication and excellence. Every year, we conduct two rounds of recruitment across various departments. To keep pace with the Government's recruitment policy, IITH conducted a special recruitment drive in January 2022 and successfully recruited 22 faculties.

IITH is keen on bringing in the professionalism and latest technology expertise from the industry through strategic recruitment of Professors of Practice in leading areas of research and development. The Institute has always been in the pursuit of engaging distinguished Professors internationally who have a proven record of achievements and have become torchbearers in leading the faculty fraternity to the cutting-edge technologies of tomorrow.

The Office of Faculty Affairs is committed to enhancing faculty development initiatives, ensuring equal opportunity for all irrespective of gender differences, improving our faculty diversity, and building a strong collaborative fraternity at IITH.

We @ IITH have always been very proactive in creating a challenging and vibrating research/teaching atmosphere through Interdisciplinary (ID) programs and activities. Faculties are highly encouraged to carry out cutting-edge research in interdisciplinary domains through a special call for the ID projects hosted and taken forward by the institute's Centre for Interdisciplinary program (CIP). The centre is very successful in bringing faculty across domains on the same board, churning out new ideas, thus acting as a cradle for innovations and new research projects.

IITH faculty are highly encouraged to have joint doctoral students with foreign universities such as Swinburne University and Deakin University. The Dean of Faculty Affairs office is dedicated to promoting and advancing research collaborations while ensuring continued excellence.

I take this opportunity to place on record the excellent team spirit with which the office of the Dean, faculty affairs functions, enabling the smooth and efficient functioning of all processes related to faculty affairs and recruitment.



“Climbing to the top demands strength, whether it is to the top of Mount Everest or to the top of your career.”  
- Bharat Ratna Dr APJ Abdul Kalam

As the Dean of Faculty Affairs, I stand beside you, extending my whole-hearted support to all our faculty to be world leaders in teaching, research, mentoring, and humble servants to the scholar community @ IITH and the whole society. **We strive to create a motivating workplace and set IITH as the dream destination for all students, faculties, academicians, and researchers across the globe.** I firmly believe that by joining shoulders together, we can build a great Institute with our eminent faculty, staff, students, and alumni.



# Theme Diary

## Interdisciplinary M.Tech in Additive Manufacturing

Prof Suryakumar S  
Department of Mechanical & Aerospace Engineering

Additive Manufacturing (AM) or more popularly known as 3D Printing, is a rapidly evolving manufacturing approach with advantages over traditional fabrication including increased design complexity, enhanced part customization and lower setup times. In particular, there is a significant interest in AM for biomedical, defence, and aerospace applications requiring high-temperature strength, higher strength-to-weight ratio, and corrosion resistance along with unparalleled design freedom.

The growing demand for AM also needs a steady influx of professionals who specialize in this area. Hence, in 2020, IITH started an interdisciplinary M.Tech in Additive Manufacturing to address the gap between AM applications and the lack of trained engineers in this field. The course is designed to equip students to understand and advance AM by combining a fundamental understanding of the underlying science along with a specialized study of different processes and technologies. The course will also focus on capturing the interdisciplinary nature of the AM by providing hands-on experience with designing, adapting, and building parts using current AM technology. It leverages the strong ecosystem of AM research at IITH, thus providing the students an opportunity to carry on research in a variety of AM Applications.

The course structure is designed to give the student a broad exposure of various AM processes and a deeper study in a chosen field. First semester courses are aimed at providing an overview of various aspects of AM to the students. In the second semester, the student can take specialized courses of his/her choice from the following course baskets:

- (1) Systems Integration for AM
- (2) Computational Tools for AM
- (3) Applications- Bio-AM
- (4) Applications- Metal-AM.

The second year will be a Thesis.

The course is open for both MoE and Self-sponsored students and candidates sponsored by government labs like DRDO.

### Elective Courses in Semester I (the list is not exhaustive)

| Basket  | Course Title   | Credits |
|---|--|---------|
| Systems Integration for Additive Manufacturing      | Life Cycle Analysis                                  | 1       |
|   | Elasticity & Plasticity                              | 1.5     |
|   | Computational Tools for Geometric Modelling          | 1.5     |
| Computational Techniques for Additive Manufacturing | Finite Element Methods                               | 3       |
|   | Mathematical Methods for Engineers                   | 3       |
|   | Augmented Reality & Virtual Reality                  | 1       |
| Bio Additive Manufacturing                          | Biomaterials: Materials in Medicine                  | 2       |
|   | Lab on Chip  | 1       |
|   | Advanced Fabrication                                 | 2       |
|   | Microfluidic Platform for Cell Culture & Diagnostics | 1       |
| Metal Additive Manufacturing                        | Metal Additive Manufacturing                         | 3       |
|   | Advanced Physical Metallurgy                         | 3       |
|   | Powder Metallurgy Manufacturing                      | 3       |
|   | Materials Synthesis and Characterization             | 3       |

### Elective Courses in Semester II (the list is not exhaustive)

| Basket  | Course Title   | Credits |
|---|--|---------|
| Systems Integration for Additive Manufacturing      | Computational Fluid Dynamics                               | 1.5     |
|   | Fluid Mechanics and Heat Transfer                          | 1.5     |
|   | Industry 4.0   | 1.5     |
|   | Design for Additive Manufacturing                          | 1       |
|   | Finite Element Analysis                                    | 3       |
| Computational Techniques for Additive Manufacturing | Introduction to Computational Methods in Materials Science | 3       |
|   | Advanced Topics in Mathematical Tools                      | 3       |
|   | Machine Learning and Its Applications                      | 3       |
|   | Topology Optimization with Additive Manufacturing          | 1       |
| Bio Additive Manufacturing                          | Tissue Engineering   | 2       |
|   | Bio microfluidics  | 2       |
|   | 3D Printing in Medicine                                    | 2       |
|   | Biomaterials - Materials in Medicine                       | 3       |
|   | Introduction to Microfluidics and Microreactors            | 2       |
| Metal Additive Manufacturing                        | Metallurgy of Welding and Additive Manufacturing           | 3       |
|   | Structure and Characterization of Metallic Materials       | 3       |
|   | Advanced Mechanical Behavior of Materials                  | 3       |
|   | Microstructure Engineering for Advanced Manufacturing      | 3       |
|   | Advanced Thermodynamics of Materials                       | 3       |
|   | Thermo-Mechanical Processing of Materials                  | 3       |
|   | Advanced Material Joining Processes                        | 1.5     |

| Course Title  | Credits   |
|---|-----------|
| <b>Semester I</b>   |           |
| Fundamentals of Additive Manufacturing                                  | 3         |
| Product Design and Prototyping  | 2         |
| Biofabrication  | 2         |
| Materials for Additive Manufacturing                                    | 2         |
| English for Communication   | 1         |
| Elective course(s) (from any one or more of the four elective baskets)* | 3         |
| Sub-total   | 15        |
| <b>Semester II</b>  |           |
| Biofabrication Technology Lab   | 1         |
| Additive Manufacturing Processes Lab                                    | 1         |
| Industrial Lectures   | 1         |
| Elective courses (from any one or more of the four elective baskets)**  | 12        |
| Sub-total   | 15        |
| <b>Semester III and IV</b>  |           |
| Thesis  | 24        |
| <b>Total Credits</b>  | <b>52</b> |



# Hindi Diary/हिन्दी डायरी

## त्रिविम मुद्रण या 'श्री-डी प्रिंटिंग'

श्रीमती मिताली अग्रवाल

जनसंपर्क अधिकारी



त्रिविम मुद्रण या 'श्री-डी प्रिंटिंग' (3D printing या additive manufacturing (AM)) त्रि-विमीय वस्तुएँ बनाने की बहुत सी विधियों में से एक विधि है। इस विधि में कम्प्यूटर के नियन्त्रण में वस्तु पर किसी पदार्थ की परत-दर-परत डालते जाते हैं और वस्तु तैयार होती जाती है। निर्मित होने वाली वस्तुएँ किसी भी आकार और ज्यामिति वाली हो सकती हैं। निर्माण के पूर्व वस्तु का त्रिविम डेटा स्रोत तैयार कर लेते हैं और कम्प्यूटर के नियन्त्रण में त्रिविम प्रिन्टर द्वारा इसी के अनुसार परतें डाली जाती हैं। वस्तुतः त्रिविम प्रिन्टर एक औद्योगिक रोबोट है।

हाथ से बनी एक जैसी दो सपाट तस्वीरों में गहराई यानी श्री डी का भ्रम पैदा करनेवाली सबसे पहली मशीन यानी 'स्टीरियोस्कोप' ब्रिटिश वैज्ञानिक सर चार्ल्स व्हीटस्टोन ने 1838 में बनायी थी। 1988 में वर्तमान काल में जो तकनीकी ज़्यादातर 3 डी प्रिन्टर में प्रयोग की जाती है, की खोज हुयी थी। इसके खोजकर्ता थे एस. स्कॉट क्रम्प।

आईआईटी हैदराबाद ने एडिटिव मैनुफैक्चरिंग के क्षेत्र में भी कई पहल की हैं। 2020 में आईआईटीएच ने एडिटिव मैनुफैक्चरिंग में एक इंटरडिसिप्लिनरी एमटेक भी शुरू किया है। किराIITH के इस अद्भुत अंक में एडिटिव मैनुफैक्चरिंग के क्षेत्र में व्यापक शोध के बारे जाना जा सकता है। आशा है भविष्य में आईआईटीएच एडिटिव मैनुफैक्चरिंग के क्षेत्र नए कीर्तिमान स्थापित करेगा।



## इसे मत पढ़िए

श्री नवीन श्रीवास्तव

हिंदी प्रकोष्ठ



वर्तमान युग ऐसा है कि लोगों को जो काम करने के लिए मना किया जाता है, लोग वही करने के लिए हमेशा तत्पर रहते हैं और नियमों का उल्लंघन करते रहते हैं। जैसे सड़कों पर कई जगह लिखा रहता है 'नो पार्किंग' (यहाँ गाड़ियाँ मत खड़ी कीजिये) फिर भी लोग वहीं गाड़ियाँ शान से खड़ी कर देते हैं। बसों में सीटों पर लिखा रहता है - 'महिलाओं के लिए आरक्षित'। फिर भी उन सीटों पर पुरुष बैठ ही जाते हैं। रेलगाड़ियों में और सार्वजनिक स्थानों पर जहाँ भी लिखा होता है - 'सिगरेट पीना मना है'। फिर भी लोग वहीं सिगरेट पीते हैं।

और अब आप को ही देख लीजिये आप भी तो यही कर रहे हैं। जब आपसे शुरू में ही कहा गया कि 'इसे मत पढ़िए' और आप है कि इसे पढ़ते जा रहे हैं।



## बेटियां

सुश्री सैयद मोमिन सुल्ताना

प्रोजेक्ट असिस्टेंट - तिहान



अंगना में खिलती एसी फूल हैं बेटियां  
अपनी गुडिया को भी संग सुलाकर  
बचपन से ही मम्ता सिखाएंगी बेटियां  
थोड़ा हंसाकर तो देखो  
सदैव प्यार करना सिखाएंगी बेटियां।

रहने दो इन छोटे हाथों में चार किताबें  
अपनी मां की कोक में बच गयी  
दहेज़ से भी बच जाएंगी बेटियां  
नयनों में सपने समाए,  
बिन पंख के भी उड़ जाएंगी बेटियां  
थोड़ा मौका दे कर तो देखो  
जो ठान लिया, वो करके दिखाएंगी बेटियां।

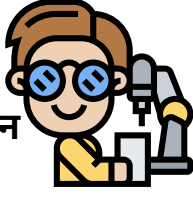
नर्मी की परछाई, दिल का सुकून है  
बेटी है वो, बोझ नहीं  
पलकों पर समंदर समाए  
हंसते सह जाती हैं बेटियां  
थोड़ा इशारा कर के तो देखो  
बिखरे टुकड़ों को समेट लेंगी बेटियां।

पापा की लाडली, मां की जान  
ब्याह के बाद दो घरों की पहचान है बेटियां  
एक बार दहलीज पार कर  
अपने ही घर की महमान बन जाएंगी बेटियां।



# Hindi Diary/हिन्दी डायरी

**IIT हैदराबाद-सभी IITs के बीच  
BTech बायोमेडिकल इंजीनियरिंग  
पाठ्यक्रम शुरू करने वाला अग्रणी संस्थान  
श्री सारांश खंडेलवाल**



**तकनीकी अधीक्षक, जैवचिकित्सा अभियांत्रिकी विभाग**

IITH में बायोमेडिकल इंजीनियरिंग विभाग एक उच्च अंतःविषय विभाग है जो मानवता के सामने आने वाली भव्य स्वास्थ्य चुनौतियों का समाधान करने के लिए विभिन्न पहलुओं पर काम कर रहा है। विभाग उत्साही दिमागों को सक्रिय करने के लिए विभिन्न फोकस क्षेत्रों में आकर्षक और गतिशील स्नातक, स्नातक और डॉक्टरेट कार्यक्रम प्रदान करता है। हम 11 फैकल्टी, 9 स्टाफ सदस्य, 36 अंडर ग्रेजुएट, 27 पोस्ट ग्रेजुएट और 100 पीएचडी छात्रों और गिनती के साथ एक विभाग हैं।

बीएमई @ आईआईटीएच ने देश में पहली बार बायोमेडिकल इंजीनियरिंग (बीटेक-बीएमई) में एक अद्वितीय बैचलर ऑफ टेक्नोलॉजी प्रोग्राम शुरू किया है। कार्यक्रम का उद्देश्य युवा और उत्साही दिमागों को स्वास्थ्य सेवा के रोमांचक क्षेत्र से परिचित कराना और सभी के लिए सुलभ, गुणवत्तापूर्ण स्वास्थ्य सेवा के पथ प्रदर्शक और सक्षम बनाना है। हम प्रमुख प्रौद्योगिकी कंपनियों के लिए स्वास्थ्य देखभाल और स्वास्थ्य-तकनीक नवप्रवर्तनकर्ताओं में उद्यमियों को प्रदान करने की उम्मीद करते हैं।

मेडिकल इंस्ट्रूमेंटेशन और सिस्टम बायोलॉजी जैसे मुख्य क्षेत्रों के साथ, हमारा कार्यक्रम हेल्थकेयर डेटा एनालिटिक्स, चिकित्सा डेटा मॉडलिंग और सिमुलेशन, 3 डी बायो-प्रिंटिंग, मेडिकल ऑप्टिक्स और इमेजिंग, नैनोमेडिसिन, न्यूरोटेक्नोलॉजी, बायोमैकेनिक्स, न्यूरोमॉर्फिक इंजीनियरिंग जैसे अत्याधुनिक क्षेत्रों में विशेषज्ञता के लिए कई वैकल्पिक संग्रह प्रदान करता है।

बायोमेडिकल इंजीनियरिंग पाठ्यक्रम इंजीनियरिंग के लगभग सभी नियमित डोमेन को परिचयात्मक पृष्ठभूमि प्रदान करता है चाहे वह इलेक्ट्रॉनिक्स, कम्प्यूटेशनल, मैकेनिकल या जैव प्रौद्योगिकी इंजीनियरिंग हो। इस पाठ्यक्रम की खूबी यह है कि व्यक्ति वास्तव में उस तेजी से बढ़ते उद्योग की गतिशीलता से जुड़ जाता है जिसे सभ्यता के अंत तक, स्वास्थ्य उद्योग तक कभी भी गिरावट का सामना नहीं करना पड़ सकता है।

## दहेज की मंडी

**श्रीमती एस वी श्री देवी**

**अनुभाग अधिकारी, मानव संसाधन अनुभाग**

जग की अनोखी रीत को देखो।  
कोई न कोई इस प्रथा को रोको।।

वाह रे नसीब एक लड़की के बाप का।  
खुद अपने दिल के टुकड़े को बेचना पड़ रहा है  
लाइली खोते हुए साथ में माल भी देना पड़ रहा है  
जोड़-जोड़ के जितना कमाया, एक झटके में उससे हाथ धोना पड़ रहा है  
फिर भी अपनी बच्ची की सलामती की भीख हर रोज मांगना पड़ रहा है।

भीख का यह सुंदर रूप है  
मांग का यह विनम्र स्वरूप है  
देने वाले की दुखती जान है।  
लेने वाले की अकड़ और शान है ।

क्यों सहे । कब तक सहे  
इस जुल्मी धारा में हम क्यों बहे...  
कही न कही तो ये जुल्म रुकना चाहिए  
दहेज मांगते हुए दिल दुखना चाहिए।

आओ चलो नारा लगाए .. डट कर इसको दूर भगायें  
लड़की कोई पुतली नहीं ....कड़क नोटों की पोटली नहीं  
लड़की किसी पे बोझ नहीं....बिकने वाली कोई चीज नहीं।

घर-घर में नारा लगाओ  
लड़की को पढ़ाओ-लिखाओ सशक्त बनाओ  
अपने बल पे आगे बढ़ने की तरकीब सिखाओ  
सिर्फ सुंदर ही नहीं....भड़कती हुई चिंगारी भी बनाओ  
दहेज की मंडी को जड़ से मिटाओ।



# Research Diary

## 3D Bioprinting for Tissue Engineering and In Vitro Tissue Modelling

Dr Falguni Pati  
BioFabTE Lab, Dept. of Biomedical Engineering



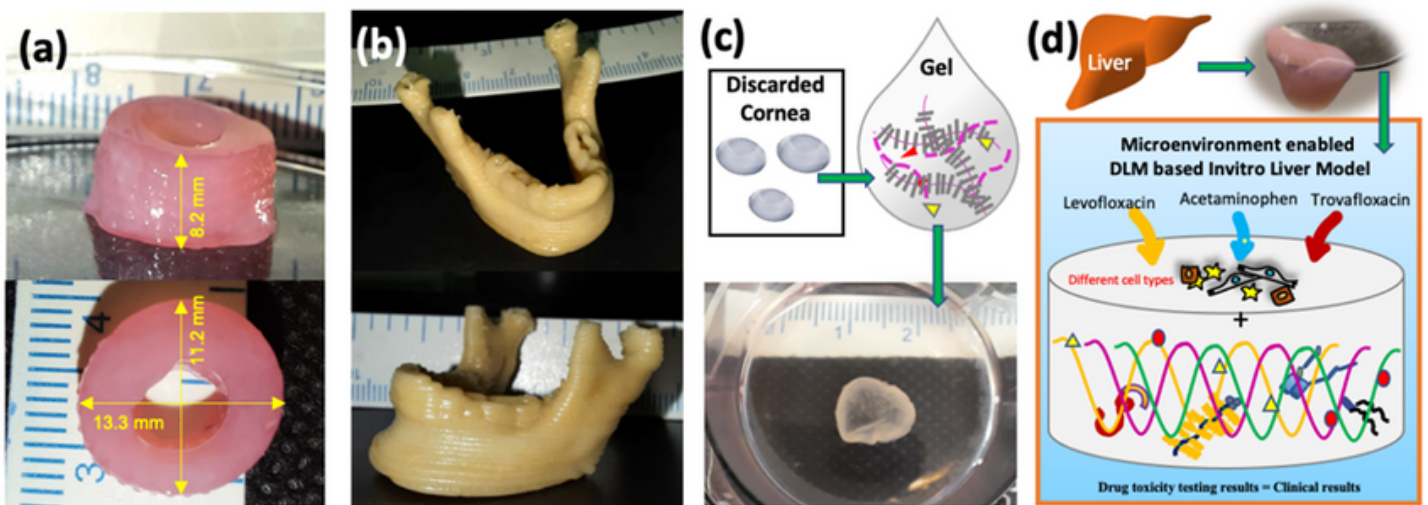
The demand for engineered tissues has increased greatly owing to the shortage of donor tissues and organs for transplantation. Though there were some promises, tissue engineering has been able to provide functional implantable tissue constructs except in a few cases. Additive manufacturing, also popularly known as 3D printing, is a cutting-edge technology in almost all the fields of day-to-day life to create 3D objects. It is a process of depositing materials layer upon layer to join materials to make 3D objects from a virtual 3D model. 3D printing has also been applied to print cells into 3D tissue constructs. Studies revealed that it has the potential for creating complex composite tissue constructs through the precise placement of cells and matrix materials in a layer-by-layer fashion. Our BioFabTE lab at IITH focuses on the development of different tissues using synthetic and tissue-derived natural polymer hydrogels using scaffold-based and 3D printing technologies. We are working on many aspects of this technology starting from formulating bioinks (3D printable polymer formulations), developing a 3D printing protocol targeted to a particular tissue, and in vitro maturation using our customized 3D printed bioreactors. While we have demonstrated 3D printing of a few tissues like cornea, esophagus, liver, and bone, a few more like skin tissue models, kidney glomerulus model, breast and esophagus cancer models are in the developmental stages as shown in **Figure 1**.

In a first attempt, we developed corneal extracellular matrix hydrogels from discarded bovine and human corneas and proved their potential to prevent corneal scarring (Chameettachal et al. 2020) and thicken the ectatic cornea (Chameettachal et al. 2021). Recently, we have been awarded the Sree Padmavathi Foundation Translation Research Grant in Biomedical Sciences 2022 for starting a clinical trial of our cornea hydrogel.

We also could make a major advance in generating the corneal construct with complexities such as human corneal size and shape using 3D bioprinting with fibril orientation and cell homeostasis. We demonstrated that the technique using SLA 3D printing was dependable to create cornea or tissues with curvature. Another interesting in vitro study explored the feasibility of engineering esophageal tissue. The main theme of the study was to develop technology to fabricate tubular tissues and organs by using mechano-compromised biomaterials (Yeleswarapu et al., 2021).

One of our studies focuses on the value addition of synthetic polymer, Polycaprolactone (PCL) which has been extensively utilized for bone tissue engineering. The application of PCL is limited because of poor cellular interaction and tissue integration. We have optimized a PCL- Silk composite to strike a balance among the cellular response, biodegradation, and mechanical strength of the materials. The results indicate that the PCL-silk fibroin microfiber composite could be an efficient biomaterial not only for conventional bone tissue engineering applications (Bojedla et al., 2022). We have also developed a 3D printable composite formulation out of these and demonstrated the fabrication of patient-specific mandible implants.

Apart from the development of viable tissues for transplantation, in vitro tissue models are also a major contribution to 3D printing for tissue engineering. Tissue models are promising tools for drug development to predict the possibilities and adverse events during clinical application. In a study using a decellularized liver matrix, we could prove its potential to serve as a liver model to screen the drugs. The liver tissue model with extracellular matrix helps in maintaining the tissue-specific microenvironment and thereby retaining the hepatic cellular phenotypes, functionality, and a more realistic drug response compared to the normal native liver (Sasikumar et al., 2021). The developed liver model has huge prospects for drug and toxicity screenings.



**Figure 1:** (a) 3D bioprinted tubular structure with smooth muscle matrix hydrogel for esophageal repair, (b) 3D printed patient-specific mandible from CT data for restoration of defect/damage, (c) 3D bioprinting of corneal stroma with decellularized cornea matrix hydrogel for partial keratoplasty, and (d) 3D bioprinted liver model for drug and toxicity screening





# Research Diary

## Buckling studies in 3D printed cylindrical shells

Dr Gangadharan Raju,  
Department of Mechanical and Aerospace Engineering

Thin cylindrical shell structures are widely used in aerospace structures, but they are prone to buckling and structural collapse. So, it is of utmost importance to consider buckling as one of the critical criteria for designing cylindrical shells to prevent a catastrophic failure. Most of the research in this area has been focused on metallic or composite shells fabricated using conventional techniques. As a thin shell's structural stability is very sensitive to geometric imperfections, its response in the presence of imperfections requires intense experimental and numerical studies. This requires fabricating shells with controlled geometric variations which are possible using 3D printing. Further, testing on real size cylindrical structures is challenging and expensive which can be addressed by studying the buckling and post-buckling response in scaled-down models. A scaled cylindrical shell made of Thermoplastic Polyurethane (TPU) is fabricated using an 'Ultimaker S5 3D printer Pro Bundle', which is available with the 'iTIC'. This shell is tested under axial compression using an MTS system and its buckling response is captured using a multi-Digital Image Correlation (DIC) technique. The DIC results would aid in the development of robust numerical models for designing cylindrical structures as shown in **Figure 2**.

Also, the geometrical imperfections in the shell are captured using the DIC and can be used for high fidelity numerical studies as shown in **Figure 3**. A short fiber composite cylindrical shell with a dimple-driven imperfection was fabricated using 'A mark-forged Mark two' 3D printer as shown in **Figure 4** which is available with the MAE department.

In this work, we aim to understand the stability and collapse behavior of cylindrical shells with structural discontinuities like cut-outs and complex stiffener geometries. These studies have a direct application in the aerospace industry and it is being carried out in collaboration with Research Centre Imarat (RCI)-DRDO

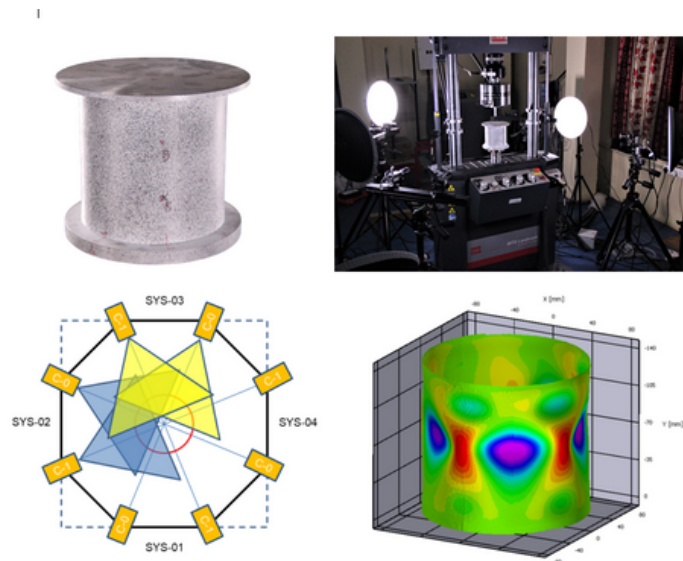


Figure 2: Experimental setup to capture the buckling deformation of the cylindrical shell

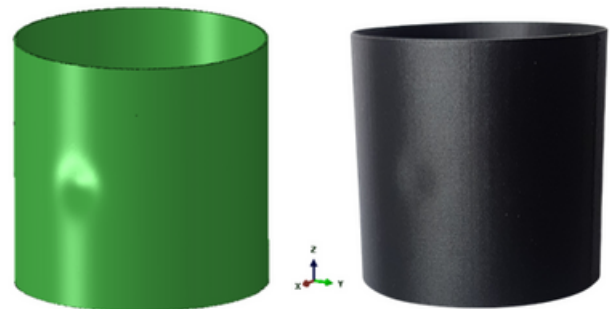
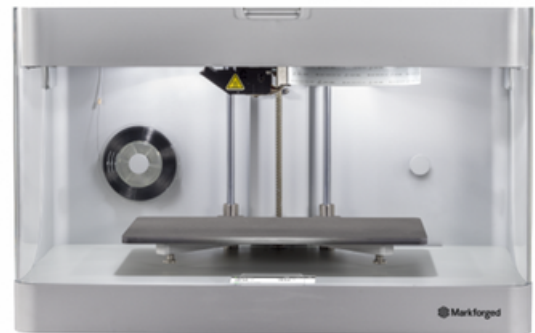


Figure 4: Markforged Mark Two 3D printer

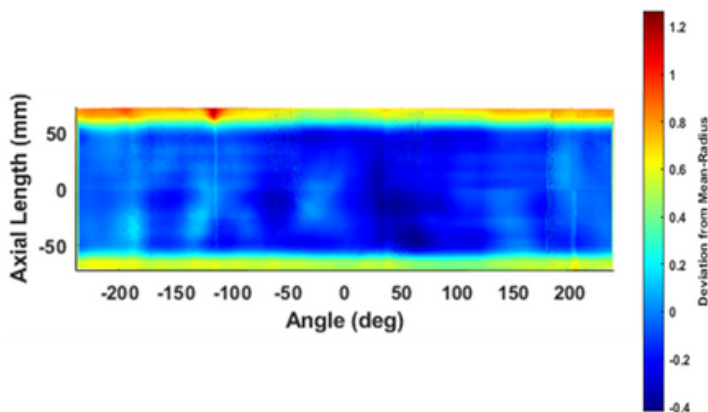


Figure 3: Cylindrical imperfection measured using DIC

# Research Diary

## Judicious Additive Manufacturing

Prof Suryakumar S (L) & Prof Ventaka Reddy N (R)  
Department of Mechanical and Aerospace Engineering



Additive Manufacturing (AM) is a lot of great things. It is, however, not a complete replacement for traditional manufacturing methods. To make the best use of AM, it must be harmonized with other manufacturing processes. The following snippets of work happening at IITH aim at such judicious use of AM, by hybridizing it with other techniques.

### 1. Deposition + Deformation for grain refinement and enhanced geometrical complexity

Wire-based Direct Energy Deposition (DED) techniques in Metal Additive Manufacturing (MAM) allow part-fabrication at higher deposition rates and lower costs. Due to the lack of any support mechanism, these processes face challenges in fabricating overhanging features. Inherent overhang capability of weld-beads and higher-order kinematics can help realize certain complex geometries. However, significant challenges like non-uniform slicing, constrained deposition-torch accessibility, etc., limit the efficacy of these approaches. This facet of research at IITH describes a Deformation aided Deposition (DaD) process to overcome some of those limitations and manufacture complex metallic components. It is based on a sequential combination of deposition and bending processes: a shape fabricated through W-DED deposition is bent to realize the required shape. The Deformation-aided-Deposition process consists mainly of two stages. The first stage is meant for deposition in the form of a GMAW welding torch and the second station corresponds to the bending which is to be carried out with a hydraulic press employing customized dies and punches. The component deposited in the first stage can move to the second station to bend the component to a required shape/geometry. After this step, the component can again move back to the deposition stage for further processing. The desired shape can be obtained through this series of activities. **Figure 5** shows a few sets of sample geometries fabricated at IITH using this method. This work is supported by DST under Advanced Manufacturing Technologies (AMT).

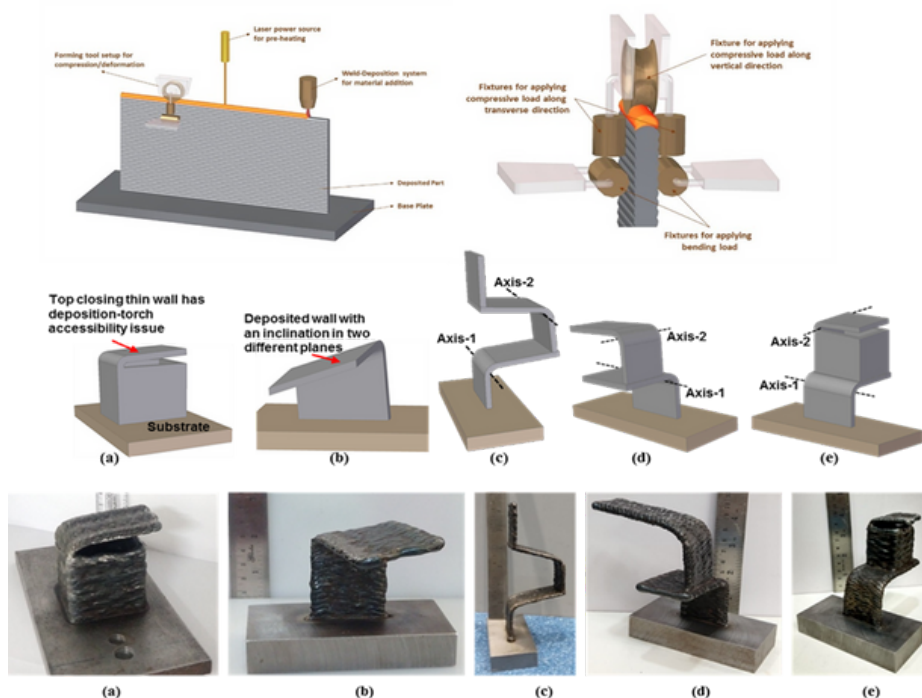


Figure 5: Markforged Mark Two 3D printer

### 2. Deposition + Laser forming for the generative realization of complex geometries

This process is similar to the earlier method, except it uses a Laser instead of a punch and dies for bringing about the necessary shape change. In this two-step process, a component deposited in the first step is subjected to multiple lasers passed in the second step, to obtain a desired angle/shape. This concept has been actualized using a WAAM setup for deposition and a 2kW Yb-YAG fiber laser for the laser forming. **Figure 6** illustrates the steps in this process along with a sample geometry made.

### 3. Deposition + Electro-pulsing for residual stress reduction

During component fabrication in AM, as the build progresses, the partially build component undergoes complex thermal cycles, including directional heat extraction, varying cooling rates, and repeated re-melting and re-solidification of layers. The consequence of these complex thermal cycles is non-uniform expansions and contractions in the component, thermal strains, and residual stresses. Present work is an attempt to reduce absolute residual stresses developed during additive manufacturing using the electro-pulsing method and comprises of applying controlled electric pulses on a partial and/or complete component fabricated using additive manufacturing. When electric current pulses are applied to a metal, a significant "electron wind" occurs. This decreases inter-granular and macro residual stress. The application of electric pulses disintegrates and mobilizes the low angle grain boundaries, indicating a reduction in residual stress. One of the significant advantages of this process is its ability to be applied in an in-situ manner during the build process.

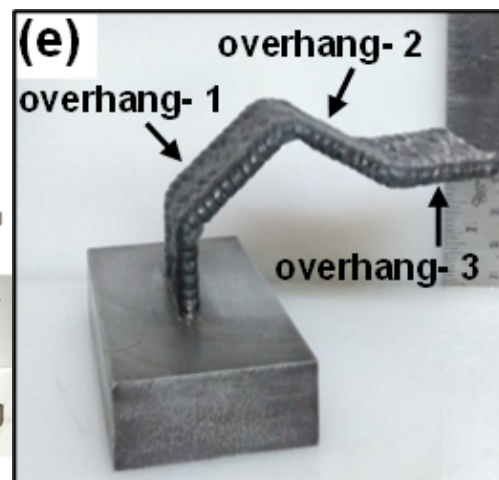
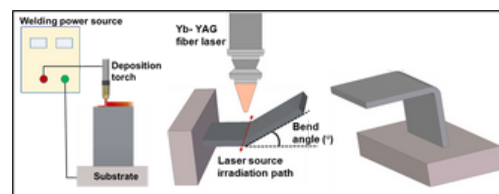


Figure 6: Deposition + Laser forming for the generative realization of complex geometries

#### 4. Wire & Powder deposition for better accuracy and higher deposition rates

Amongst the directed energy deposition-based AM processes, Powder and Wire are different forms of raw material that can be used. Powder-DED comprises a cladding head in which a laser fuses together powder particles sprayed from concentric nozzles. Wire - DED, also known as Wire Arc Additive Manufacturing (WAAM) builds on Arc welding to produce fully dense complex functional metallic objects with wire as feedstock. Amongst the Powder and Wire based processes, the powder offers better accuracy and feature resolution, and wire-based processes are capable of high deposition rates as shown in **Figure 7**. This work aims at developing a Wire & Powder Hybrid Direct Energy Deposition (WP-DED) process bringing together the advantages of a high deposition rate with high accuracy. Apart from the system design, development, and integration, the research also includes studies on:

(a) addressing the distortion and residual stress concerns in the fabrication of large components and,

(b) addressing possible property irregularity arising out of using energy sources with different energy densities.

This work is done together with IIT Dharwad and NITK Suratkal and is supported through the DST-CRG grant.

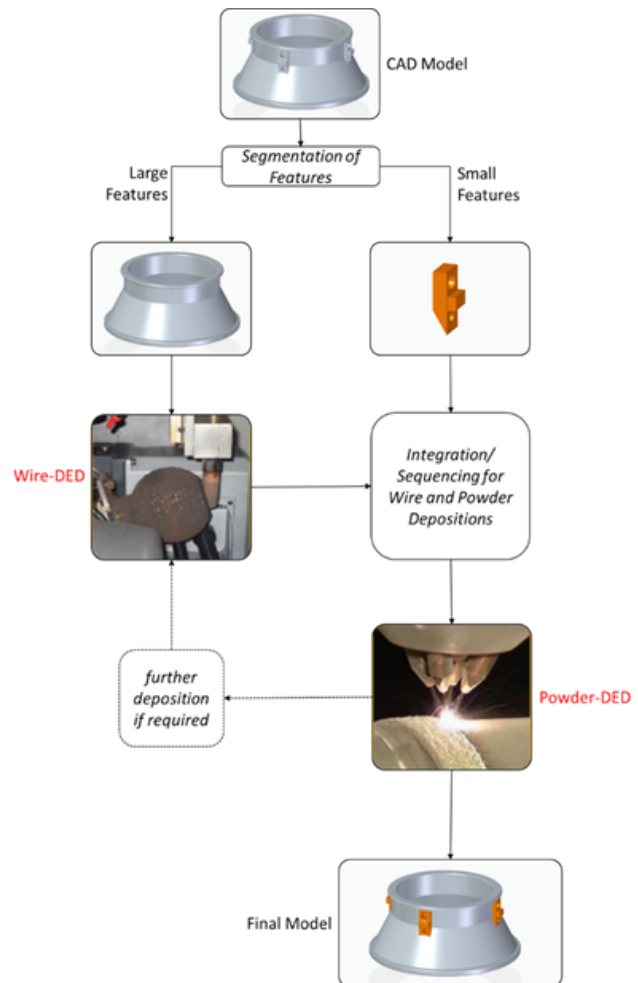


Figure 7: Wire & Powder deposition for better accuracy and higher deposition rates

#### IITH and WiSig unveil 5G Infra Solutions

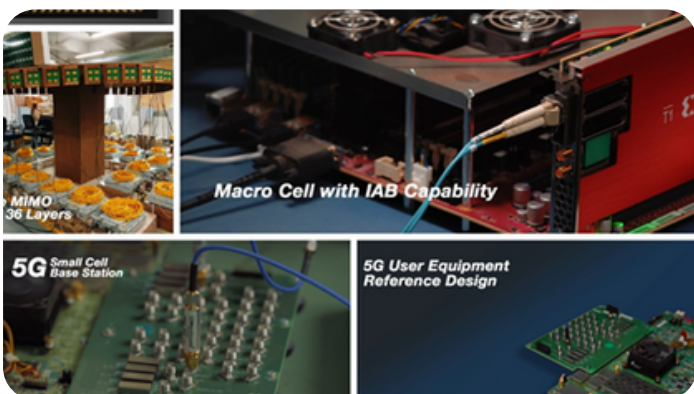
IIT Hyderabad (IITH) and WiSig Networks jointly announced a maiden 5G data call using indigenously developed 5G ORAN technology. The call was made using MIMO capable base station that supports 100MHz bandwidth in the 3.3-3.5 GHz frequency band.

"Inventing and innovating in Technology for Humanity (IITH) is our mantra, and we expect WiSig to make India "Aatma Nirbhar" in the 5G space", **added Prof B S Murty**.

Read More:

<https://pcr.iith.ac.in/files/pressrelease/5GIS.pdf>

Video Abstract: <https://youtu.be/gVPPAgZhkeQ>



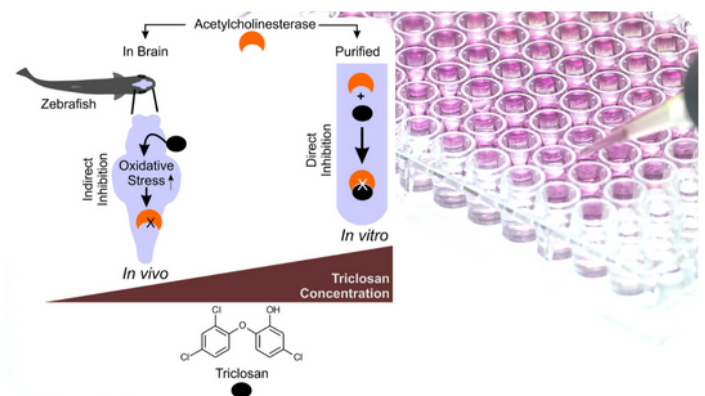
#### IITH Research in news - Q1, 2022

##### How antioxidants improve the inhibitory nature of Triclosan on Acetylcholinesterase, answers IITH

Can we do something to protect ourselves from the toxic effects of Triclosan? Know from IITH's team. Highlights: 1. Triclosan causes damage to the nervous system at very low concentrations. 2. Triclosan impairs acetylcholinesterase enzyme directly and indirectly (via oxidative stress). 3. Acetylcholinesterase enzyme is a vital cellular component, as it is required for optimal sensory and motor skills. 4. Remarkably, if we improve health with antioxidants, we can also prevent the damage caused by Triclosan.

Read more: <https://pcr.iith.ac.in/files/pressrelease/ATL.pdf>

Video Abstract: <https://youtu.be/npprVSvI53U>





# Students' Diary

## Additive Manufacturing: What you see is what you build!

Manoj Singh  
2nd year MTech (Additive Manufacturing)



Additive Manufacturing is a process by which digital 3D design data is used to make up an element in layers by depositing material. The most exciting thing about this process is that an idea can be brought to life in a few hours, and we can make things anywhere at any time!

I was a little confused before joining MTech in Additive Manufacturing at IITH and worried about a career in AM field after MTech. Since I was not much aware of this emerging technology at that time. Right now, I'm in the final year of MTech and working on the project entitled "Deformation and Recrystallization behavior of Selective-Laser-Melted High Entropy Alloy". I have seen in my entire MTech that people have misconceptions about this cutting-edge technology which is why I am writing this article about the phenomenal and diverse applications of additive manufacturing, showing us the full eventuality of this technology.

I would like to tell the people some exciting 3D printing facts so that they get inspired to give life to their 3D printing projects.

- 3D Printing is older than the Internet: Sir Tim Berners Lee invented the World WideWeb in 1989 while the groundwork for modern 3D printers was first laid by Chuck Hull of 3DSystems in 1986.



Chuck Hull of 3D Systems

- 3D printing can help to make houses in space: NASA recently hosted a design competition for building houses on Mars and the winner of phase 1 was ICEHOUSE which used 3D printing and ice to produce an igloo-suchlike structure.



NASA's Contour CraftingTechnology

- 3D printing is on the silver screen:3Dprinting techniques have been featured in movies such as iron Man, The Hobbit, Jurassic Park, Avatar, etc.



3D-printed crown (Black Panther)

It helps save lives: 3D Bioprinting allows the creation of various tissue structures, such as kidney tissue or skin tissue. Indeed, Blood vessels and bones are now getting 3D printable using this technology.



A white 3D-printed model of a human heart

- We can 3D print Food: Regarding meat 3D printing, Giuseppe Scionti, an Italianbioengineer worked on some bioprinting projects, such as creating synthetic tissues, like artificial corneas and 3D printed artificial skin.
- We can use numerous materials for 3D printing: Plastic, metal, resin, 3D printed wood, 3D printed meat, etc.

So, there are no two ways that this technology will be the future of the Industrial Revolution. Currently, this technology is in the development phase. Developments are taking place toward making 3D printing products helpful and cost-effective.



## Students' Diary

### Building large metallic parts with Wire arc additive manufacturing

Saurav Singh  
2nd year MTech (Additive Manufacturing)

WAAM is one of the prominent metal additive manufacturing processes which is already been established as an alternative production process and now making an impact in different manufacturing sectors. WAAM employs an electric arc as the heat source and wire spool as feedstock combining it with robotic systems or CNC machines for motion control to a welding torch for depositing three-dimensional parts. WAAM can manufacture near-net-shape parts with modest complexity. It is particularly suitable for the fabrication of large-scale parts achievable in reasonable times with its high deposition rates (with rates ranging from 1kg/h to 4kg/h). In WAAM, employing the wire as feedstock makes it economical and convenient to handle; it also reduces the cost of parts by reducing material wastage. The application of this process is mainly found in the aerospace and marine industries.

Our work at IITH on WAAM particularly focuses on the realization of large-size components. An example of such components can be seen in the motor casing deposited. This deposition is a part of my M Tech Project under the guidance of Prof. Suryakumar S. The experimental setup used for the fabrication comprises a weld-deposition unit integrated with CNC machines. CMT variant of Gas Metal Arc Welding is used for metal deposition. Cold Metal Transfer (CMT) is one of the variants introduced by Fronius and the advantages of having CMT are excellent welding performance, good weld quality characteristics, low heat input, and virtually spatter-free mode. During welding, temperature variation has a significant impact on the material characteristics and weld bead dimensional accuracy due to residual stresses. To encounter this effect, CMT provides a controlled way of material deposition and low thermal input by using an innovative wire feed system coupled with high-speed digital control.

The deposited part is 487mm in height and diameter of 210 mm as shown in Figure. The built part fits well within the required tolerances. The deposition parameters produced a wall thickness of 5mm; against a target of 3.3mm. This deposition took 48 hours to build from the digital model.



**Figure - Complete deposited Part of Motor casing**

- In WAAM, the temperature distribution is transient, and non-uniform contributes to distortion and residual stresses. The emphasis should be given to the part quality (mechanical properties and residual stresses) and accuracy (surface finish and geometrical precision).
- In the manufacturing of large components, there is a decrease in the thermal gradient of the molten pool and an amount in heat loss. This is due to the reason that in WAAM, the preferential mode of heat transfer is conduction through the substrate and cooling the molten pool. The magnitude of heat flow decreases on an increasing number of layers, causing heat accumulation. Therefore, the thermal conductivity, the specific heat of the base plate, and the amount of heat applied are important for determining the cooling rates in WAAM.



## Students' Diary

### Exploring property space of triple periodic minimalistic surfaces (TPMS) for product design and development

S Kamal Krishnam Raju, 2nd year MTech (Additive Manufacturing) (L)  
Dr Prasad Onkar (Supervisor), Assistant Professor Department of Design (R)

Additive manufacturing (AM) allows for the manufacturing of complex shapes, especially metamaterials. The design of metamaterials using advanced software algorithms opens the door for tailored properties in different places of the structures without changing the material and final shape of the component. Using metamaterials also decreases material consumption without negatively affecting the desired structural properties; it also brings us a step closer to the United Nations (UN) Sustainable Development Goals (SDGs) of 9, 11, 12, and 13.

Triple periodic minimalistic surfaces (TPMS) are a special kind of metamaterial, also known as Architected materials, that have potential applications in fields like Aerospace, Energy Conversion, Tissue engineering, etc. A minimal surface is a surface that is locally area-minimizing; that is, a small piece has the smallest possible area for a surface spanning the boundary of that piece.

For example, Soap films/bubbles. Minimal surfaces necessarily have zero mean curvature, The minimal surface can represent the lowest energy state. The TPMS are minimal surfaces periodic in three independent directions, extending infinitely and, in the absence of self-intersections, partitioning the space into two labyrinths<sup>2</sup>. TPMS structures have an excellent mechanical properties, including energy absorption, strength, and stiffness, as well as easier control of structure properties, better load sustaining capabilities, and higher surface area densities than stochastic and prismatic cellular solids. German Mathematician H.A. Schwarz described the first example of TPMS in 1865 and named it Schwarz diamond surface<sup>2</sup>. Even in nature, many structures like butterfly wings are members of this group of structures.

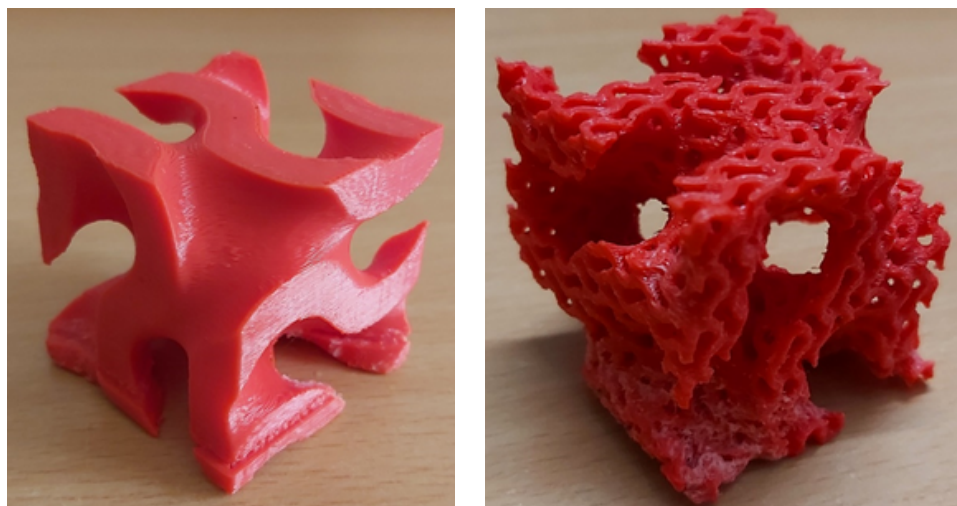
One of our research work primarily deals with second-order TPMS with variable density. In this work, The hierarchy is introduced in the TPMS structure which allows us to control certain parameters depending on the applications. One such example is shown in **Figure 8**. A cube of solid material is reduced to 1st order Gyroid (TPMS) structure. On top of that, a hierarchy is introduced (2nd order Gyroid, as in **Figure 8 (b)**). This type of structure opens up new avenues for product development and design. Hierarchy allows for the addition of tailored properties in different places of the components.

The simulation and analysis of such structures are also difficult because they are essentially heterogeneous in nature. To understand the material behavior, homogenization techniques help to replace the heterogeneous material with a homogeneous material representation. **Figure 9** represents the stiffness matrix of TPMS unit cells, calculated through homogenization (colorful blobs). This helps the designers to predict the influences of the unit cell in the final designs of structural components.

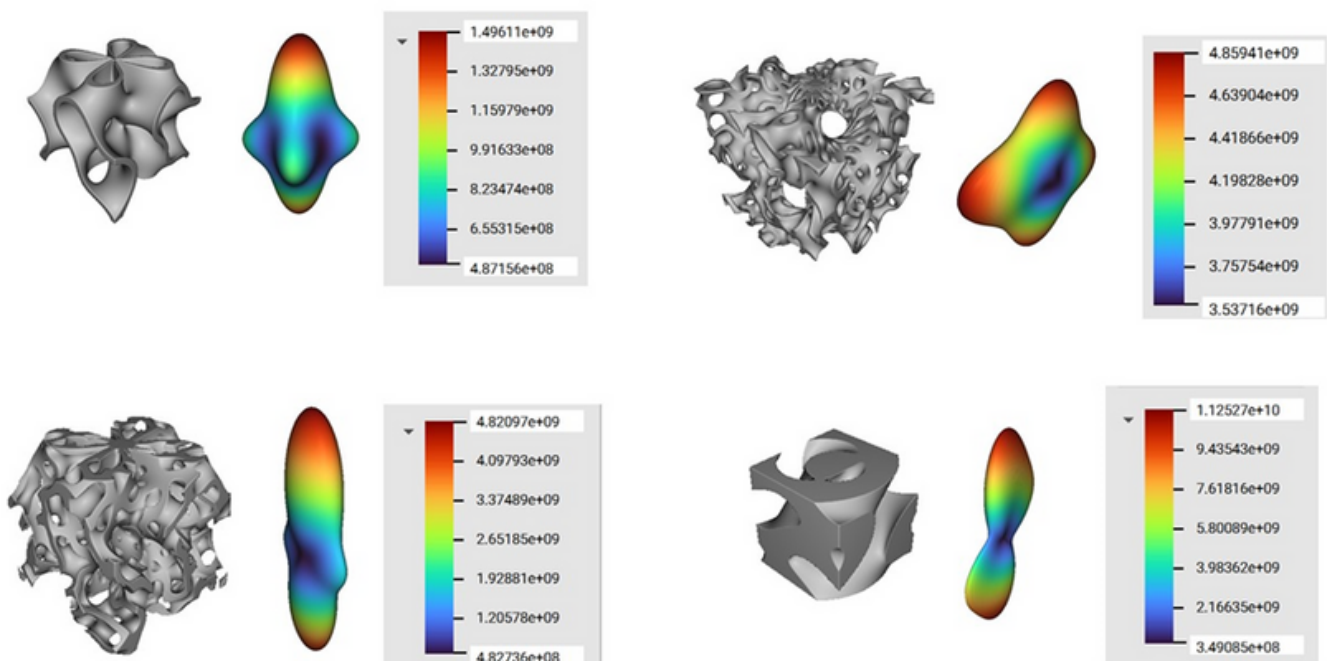
Additive manufacturing technologies enable the manufacturing of TPMS structures which otherwise would not have been possible. But it is still a challenging domain, especially for metals, which calls for further research and explorations.

**References:**

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**Figure 8: Hierarchy in TPMS. a) 1st order Gyroid, b) 2nd order Gyroid**



**Figure 9: Property space of TPMS (Values in MPa).**





# Students' Diary

## Additive Manufacturing of Miura Fold - An Origami Structure

Bhagyashree Pandurang Khandare, PhD Scholar  
 Vijayan Suryakant Nikam, MTech (Research)  
 Department of Civil Engineering

Additive Manufacturing, especially three-dimensional printing, is a method to print three-dimensional objects with the help of computer-aided design in layers. It enables us to produce very complex shapes or geometries that would be otherwise impossible to construct by hand, including hollow parts or lattice structures, or parts with internal truss structures.

But here we came up with a brand-new idea to 3D print an Origami based Deployable structure, which can reconfigure its shape and change its volume through folding and unfolding in a controllable manner. Recently, there has been a growing interest in creating novel deployable structures and devices for high-performance engineering applications, such as solar panels and antennae for space, civil architectures, robotics, and healthcare. 3D printing facilitates advanced design exploration, which we have used for printing Origami fold patterns. Conventionally, such structures are manufactured by the Synchronous folding process, the Gradual folding process, the Pre-gathering process, or Cold gas-pressure folding. Usually, origami-based structures are designed on the premise of 'rigid foldability', i.e., the facets and fold lines of origami can be replaced with rigid panels and ideal hinges, respectively.

We are introducing a novel manufacturing technique by 3D printing- a particular Origami structure- A Miura fold. We have used Thermoplastic Polyurethane [TPU] as the material for printing. TPU is a category of plastic that is created when a polyaddition reaction occurs between di-isocyanate and one or more diols. It is super easy to print with: virtually all 3D printers can print this material. It has rubber-like elasticity, high tear and abrasion resistance, high elongation at break, and thermal stability.

The 3D-printed Miura fold as illustrated in **Figure 10** can be twisted into a saddle-shaped configuration with a negative global Gaussian curvature. Also, it assumes a saddle-shaped configuration under out-of-plane bending which is typical behavior for materials with a positive Poisson's ratio. It exhibits Positive Poisson's ratio under out-plane deformations and a Negative Poisson's ratio under in-plane deformations.

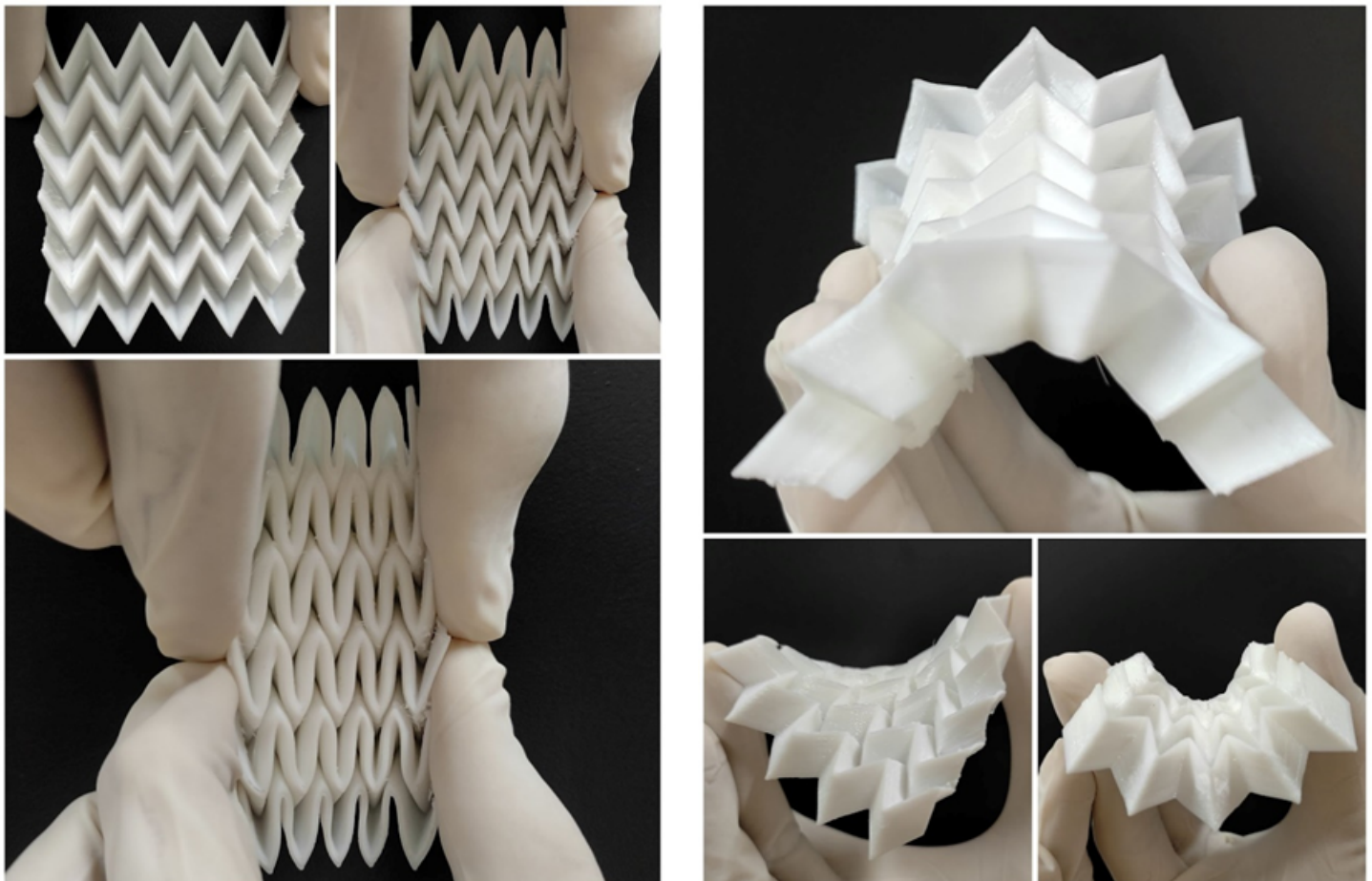


Figure 10: Additive Manufacturing of Miura Fold - An Origami Structure illustration Images

# Alumni's Diary

## Additive Manufacturing: A Technology to Print the Future

Dr Pankaj Sahlot, MTech (2012), Department of MSME

Current: Assistant Professor, Department of Mechanical Engineering  
School of Technology, PDEU, Gandhinagar, Gujarat



Modern design techniques and innovation scale call for on-demand components fabrication in various industries. Additive Manufacturing (AM) is a layer-by-layer deposition technique to create parts using data from a CAD model to fulfill this requirement. AM provides many advantages over the subtractive manufacturing process for creating complex geometry and on-demand components. With the shifting to Industry 4.0, rapid prototyping and on-demand fabrication are becoming the need of the hour. Many companies are incorporating AM to build new-age components. In early-stage, AM processes are typically used for prototyping. However, functional components are created using the process nowadays. AM has a lot of applications in different industries such as aerospace, medical, automotive, consumer goods, electronics, construction, and oil and gas. The adoption rate of AM is increasing rapidly across different industries as shown in Figure 11.

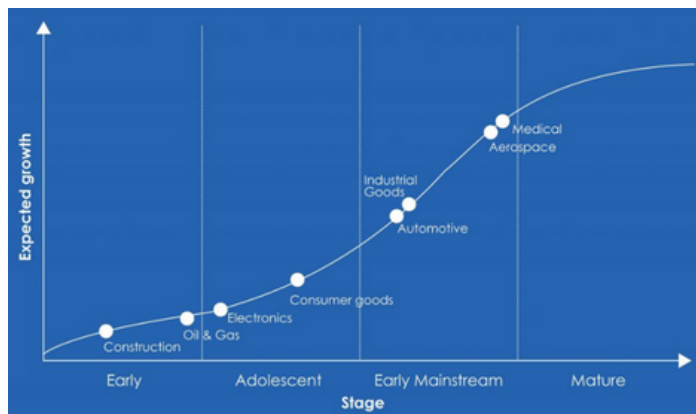


Figure: 11 The adoption rate of AM across different industries [1]

These industries have already been using AM techniques for rapid prototyping and have started producing functional components on-demand that can be directly put to use. Some of the aerospace applications of AM include rocket engines with conformal cooling channels, and regenerative design components to reduce payload. The medical industry also has a lot of applications such as different implants, prosthetics, and even artificial hearts and kidneys created using AM. The Automotive industry is the next field to be tapped by this technology, wherein certain complex design or weight reduction components can be created. The area of AM also shows futuristic promise in constructing houses on-site, building oil well structures offshore, and even in consumer households. Additive manufacturing has also significantly contributed to the initial time of COVID-19 by producing various personal protective equipment (PPE) as shown in Figure 12.

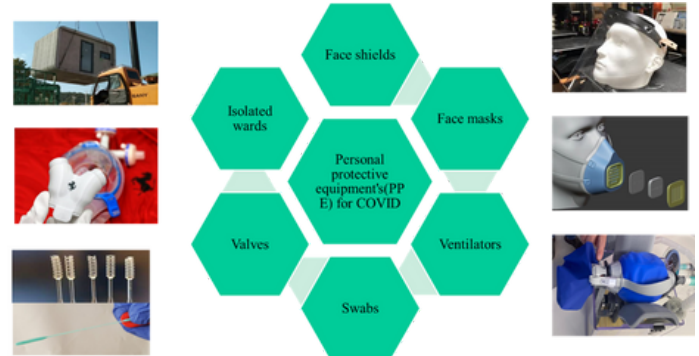


Figure 12: Personal protective equipment's (PPE) developed by AM processes for COVID-19

Various researchers are working to understand the science and improve the technology of different AM processes. Some promising fields of research are numerical modelling and simulation of various AM processes, process parameters optimization, design for AM, the effect of various parameters on mechanical and microstructural properties, the feasibility of printing new materials, and even using machine learning models to predict the output properties. Additive Manufacturing is a disruptive technology with many potentials to create a difference in the future as illustrated in Figure 13.

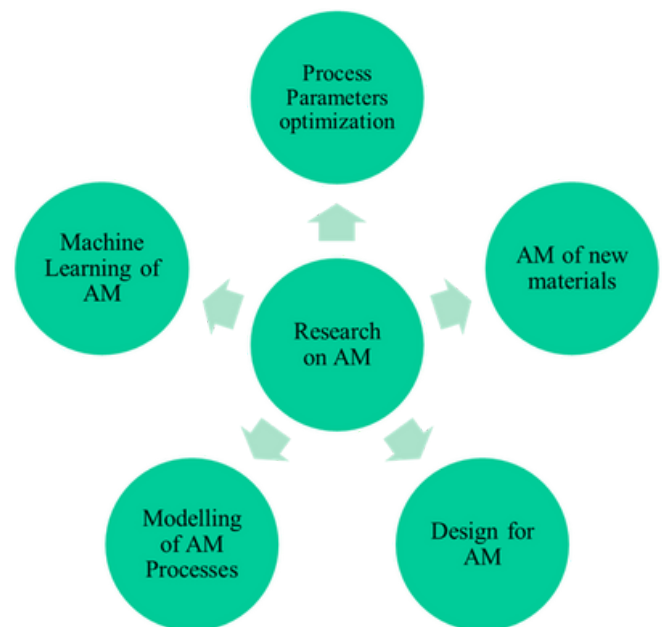


Figure: 13 Few key areas of AM research

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1. <https://amfg.ai/2019/10/04/connecting-the-digital-thread-scaling-additive-manufacturing-with-workflow-software/> access on 22nd April 2022



## Life at IITHyderabad & Around Additive Manufacturing

Dr Somashekara M A, MTech (2011) & PhD (2016),  
Department of Mechanical & Aerospace Engineering  
Current: Assistant Professor, IIT Dharwad

### About me

This is Somashekara M A. I did my M.Tech (First Batch) and PhD in the year 2011 and 2016 respectively from the Department of Mechanical and Aerospace Engineering at IITH. I went on to do my post-doc at the Singapore University of Technology and Design (SUTD) and Ames laboratory. At the Ames lab, I worked on a project titled "In-Situ Data Analysis and Tool Development for Additive Manufacturing Metal Powder Systems" which is funded by the United States Department of Energy. The project is a collaboration between Stanford Linear Accelerator Center (SLAC), Lawrence Livermore National Laboratory (LLNL), and Ames laboratory.

I am currently working as an assistant professor at the IIT Dharwad. Recently, I received the Technology Translation award (TETRA) from the SERB for 4D Printing technology Development and transfer.

### Life at IITH

It's difficult to word my time of 6 years (MTech+PhD) in 2-3 pages at IITH. My journey at IITH started in August 2009 (first batch M.Tech). We spent our first semester at IIT Madras, where the IITH office was not more than 15 X 15 ft and with only 3-4 staff, 30 M.Tech students, and a few PhD students, and courses were carried out along with IIT Madras. Around the end of December 2009, we all moved to the ODF campus. We faced a lot of challenges in the initial days however, with the help of new and young faculty we progressed together.

It was a learning experience to see the progress of IITH from less than 200 students (all programs) to 2000 students when I left. We had often joked that we are seniors to any faculty member in the department. I learned a lot from Prof. Raja Banerjee, the MTech supervisor. He is a very supportive and kind person.

I enjoyed learning the courses taught by Prof. Suryakumar (Rapid Prototyping and Manufacturing, CNC and Part Programming, Manufacturing core lab), Prof. Vinayak Eswaran (Mathematical Methods for engineers), Prof. Abhay Sharma (Advanced Material joining processes), Prof. N V Reddy (Rapid Prototyping), Prof. Ashok Pandey (Design Core lab). Prof Prashanth and Prof Ramji M helped in several ways during my journey.

It was Prof Surya who inspired me a lot and supported me both personally and academically as well. Prof. Surya's philosophical emails have changed my life in many ways. There were days when I had left hope for myself, but he always had confidence in me which drove me to work hard and go on and on.

My heartfelt thanks to Prof Vinayaka Eswaran, who inspired me a lot in more ways than one during this journey.

I was a PhD representative and Senate Member during 2013-2014 and it was a learning experience during that period related to various fractional course reviews and discussions. I think because of that position leadership qualities improved a lot. I must say thanks to my PhD batchmates who trusted and voted for me. Special thanks to Dr. Hari Prasad C and Mr. Bhagath Singh M.

I just love the ODF campus very much, from day one (December 29, 2009) to October 2015, I was always happy to stay in the campus, Room 508 (Special thanks to Mr. Bhagath Singh M, roommate) which is so special to me, Tuesday and Friday market, eating chats in complex, Amul fast food, Night canteen, Sarath stadium, South gate and so on. I always dreamt of staying on the permanent campus of IITH which was under construction since my MTech. Finally, I happened to stay there for three months (October 2015-Jan 2016) towards the end of my tenure, room no 416 C-Block was also special to me.

Last but most important, I met Ms Manasa K, my wife who supports all my endeavors. There is not a single doc that went out without her review including my PhD thesis and publications.

### Additive Manufacturing Research work at IITH

In August 2011, I joined a PhD program under the guidance of Prof. Suryakumar S. We had developed Twin-wire additive manufacturing (Industrial robot with twin-wire welding setup) for gradient objects fabrication (Wire arc additive manufacturing (WAAM)). I was a part of various events/activities related to additive manufacturing viz, digital symposium conference, NATFOE, departmental events, etc. Definitely, it was a great research experience in the area of additive manufacturing and the reason I am today. I must thank all staff members (Workshop, Manufacturing labs, etc.)

### Additive manufacturing and 3D printing Lab at IIT Dharwad

I joined IIT Dharwad as an Assistant Professor, before that I spent 3 years at SUTD Singapore, Ames Laboratory, Critical Material Institute, and Iowa State University. The experience I gained at IITH, SUTD, and Ames Laboratory helped me establish labs and research facilities at IIT Dharwad.

At IIT Dharwad our research group is working on different problems in the areas of additive manufacturing. Followings are a few areas,



My research group at IIT Dharwad



**1. 3D Printed Mechanical Metamaterials**

The research work is aimed at developing a combination of multi-material and meta-materials via additive manufacturing with a focus on fabricating multi-material components with meta-material features for different applications. Designing innovative structures of metamaterials will lead to the development of advanced materials with special properties. The experimental investigation presented in this work involves the design, simulation, fabrication, and testing of three different mechanical metamaterial models as shown in **Figure 14** i.e. Chiral, Re-entrant, and Hybrid printed in acrylonitrile styrene acrylate (ASA) using fused deposition modeling (FDM). Also, a uniaxial compression test and ex-situ characterization was performed for studying the mechanical properties, the types of fracture, and crack propagation of the printed metamaterial models which may lead to the development of metamaterials with tunable compressive/bending stiffness.

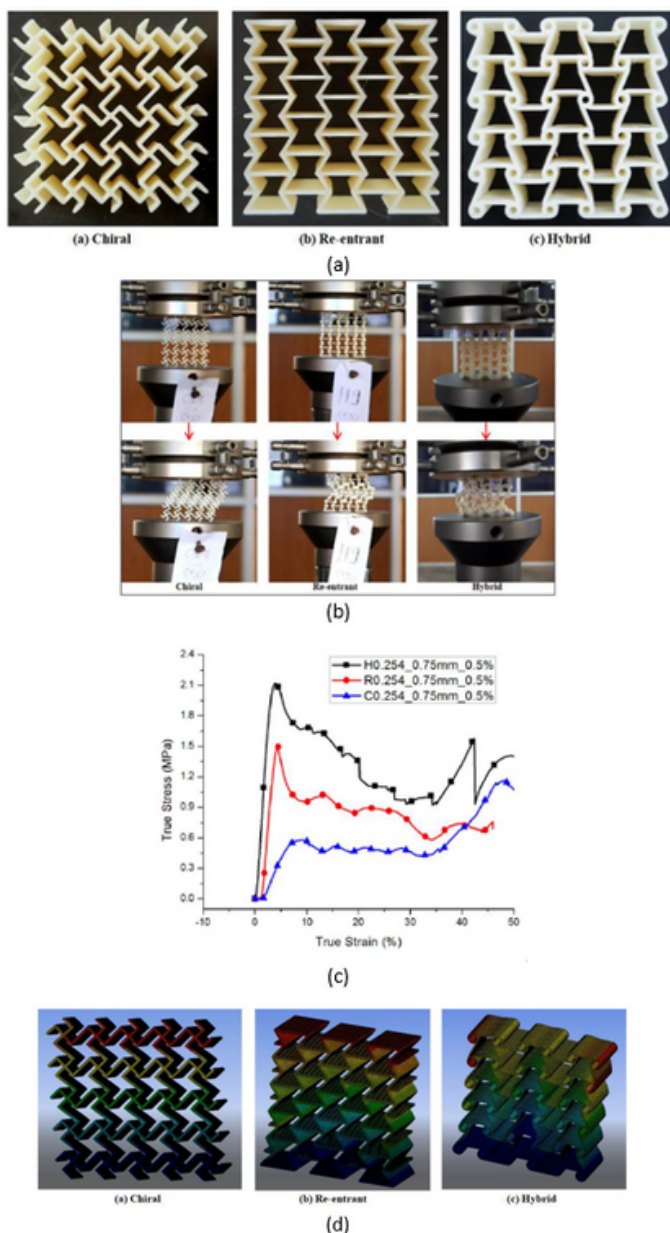


Figure 14. (a) 3 Printed Mechanical Metamaterials, (b) Deformation of printed meta-materials under compression test with 0.5% s<sup>-1</sup> strain rate (b) True stress-strain relationship between uniaxial hybrid, re-entrant, and chiral models, (Sunil M et.al, SFF 2021).

**2. Functionally Gradient Objects Via Hybrid Additive Manufacturing Process.**

This research work collaboration between three institutes IITH (Prof. Suryakumar), NIT Surathkal (Prof. Srikanth), and IIT Dharwad, and the project is funded by SERB. Prof. Surya is leading this project. This research work is aimed at the development of Functionally Gradient Materials (FGM) via the Hybrid Wire-Powder DED process to achieve high feature resolution and deposition rates. Development of integral system capable of sequential and subsequently, simultaneous hybrid Wire-Powder DED process for achieving FGMs

**3. 4D printing Technology.**

This research is aimed at the Design and Development of 4D Printing technology for different applications. Focus is basically the integration of smart materials (shape memory alloys, shape memory polymers) during 3D printing so that printed parts have dynamic structure instead of static structure (typically 3D printed parts are only static). Here we are developing mathematical models, different designs, smart material integration, the behavior of smart material, type of actuation, external stimuli, etc. This work is patented and funded by SERB. Also, received Technology Translation Award 2022.

**4. Self-healing and Gradient structure applications**

India is a land of rich history and cultural heritage. In ancient days, many popular metallic structures were developed. One such structure is Delhi Iron Pillar erected about 1600 years ago. The pillar is made up of Wrought Iron. The pillar is referred to as a “Rust-less pillar” since it did not rust to date. There is a material variation from inside to outside in the form of the gradient. Research takes into account, the ancient manufacturing ideas and gives it a modern touch to suit present requirements. The present proposal aims at the development of engineering structures, gradient structures, self-healing objects via polymer (Material Extrusion), and metallic (Wire-Directed Energy Deposition) additive Manufacturing processes. This research work is funded by the Indian Knowledge System (IKS).

**Acknowledgment:**

I take this opportunity to acknowledge everyone (Family, Friends, Staff members, faculty members, etc.) who was a part of my journey at IITH starting from August 2009-Jan 2016. As a concluding remark, I would like to say that IITH is one of the premier institutes and growing faster and faster with the best research facilities, best faculty members, and fostering an excellent innovation environment If you want to reach me, please mail me at [somashekara@iitdh.ac.in](mailto:somashekara@iitdh.ac.in) or [somashekara.ma@gmail.com](mailto:somashekara.ma@gmail.com)



This photo was taken soon after my Ph.D viva voce



## Experience, learn and enjoy

Ms Anju P V, M.Tech (2019)

Department of Materials Science and Metallurgical Engineering  
Current: Doctoral Candidate, Hokkaido University, Japan

I am Anju P V. Graduated from IITH in 2019 in Material science and Metallurgical engineering as a master's student. Now I am a Doctoral student at Hokkaido University in the Sustainable Resources Engineering division supported by the JICA fellowship.

The main reason to choose IITH is that it is one of the best second-generation IITs. Also, I was sure that an opportunity to study at an IIT will not only help you to become good in academics but also help you for your overall growth as a human being, as an Alumni I can proudly say IITH did that Change in me.

All the subjects I took are my favorite. The professors and the curriculum system in IITH made it very easy and enjoyable. I did my bachelor's degree in Polymer engineering when I attended the courses in material science and metallurgical engineering department it was a little bit difficult for me in the beginning. But the fractal academic system helped me to overcome this situation. I used to audit basic courses to help me to understand the advanced courses I took for completing my master's program.

I once participated as a mentor in the Vigyan Jyoti knowledge Centre residential program organized by IITH. It was an initiative designed to provide motivation, vision, and guidance to girls early on, so they can pursue their dreams and contribute to the growth of our society. It was a really great opportunity to join the team and see the ambitious girls and see how IITH provided them to build their hopes high. I am thankful to my supervisor Dr. Mudrika Khandelwal for motivating me to join the program. Also, I had a great experience organizing department day in the Material science and metallurgical department with my batchmates. I really need to mention how much fun I had while participating in cultural activities.

The best training overall I had in IITH is "to become a researcher". Building curiosity, observing, analyzing, and communicating in the right way in terms of science.

Doing my master's in IITH shaped me to become a good researcher. I learned how to approach a problem as a researcher. I must mention the part of my supervisor in IITH Dr. Mudrika Khandelwal's guidance during my time there. I had a big change in my research approach after being her student. Being part of a very good research team with experienced seniors influenced me to proceed carrier in Research. Interdisciplinary work carried out by our group enhanced me to have knowledge in multiple disciplines, I think as a researcher it is helping to think out of the box and adopting a critical way of thinking.

IITH life for me was a pleasant time. A place where I had a healthy social life. IITH student life will be always one of the favorite times of my life. The best moment I feel is the day I left IITH , I realized how much I value the moments I spend there, and I am grateful to IITH for giving me the best days of my life.

I want to say only one thing as an Alumni, enjoy your life in IITH, It will one of the best moments in your life. Experience, learn and enjoy.

The best thing about IITH is that it is a lively campus, the best community to live in. Almost all the students live on campus, which makes it easy to interact and communicate with people easily. I don't have any suggestions, but I hope this will stay vibrant by continuing cultural and social activities often as we used to have.

I can be reached at [anjupv579@gmail.com](mailto:anjupv579@gmail.com).

## Alumni in IITH news



### Dr Santhosh Kumar Pamula

PhD (2017), Department of Mathematics

Appointed as Assistant Professor in the Department of Mathematical Sciences at IISER Mohal



### Dr Arthi Gopalakrishnan

JDP (2021), IITH-SUT, Department of Electrical Engineering

Admitted as 'Associate Fellow of the Telangana Academy of Sciences'.



### Getting Started with V Programming

A book by Navule Pavan Kumar Rao (MTech - Data Science, IITH)

An End-to-end Guide to Adopting the V Language from Basic Variables and Modules to Advanced Concurrency is now available on Packt, Amazon IN, USA & worldwide

# Incubatee's Diary

## Activities by iTIC Incubator at IITH

Divya Bansal, Executive - Digital Marketing (R)  
Keyur Punjani, Manager - Programs (L)  
i-TIC Incubator)



### OTTONOMO'22

TiHAN and iTIC Incubator at IITH jointly organized OTTONOMO'22, a grand challenge to identify impactful solutions to address the bottlenecks in the domain of Autonomous Navigation to leverage the innovation capabilities of teams around the world who are passionate about solving problems in the Autonomous Navigation industry.

TiHAN and iTIC Incubator collaborated to provide access to the platform and resources that can be engaged in solution identification based on the problems sourced from the industry. Currently, the applications are being shortlisted for the virtual boot camp.

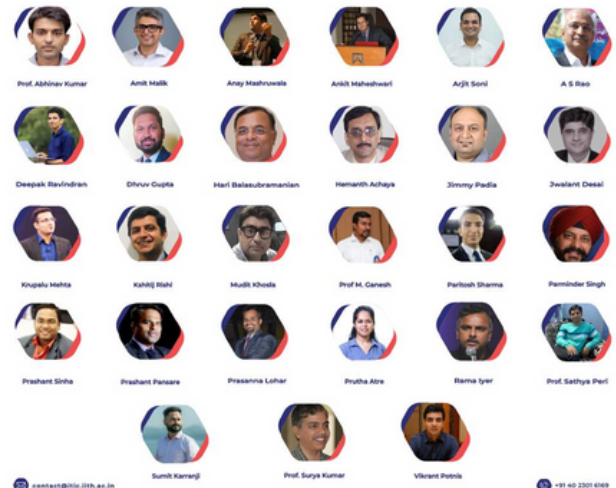
OTTONOMO'22 Announcement

### Certificate course on Deeptech Entrepreneurship

For the second time, a 5-day certificate course on Deeptech Entrepreneurship was jointly organized by the Dept. of Entrepreneurship and Management, IITH, and iTIC Foundation IIT Hyderabad from February 21, 2022, to February 25, 2022. The program was conducted virtually and was focused on mentoring early-stage founders and aspiring entrepreneurs.

The course was divided into lectures, interactive sessions, workshops, panel discussions, etc. The course received a huge response and was attended by more than 100 participants pan India.

### Thank You To Our Incredible Speakers



A glimpse of Deeptech Entrepreneurship speakers

### Conclusion Of EnCode'22

iTIC incubator launched a hackathon in collaboration with Engro Technologies and Meity startup Hub. The hackathon offered a chance to work on real-world challenges and propose a solution that can be converted into a full-fledged business.

EnCode'22 was launched virtually in the first week of January 2022 and received an overwhelming response from students, researchers, teachers, and aspiring entrepreneurs. After initial shortlisting, two teams were selected to build a PoC in 30 days. iTIC and Engro teams provided all the necessary support and mentorship to the teams.

After building satisfactory PoC, both the teams were shortlisted for a virtual round of interviews. They were awarded the Meity EiR grant of up to INR 4 Lakh and pre-incubation support by iTIC for 12 months to convert it into a prototype.



### enCODE22

iTIC Incubator and Engro Technologies congratulates all the winners and wishes them Good Luck for their entrepreneurial journey.

#### Winners

- Hrishita Kumar
- Shashikant Sahu



Encode 2022 Result Announcement



### Onboarding New Startups

On March 28, 2022, iTIC team hosted NMDC delegates and facilitated interactions with the new onboarded startups. Under the NICE program, 4 startups and 1 fellow were onboarded and 2 startups were onboarded under NIDHI PRAYAS. iTIC formed a new Advanced Incubation program and onboarded one startup under it. This program is focused on supporting MVP stage startups for 12 months.

Startups under the NICE fellowship and NIDHI PRAYAS would receive up to INR 10 Lakhs of support to convert their Proof of Concepts into prototypes. Startups under NICE incubation would receive up to INR 25 Lakhs to convert their prototypes into Minimum Viable Products.



### Additive Manufacturing @ iTIC

iTIC Incubator has set up iLAB, a prototyping lab for startups where they can build their prototypes in-house. Under iLAB, there are three types of 3D printing technologies that can collectively print in more than 50 different materials.

#### Fused Filament Fabrication (FFF)

FFF 3D printing uses filament as raw material and can print in different polymers of plastics like PLA, ABS, Nylon, PETG, PP, PC, TPU, HIPS, and other filaments below 300 degrees Celcius.



#### Low Force Stereolithography (LFS)

LFS 3D printing uses UV curable resin as raw material and can print in different materials with properties like Transparent, Rigid, Flexible, Tough, Dental, High Temp, Castable, Biomedical, and all materials by Formlabs.



#### Multi Jet Fusion (MJF)

MJF technology uses Nylon powder as a raw material and CMYK ink colors to provide millions of color options. MJF technology can print functional as well as colorful parts with minimal post-processing.

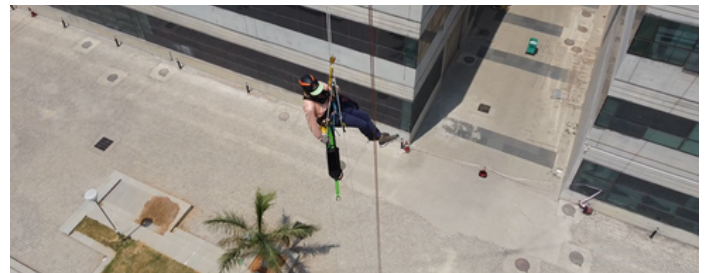


### Startup Stories

#### ManaliSwing starts testing of AI-backed giant swing at IITH

ManaliSwing offers the world's most creative & safe high-altitude Giant Swing allowing one to experience the adrenaline of 70m free fall with 100+ jump styles backed by artificial intelligence promising impeccable safety like never before in history.

ManaliSwing started developing their prototypes at IIT Hyderabad last year. Currently, they are testing their system with dummy jumps and after 1000 jumps, they'd do human jump trials.



#### MyUdaan

MyUdaan focuses on serving the elderly and PwD. They're developing a wheelchair attachment that can convert any wheelchair into a motorized one.

The attachment will help to improve the quality of life of the users.

Some of the features of the wheelchair:

- ADAPTABILITY - Fits on any wheelchair
- AFFORDABILITY - Value for money product
- CONVENIENCE - Using the attachment does not need any outside assistance
- COMPETITIVE - First in the Atmanirbhar Bharat campaign

myUDAAN is a single epicentre solving inter-related mobility problems with below products and services:

1. On-Demand Mobility Assistance for PwD & Elderly - Customers can book a mobility assistant through simple steps like Uber. People can now freely move in malls, cinema halls, and large open spaces with dignity and freedom. They can also independently travel outstation.
2. Accessibility for PwD & Elderly - Customers can now check locations accessibility before travel. Our mobile application has a feature to classify whether locations are accessible or inaccessible for PwD.
3. Mobility for PwD & Elderly - Customers can gather information or purchase unique mobility products on our platform [www.myudaanstore.com](http://www.myudaanstore.com).











# IITH in News

THE HANS INDIA

Thu, 17 Mar-22; The Hans India - Hyd; Size : 64 sq.cm.; Circulation:-; Page : 9

## IIT-H teams up with Hyundai Mobis

For research on India-specific advanced auto tech

In a strategic move aimed at accelerating the pace of research in the field of Advanced Automotive Technologies, IIT Hyderabad has joined hands with Mobis India Ltd.

Under the agreement, IIT Hyderabad will leverage its expertise in the field of Mathematical Modeling, Machine Learning, and Hardware prototypes for ADAS to address India-specific challenges in Advanced Driving Assistance Systems (ADAS) and Hardware Resource Optimisation techniques for Chassis Software.

Prof B S Murty, Director of IIT Hyderabad, said, "With this collaboration, IIT-H aims to strengthen further its expertise in the field of Automotive Industry, specific to Advanced Automotive Technologies like ADAS. This pact will enable our researcher to answer the unsolved challenges and equip IITH to prep industry-ready human resources with the domain expertise to achieve our motto of Inventing & Innovating in Technology for Humanity".

Mobis India Limited, which is one of the

R&D Centre for Hyundai Mobis, works on various vehicle Infotainment, Mechatronics (Chassis, Safety, and Vision Systems), and CAE. The focused area will be on software development on many cutting-edge technology projects in automotive. Software Development projects executed at Mobis India Limited - R&D Center in Hyderabad.

Hyundai Mobis is a global Strategic business partner of Hyundai Motor Company (HMC) & Kia Motor Company in the areas of Advanced Automotive Modules, core automotive parts, and advanced automotive electronics systems.

Expressing delight on the collaboration, Jae oh Cha, Chief Technical officer (CTO), said, "Mobis India Limited (Mobis Technical Centre of India) is happy to collaborate with IIT Hyderabad for future technology development in advanced driver assistance systems and Chassis systems for Indian Automobile Market. We are looking forward to increasing the collaboration in the future".

DECCAN Chronicle

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5 Feb-22; Deccan Chronicle - Hyderabad; Size : 25 sq.cm.; Circulation:43099; Page : 5



Representatives of IIT-H and Suzuki Motor Corporation pose for a photograph in Hyderabad on Friday. — DC

## Suzuki innovation centre to aid IIT-H

Company to blend technology, design

DC CORRESPONDENT HYDERABAD, FEB. 4

In a first, Indian Institute of Technology Hyderabad started an innovation centre for knowledge exchange with Suzuki Motor Corporation (Japan) to further academic and technology collaboration between India and Japan.

The centre will address broad challenges beyond mobility in India and Japan, support skill development and exchange of human resources between the two countries.

It will be operated as a platform for open innovation among industry, academia, and start-ups. Prof B. S. Murty, director of IITH, said, "The

endeavour is to create inclusive value for Indian and Japanese societies. IITH will work closely with Suzuki Motor Corporation and other upcoming stakeholders to identify and address broad challenges on and beyond mobility on top of the synergistic combination of technology and design."

THE TIMES OF INDIA

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Sat, 05 Feb-22; Times Of India - Hyderabad; Size : 172 sq.cm.; Circulation:267065; Page : 5

## IIT-H powered job portal for PWDs soft-launched

TIMES NEWS NETWORK

Hyderabad: 'Swarajability', positioned as India's first AI-triggered accessible job portal, for persons with disabilities (PwDs) was soft-launched on Friday by India's principal scientific adviser K Vijay Raghavan.

Raghavan, emphasized the significance of rigorously testing technological innovations in both the software and hardware sector among groups of people who need them most, before these innovations are scaled up by the industry for a transformative impact. "It is important to remember the age-related subgroups of people with disabilities. Children are a vulnerable group too and their disabilities should be considered," he said, adding that critical feedback will be taken on the beta version to make it a widely used platform.

This customized job platform, whose beta-version was launched on Wednesday, will analyze the available information and suggest the required

### CUSTOMIZED JOB PLATFORM

► This platform will analyze the available information and suggest the required training needed for the concerned job seeker



► BS Murty, director, IIT-Hyderabad, said this portal would become live soon and benefit a large section

► It has been developed for both web and mobile versions for the maximum reach of the initiative

training needed for the concerned job seeker.

It has been developed for both web and mobile versions for the maximum reach of the initiative. While IIT has given its expertise for the AI component, Visual Quest India is the developer and Youth4Jobs will help in skilling and job linkages. The project, which provides an opportunity for PwDs to learn skills, linked to jobs, is funded by Kotak Mahindra Bank. "It is named 'Swarajability' as it gives independence to PwDs using technology

skills, and job linkages. It is an effort to include cutting-edge technology that allows persons with disabilities from all walks of life to join and explore job opportunities. Youth are given training that is tailored to their skills and knowledge. It is a one-stop-shop for organizations that want to hire persons with disabilities," a press communique from the institute read. BS Murty, director, IIT-Hyderabad, said this portal would become live soon and benefit a large section of those needing such a platform.

Telangana Today

In a nutshell

Sangareddy

## IIT-H Professor wins award

Assistant Professor at Department of Liberal Arts, Indian Institute of Technology-Hyderabad (IIT-H) Dr Shuhita Bhat-tacharjee, has been awarded the "Out-standing Woman Researcher in English Literature (Humanities and Social Sciences) Award" in the 7th Venus International Women Awards (VIWA) 2022.

# IITH's Bank of Knowledge

## Teaching Staff



**Dr Ashudeb Dutta**

**Professor**  
Department of Electrical  
Engineering

Prof Ashudeb Dutta did his BTech in Radio Physics & Electronics, from Kolkata University, West Bengal, a Master's degree in ECE from IEST, Shibpur, and obtained his PhD degree in E&ECE department from IIT Kharagpur in the year 2009. He joined as Assistant Professor in Electrical Engineering Department at IITH in 2009 after completing his PhD and became Associate Professor in the year 2016. Presently, in 2022 he is working as Professor in Electrical Engineering Department at IITH. His research interests are in the fields of Analog and RFIC design. He has been involved with several research projects funded by Meity-India, DRDO, Astra Microwave Ltd., etc. Based on his research interest, he became an active member of three start-up companies in the area of Analog, RF, and System design.

**My Experience at IITH:**

My experience at IITH was great. The research infrastructure and funding were extremely good to build state of research laboratories. Moreover, I experienced, IITH be a glorious family with a distinct vision and independent work environment. I enjoyed every time in teaching as well as performing research work with IITH students and Faculties.

Prof Narasimha Mangadoddy has been with IITH since 2010 as Assistant Professor after completing his PhD from the University of Queensland, Australia, in 2010. He did his BTech from College of Technology, Osmania University, Hyderabad, with a bachelor's degree in Chemical Engineering and a master's degree in Chemical Engineering from IIT Kanpur before joining TATA Steel in 2002. He worked as a Research Manager at R&D, TATA Steel, Jamshedpur, and deputed as TATA Researcher at SMI-JKMRC, the University of Queensland, Australia, from 2002 to 2006. His research interests include Comminution and classification, Fluidization, Multi-phase CFD, CFD-DEM coupling, and Mineral beneficiation. He has been involved with several research projects funded by UAY-MoE, National Mineral Development Corporation (NMDC), TATA Steel, Department of Science and Technology (DST), Hindustan Zinc Ltd., etc. For the past several years, he has been serving as a member of the Telangana State Pollution Control Board for CFO & CFE. He is presently an International Advisory Committee (IAC) member from India at International Mineral Processing Council (IMPC).

**My Experience at IITH:**

I have been at IITH for over 11 years and have experienced a very vibrant research & academic culture and a substantial amount of administrative work. The kind of support for faculty and research scholars provided by the institute for establishing the state-of-art research labs and freedom for research explorations really boosted us to excel as younger IIT in the top 10 institutions of India within a short span of existence. The rate at which the campus is getting developed currently, both in terms of infrastructure and research innovation hubs, surely, will lead us as one of the world-class institutions and prime destiny for researchers and faculty in the near future.



**Dr Narasimha Mangadoddy**

**Professor**  
Department of Chemical  
Engineering

Prof Sivakumar Keerthipati received a BTech degree in Electrical Engineering from Sri Venkateswara University, Tirupati, India in 2004; an MTech degree in power electronics and drives from the National Institute of Technology, Warangal, India in 2006, and the PhD degree from the Center for Electronics Design and Technology, Indian Institute of Science, Bangalore, India in 2010. He joined IITH as Assistant Professor in March 2011.

His research interests include multi-level inverters, open-end winding induction motor drives, pulse width modulation techniques, Switched-mode power conversion, microgrids, and power quality and control.

**My Experience at IITH:**

It is very good to be at IITH.



**Dr K Siva Kumar**

**Professor**  
Department of Electrical  
Engineering

Prof Sumohana S Channappayya received his BE degree in ECE from the University of Mysore, MS in EE from Arizona State University, and PhD in EE from the University of Texas at Austin. He spent close to five years in the industry before joining IITH in July 2012.

**My Experience at IITH:**

My experience at IITH has been a positive one, thanks to the wonderful colleagues, students, and staff.



**Dr Sumohana S  
Channappayya**

**Professor**  
Department of Electrical  
Engineering



# IITH's Bank of Knowledge

## Teaching Staff



**Dr Koyel Banerjee Ghosh**

Assistant Professor  
Department of Chemistry

Prior to joining IIT-Hyderabad, Dr Koyel worked as a postdoctoral fellow in the Department of Chemical & Biological Physics at the Weizmann Institute of Science, Israel. She received a prestigious award for Outstanding Performance in Postdoctoral Research in 2018 by the Weizmann Institute of Science. She completed her PhD from CSIR- Central Glass & Ceramic Research Institute, Kolkata, in 2017. She obtained her MSc and BSc degrees in Chemistry from Jadavpur University, Kolkata. Her research interest is in the field of Chiral Molecular Electronics.

**My Experience at IITH:**

The warm and friendly welcoming attitude of my colleagues, the Director, and administrative staff makes me feel very comfortable here from the day of my joining. On-campus housing, a health center, a school for children, and a departmental store for our everyday necessities make our family life easy inside the campus. The working environment is very vibrant here. I found a strong sense of unity within the fraternity to do good research. I look forward to flourishing my research and teaching career at IITH.

Prior to joining IITH, Dr Kishore Natte was working as a Senior Scientist at CSIR-Indian Institute of Petroleum (CSIR-IIP), Dehradun. He obtained his PhD from the Technical University of Berlin in collaboration with the BAM-Federal Institute for Materials Research and Testing under the supervision of Joerg Friedrich in 2013. In the same year, he joined the research group of Matthias Beller at Leibniz Institute for Catalysis (LIKAT) for his postdoctoral research and worked till December 2015 and then moved to RWTH Aachen University. His research focuses on the development of new strategies and technologies in chemicals and pharmaceuticals, including fuel-type molecules. His hobbies include playing football and cricket.

**My Experience at IITH:**

I joined IITH in March 2022. I am extremely thankful to the staff and faculty colleagues for their kind support and welcome. I feel fortunate to join the IITH family, where the research and academic environment are excellent. I also noticed that the students were highly motivated and passionate about studying and innovating. I am looking forward to collaborating and working with more academics and students, as well as contributing to the institute's further growth.



**Dr Kishore Natte**

Assistant Professor  
Department of Chemistry

Prior to joining IITH in March 2022, Dr Sachidananda was a Postdoctoral Fellow in the Dept. of Mechanical Engineering, IIT Bombay, from August 2020. Sachidananda did his BTech from C. V. Raman College of Engineering, Bhubaneswar, and obtained his MTech from Dept. of Mechanical Engineering, IIT Guwahati, and a PhD degree from IIT Kanpur. His research interests are in the fields of Turbulence, Turbulence Modelling of incompressible flows, Computational Fluid Dynamics, Study of bluff bodies and Jets.

**My Experience at IITH:**

I found the people at IITH very welcoming and feel fortunate to have joined the family of IITH. I look forward to contributing to the growth of the Institute and having an enriching career at IITH.



**Dr Sachidananda Behera**

Assistant Professor  
Department of Mechanical  
and Aerospace Engineering

Before joining IITH in March 2022, Dr Sudarsanam Putla was a Scientist at CSIR-NCL, Pune, from 2020. He was a postdoctoral fellow at KU Leuven (Belgium), LIKAT Institute (Germany), and RMIT University (Melbourne). He obtained his MSc degree from IIT Madras and a PhD from CSIR-IICT, Hyderabad. His research area is Heterogeneous Catalysis, focusing on the synthesis of new nanostructured metal-based catalysts for biomass conversion, selective carbon-nitrogen coupling reactions, and green chemistry. He has authored 60+ publications in high-impact journals (h-index: 34), five book chapters, and serves on numerous Editorial Boards of peer-reviewed journals, including ACS Sustainable Chemistry & Engineering, Catalysis Communications, and Biomass Conversion and Biorefinery.

**My Experience at IITH:**

I feel so happy to be a part of this excellent institute. The non-teaching staff of all the departments are efficient and assisted me in completing the joining process on the same day of my joining. My department welcomed me with a group meeting, and I had an enjoyable discussion with my colleagues. They are very amicable. The institute has a beautiful campus and feeling thrilled by the unique designs of academic/non-academic buildings. I look forward to strengthening my academic/research profile at IITH and contributing to the institute's growth.



**Dr Sudarsanam Putla**

Assistant Professor  
Department of Chemistry



# IITH's Bank of Knowledge

## Teaching Staff



**Dr Mahesh Ganesan**

**Assistant Professor**  
Department of Chemical  
Engineering

Dr Mahesh hails from Chennai, Tamil Nadu, where he did all of his schooling. He then completed his BTech in Chemical Engineering from NIT, Trichy. He subsequently obtained his MS and PhD in Chemical Engineering from the University of Michigan, Ann Arbor (UM), USA. At that time, he also obtained an MS in Mathematics from the University of Michigan. After spending a year as a post-doctoral research fellow at UM, he worked as a Research Scientist in the Global Material Sciences team at the Performance Tapes Division of Avery Dennison Corporation. He subsequently returned to academia as an Assistant Research Faculty at UM, leading independent projects on soft matter research, and recently joined IITH in January 2022. His research interests are studying the fundamental micro-scale features of soft materials towards efficient control of their self-assembly, and structural and rheological properties. Materials that he works with include polymer solutions, biopolymer complexes, pressure-sensitive adhesives, colloidal assemblies, and fractal cluster gels.

**My Experience at IITH:**

Overall, in the past two and a half months, my experience at IITH has been positive. Faculty colleagues in the department have been very welcoming, extremely supportive and many of them have graciously helped me out on pretty much anything that I have reached out to them for. The vibrant research environment, together with an equal focus on student education in our department, reinforces my responsibilities and duties as a faculty. I am grateful to be amongst such kind-hearted and distinguished colleagues. I eagerly look forward to enriching times ahead.

Prior to joining IITH, Dr Nitin Saurabh was an Assistant Professor at IIIT Hyderabad from July 2021. Before working at IIIT Hyderabad, he was a postdoctoral fellow at Technion, Israel; MPII Saarbruecken, Germany; and Charles University, Prague, Czech Republic. Nitin did his BSc (Hons) in Mathematics and Computer Science from Chennai Mathematical Institute, Chennai, and obtained his Masters and PhD degrees from the IMSc Chennai. His research interests lie in Theoretical Computer Science, especially in complexity theory, analysis of Boolean functions, circuit complexity, and algorithms.

**My Experience at IITH:**

It has been a very helpful and smooth joining process. Soon after joining, I was glad to teach a full course. It allowed me to interact with young undergrads, which was very exciting. I am also very happy to be a part of a department where the colleagues are very warm, welcoming, and supportive. This makes the culture of the department positive and exciting. The support from Admin has been equally satisfying. In a few words, I am delighted to be a part of the IITH family and look forward to an enriching association.



**Dr Nitin Saurabh**

**Assistant Professor**  
Department of Computer  
Science and Engineering

Before joining IITH, Dr Himanshu was a Postdoctoral Research Associate at the University of Illinois Urbana-Champaign from October 2017. He obtained his master's degree in physics from Kumaun University Nainital, India, followed by his PhD from the Indian Institute of Science Bangalore, India, in 2017. After a brief internship at Samsung Advanced Institute of Technology in Bangalore, he moved to the USA for his postdoctoral studies. His research interests include the assembly and dynamics of membrane-DNA systems, biomimetic materials, Nanopore sequencing, DNA nanotechnology, and computational virology. He was born and brought up in a small village located in the hills of Uttarakhand, and he enjoys outdoor running and playing field hockey in his leisure time.

**My Experience at IITH:**

During this short period of time, I have come across a very welcoming and cooperative IITH community. In the leadership of a motivating director Prof Murty and a very supportive head of the biotechnology department Prof Roy, I have thoroughly enjoyed my stay at IITH so far. I feel privileged to have a set of friendly colleagues across the departments who have helped me settle on a peaceful and beautiful campus. I am particularly thankful to the non-teaching staff members for a smooth joining experience. I was pleasantly surprised by the excellent sports facilities and the upcoming plans here. I am looking forward to working together with the members of the IITH community for an enriching research and teaching career.



**Dr Himanshu Joshi**

**Assistant Professor**  
Department of  
Biotechnology

# IITH's Bank of Knowledge

## Teaching Staff



**Dr Ganesh Sambhaji Chalme**

**Assistant Professor**  
Department of Artificial  
Intelligence

Prior to joining IITH, Dr Ganesh Ghalme was a post-doctoral fellow at the Technion, Israel. He works in the area at the intersection of machine learning and microeconomics, game theory in particular. He completed his PhD in game theory and mechanism design in June 2020 from the Indian Institute of Science, Bangalore. Before that, he completed his master's from the Department of Electrical Engineering at the Indian Institute of Science in 2015. He completed his BE in electronics and telecommunication engineering in 2010 from the University of Pune. He also holds a diploma in corporate laws from ILS Law College, Pune. His current area of interest is designing machine learning algorithms that take into account the presence of human agency in data creation and consumption. When data is created by humans who have a vested interest in the predictions made by algorithms, they may strategically present the data so as to get favorable outcomes. He works on designing algorithmic solutions to inefficiencies introduced by strategic manipulation. He also works on fairness in AI, where algorithms decisions are scrutinized from the social perspective. When algorithms are used to distribute opportunities, responsibilities, and risks among people, one needs to carefully look at how these goods are distributed. He works on designing algorithms that take cognizance of the social context in which they are used and make appropriate adjustments to adhere to distributive justice norms such as equitability, treatment parity, privacy, meritocracy, and so on.

**My Experience at IITH:**

I recently joined as an Assistant Professor at the department of AI, IITH. My experience at IITH has been fantastic so far. People at IITH, in general, and the department of AI, in particular, are very helpful and cooperative. The department hosted lunch on the day of my joining; I found that a generous gesture. My colleagues helped me with multiple joining processes, identifying funding and industry collaboration opportunities, and even finding an apartment. I got to meet with Prof. Murty, the director of IITH. It was a great opportunity to talk to him about the Institute's culture, activities, and vision. I found this tradition unique and encouraging for a new faculty.

Before joining IITH, Dr Vikas was a University Assistant Postdoc at the University of Vienna, Austria, from 2019. Prior to that, he was a postdoctoral fellow at the University of Vienna, a Junior Research Fellow at the Erwin Schrodinger Institute for Mathematics and Physics in Vienna, and a Postdoctoral Fellow at the Federal University of Pernambuco, Brazil. He has an Integrated Masters in Physics from the University of Mysore and a PhD in Mathematics from Imperial College London. His research interests are in the fields of applied mathematics, fluid dynamics, and, more specifically, vortex dynamics.

**My Experience at IITH:**

It feels great to be part of a fast-growing and reputed young institution such as IITH. I have found welcoming and warm colleagues, a helpful administration, and driven students, both in my department as well as in the broader IITH community.



**Dr Vikas Krishnamurthy**

**Associate Professor**  
Department of  
Mathematics

Dr Anurup Datta obtained his bachelor's degree in Manufacturing Science and Engineering from the Indian Institute of Technology, Kharagpur, India, in 2012, followed by his PhD from Purdue University, USA, in 2018. His research interests include process monitoring of manufacturing processes, laser-based micro and nano-manufacturing, and applications of subwavelength laser spot using nanoscale optical antenna. Prior to joining IITH in January 2022, Anurup was a researcher at UiT, the Arctic University of Norway, from 2019, where he has focused his research efforts in developing integrated optical sensors for environmental gas sensing using spectroscopy.

**My Experience at IITH:**

So far, I had a fantastic experience at IITH due to the very friendly and welcoming atmosphere both at the department level and institute level. While interacting with senior colleagues, I have always found it very fascinating to experience their drive and passion for the institute, which has made IITH one of the fastest-growing institutions in the country. This provides a unique opportunity for a young faculty to learn and grow both professionally and personally. I feel fortunate to be a part of such a young and dynamic institute, and I am eagerly looking forward to a wholesome academic career at IITH.



**Dr Anurup Datta**

**Assistant Professor**  
Department of Mechanical  
and Aerospace Engineering

# IITH's Bank of Knowledge

## Non - Teaching Staff



**Mr Devatha Phani Bhushan**

**Junior Psychological Counsellor  
Sunshine**

Mr Phani Bhushan holds a Master's Degree in Clinical Psychology from Amity University, Mumbai. Prior to his regular appointment, he served in IITH as project staff for 2 years, and he also served in Apollo Life, Hyderabad, and KL University, Vijayawada. He has 5 years of experience in the field of Counselling and Clinical Psychology. His areas of interest are anxiety, stress, and intra and interpersonal relationship counseling. He has been trained in a range of modalities including Cognitive Behavioural Therapy, Rational Emotive Behavioural Therapy, Trauma-focused Therapy, Art Therapy, Human Relations & Personality Development and Mindfulness Approaches. He received certifications for the Covid-19 Mental Health Care and Telepsychiatry from American Psychiatric Association and Harvard Medical School. On the academic front, he is the topper of the batch 2015-2017 and in the year 2019, he also received the "Shri Baljit Shastri Award" for Best in Human Values by Amity University, Mumbai. His areas of interest are anxiety, stress, intra and interpersonal relationship counselling.

**My Experience at IITH:**

I believe that everyone should have a safe and healing place to work through life's difficulties which helps enhance the quality of life. IIT Hyderabad is one such place where there is a lot of scope for growth in all the areas of our lives, and everyone here is so supportive of the friendly and nurturing environment—these 2 & 1/2 years of experience @IIT Hyderabad truly cherishing and learning towards reaching to my best potential.



**Mr Mandlipalli Anil Kumar Reddy**

**Technical Superintendent  
Computer Centre**

Mr Mandlipalli Anil Kumar Reddy is a Postgraduate in Computer Science from Pondicherry Central University, Puducherry. He is an experienced professional in software design and development. He worked in an IT product-based company as a Software Engineer and worked at the National Institute of Technology Karnataka, Surathkal, as an MIS (Management Information Systems) Officer.

**My Experience at IITH:**

It gives me immense pleasure working for IITH. The work culture and support from the IITH community are quite impressive. In this glorious journey, I would like to be a part of a contributor to the institute by enriching my career. I am enthusiastically looking forward to a fruitful association with IITH



**Mr Sankepally Saikiran**

**Technical Superintendent  
Department of Civil  
Engineering**

Mr Sankepally Saikiran is a BE Graduate in Civil Engineering from the University College of Engineering Osmania University Hyderabad. Before joining IITH, he served in the Roads and Buildings Department (Govt. of Telangana) as Assistant Executive Engineer for more than 5 and half years. He is a state topper (1st rank) in the Exam conducted for recruitment of Assistant Executive Engineer Exam (Group A Gazetted officer Post) Conducted by the Telangana State Public Service Commission, Government of Telangana in the year 2015.

**My Experience at IITH:**

This is a great place for me to learn and excel in the field in which I am working. This is an outstanding opportunity for me to enhance my skills and upgrade my knowledge. I will work hard with passion to reach the goals of the Institute



**Mr Kaleeswaran P**

**Technical Superintendent  
Department of Civil Engineering**

Mr Kaleeswaran graduated in Civil Engineering from Anna University Chennai. Before joining as a Technical Trainee in the Department of Civil Engineering at IIT Madras (2019-2021), he Worked as Pavement Engineer (QA/QC) in V R Techniche consultant PVT LTD for the past eight months.

**My Experience at IITH:**

I am really proud to be working with one of the best Institutions in India. It is a very nice infrastructure, and I should learn new techniques at IITH.



# IITH's Bank of Knowledge

## Non - Teaching Staff



**Ms Sonia Madhav Naik**

**Junior Medical Officer  
Clinic**

Dr Sonia Naik is a Pediatrician, who received DNB from Deenanath Mangeshkar Hospital, Pune, and also done PG Diploma in Child Health from Goa Medical College, where she topped her class. Before joining IITH, practiced as a Pediatrician for nearly 7 years in several prestigious organizations. She served in a state government organization, for the Directorate of Health Services, Goa as a Pediatric Consultant, also worked in Ankura Children's Hospital & Citizens Multi-Specialty Hospital, Hyderabad as a Consultant in Pediatrics. She is very active in extra circular activities, outside of her work, she likes singing, dancing, glass painting, and many more.

**My Experience at IITH :**

It is been amazing to work for such a prestigious organization. Campus and clinics are the most happening places at the moment. People are so warm and welcoming, right from the beginning. Lively and lovely environment all around us, filled with more amazing people. It was always my dream all my life, to be a part of such an amazing organization, today my dream came true. Feeling truly excited to contribute to such an awesome community and feel more responsible than ever. Thanks for such a warm welcome to the IITH family.

Mr Ajith is an undergraduate in BE Aeronautical Engineering. He has worked as a Senior Project Associate in National Wind Tunnel Facility, IIT Kanpur From 23 August 2018 to 28th February 2022. He also has One Year of experience as a Graduate Trainee at Vikram Sarabhai Space Centre (VSSC-ISRO).

**My Experience at IITH :**

I have Found IITH Campus to be a calm and quiet place. The Professors and Non-teaching Staff (Colleagues) in the Mechanical and Aerospace Engineering Department, in general, have been very supportive, Encouraging, and Interactive. The facilities available in the MAE department are up-to-date. I am excited that there are the latest facilities upcoming in the near future. IITH gave me the opportunity and platform to exhibit my skills and experience.



**Mr Ajith A**

**Technical Superintendent  
Department of Mechanical  
and Aerospace Engineering**

## Campus Corner Collaborations



IITH signed an MoU with Cyient to Launch Private 5G Center of Excellence. Read more: <https://pcr.iith.ac.in/files/pressrelease/5GIS.pdf>

**IITH & Basavatarakam Indo American Cancer Hospital & Research Institute (BIACH&RI) Signed pact for Academic & Research Collaboration.**



IITH signed a pact with Mobis India Ltd, Hyundai for joint research on Advanced Automotive Technologies. Read more: <https://bit.ly/36PFhLW>.

# Campus Corner

## Collaborations

IITH and APUNA joined hands to promote UN objectives of 2030 SDGs agenda.



IITH & Electronic Corporation of India Limited, signed an MoU for Enhancing Academic & Intellectual Interaction to promote Mutual Intellectual Growth & Indigenous Technological Solutions.

IITH & Centre for Adivasi Research and Development Odisha (CARD) signed an MoU for Promotion, Awareness & Empowerment of Marginalized Communities.

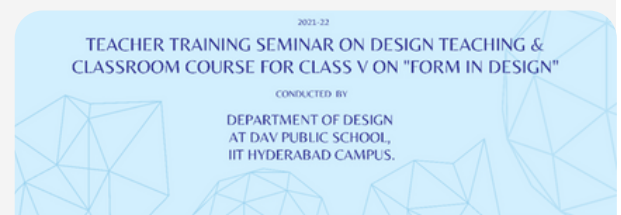


### Seminars & Talks



IITH hosted India's 1st International Conference on Structural Steel.  
Read more: <https://bit.ly/3Lvizb7>

Design Education Innovation program was conducted by Prof Deepak John Mathew and his PhD student, Ms Upasna Bhandari



EML of IITH conducted the Talk on "Striving For Excellence" by Prof P Ajayan

Department of MSME, IITH organized a Workshop on MicroSim.





# Campus Corner

## Seminars & Talks

**Workshop on Capability and Tools / Technology Mapping**  
 Organized by IITM National Hub  
 In association with Indian National Academy of Engineering  
 February 19 - 20, 2022

**About the Workshop**  
 Indian National Academy of Engineering (INAE) has established an expert group to prepare a technology mapping with industrial recommendations for 'Advanced Materials (General) and Equipment' in the area of 'Advanced Materials (General) and Equipment'. The group has identified the following key technical areas of interest for engineering education of structural engineering students.

**Workshop Tracks and Track Coordinators**

| Technical Subject Area  | Track Coordinators          |
|---|-----------------------------|
| 1. Using based Biomechanics                                   | Dr. Partha Ghose, IITM      |
| 2. Advanced Steels for Critical Applications                  | Dr. R. Ramakrishnan, IITM   |
| 3. Next Generation Super alloys for Thermal Power Plants      | Dr. Sanjay Kumar, IITM      |
| 4. Additive Lightweighting                                    | Dr. Venkatesh Shankar, IITM |
| 5. Super alloy based Component Development through PBF Routes | Dr. Sanjay Kumar, IITM      |

**Modeling and Simulation**

| Track Coordinators  |
|---|
| 1. Manufacturing and Process Modeling including Computational Mechanics (CFD / FEM) |
| 2. Mesoscale / Microstructure Modeling including Phase Field and Crystal Plasticity |
| 3. Electronics Structure Calculation, Analysis / FEM Methods and Structure Modeling |
| 4. Multiscale Modeling / Homogenization   |
| 5. Computational Thermodynamics / New Alloy Design                                  |
| 6. Turbulence Modeling, Uncertainty Quantification, Data Science and AI/ML          |
| 7. Topology Optimization based Product Design                                       |

**Experiments**

| Track Coordinators                 |
|------------------------------------|
| 1. High-throughput Experiments     |
| 2. Corrosion Experiments           |
| 3. Spectroscopic Characterizations |

**Case Studies**

| Track Coordinators   |
|--|
| 1. Major Innovation (Component Innovation / Material Innovation) |

**INAE Expert:**  
 Dr. S. K. Paul

**Prof Kishalay Mitra, Dept of Chemical Engg., IITH led the AI track jointly with a senior professor from IISc.**

**IITH organised an Entrepreneurship Talk by Ms Nidarshana Saikia Das, Co-founder - The Bartan Company.**

**Entrepreneurship Talk**

By **Ms Nidarshana Saikia Das**  
 Co-founder - The Bartan Company

**Topic:** Social Enterprise

**Brief:** Nidarshana Saikia Das, originally from Assam, is an ex-Marketing Communications professional. After 13 years of work experience, she decided to part ways with her corporate career to explore her passion for enabling sustainable living for urban India. She was still dabbling with diverse entrepreneurial ideas when she started a not-for-profit cutlery bank with her neighbour as a stretch initiative. Within a year because of the

**Ashish Chauhan**  
 MD & CEO, Bombay Stock Exchange

**Dr. Anurag Batra**  
 Chairman & Editor-in-Chief, BW Businessworld

**Ashish Deshpande**  
 Director and Co-founder, Elephant Design

**Uday Mahajan**  
 Sr VP (Hardware Products), Rebel Foods

**Anirudh Jaitley**  
 Head of Marketing and Process Improvement, Aegis

**Annu Grover**  
 Founder, Nurturing Green

**Akhil Gupta**  
 Founder, No Broker

**ECell, IITH organised the 'E-Summit 2022 - An Exordium of Resurgence. Read more: <https://bit.ly/395bDms>. Video Abstract: <https://www.youtube.com/watch?v=q4AOejbBur8>**

**Department of Physics & IIC at IITH organized a science outreach event on Pi Day.**

**π Day 2022.3.14<sup>159265..</sup>**  
 a science outreach event | March 14, Monday

Pi Day is an international celebration recognizing the significance of π, the familiar Greek letter, that denotes the ratio of a circle's circumference to its diameter. Basic science is incomplete without π, and Pi Day makes sure that this tiny letter gets its well-deserved fame.

**Inauguration 11:00-11:15**  
 Prof V Kanchana, Dean Faculty, IITH  
 Prof. Pratik Paul, PhD, Dept. of Physics, IITH

**Popular Talk-I 11:15-12:00**  
 "From Cosmos to Atoms and More"  
 Dr. Prityotosh Bandyopadhyay, Associate Professor, Dept. of Physics, IITH

**Pictionary 12:00-13:00**  
**Break 13:00-14:30**  
**Popular Talk-II 14:30-15:00**  
 "The Quantum Realm"  
 Shilpa Jangid, PhD Student, Dept. of Physics, IITH

**Popular Talk-III 15:00-15:30**  
 "A Tale of Dark Matter"  
 Dr. Manoranjan Dutta, Postdoc, Dept. of Physics, IITH

**Quiz 16:00-17:00**  
**Dumb Charades 17:00-18:00**  
**Open Mic (for kids) 18:00-18:30**  
**Campus Tour 18:30-19:30**  
**Sky Observation 19:30-21:00**  
 Nishikanta Astronomy Club, IITH

**Venue:** Auditorium, Acad-A, IIT Hyderabad  
**Organizer:** Dr. Prityotosh Bandyopadhyay

**Webinar on Intellectual Property Rights :Patent & Designs Process**  
 Jointly Organised by IIT Hyderabad @ RGNIIPM (Under National Intellectual Property Awareness Mission)

**Agenda**

- Whether idea can be patented or not
- Provisional (vs) Complete Specification
- International Patenting Process

**Speaker**  
**Dr. Bharat N Suryawanshi**  
 Asst. Controller of Patents & Designs

**Joining Details**  
 11th Jan 2022, 2:30 PM to 03:30 PM

**Session Link:** <https://meet.google.com/sag-qmvg-nxw>

**IPFC at IITH in association with RGNIIPM conducted a webinar on IPR.**

**A My Story session by Mr Sandeep Medarametla, Co-Founder, Cokit.tech organized by IIC at IITH. Video Abstract: [https://youtu.be/rIYrls\\_Mces](https://youtu.be/rIYrls_Mces)**

**My Story**

By **Mr Sandeep Medarametla**  
 Co-Founder, Cokit.tech

**Topic:** How to go Independent and work for yourself.

**Brief:** Sandeep is a 3X tech entrepreneur and Crypto, and AI enthusiast - Sandeep believes that the next wave of wealth creation happens through automation of work and crypto becomes the way forward for the economy of abundance that's created due to AI.



**IITH organized One Day National Symposium On "Recent Advances In Magnetism and Spintronics (NS-MAGSPIN-2021)" by Department of Physics.**



# Campus Corner

## Seminars & Talks

### Entrepreneurship Talk

By  
**Mr Yogesh Patil**  
CEO - India's largest weather company,  
Skymet

Topic:  
How the future is going to span out in the Agri-Tech sector with innovation & business opportunities.

Brief:  
Yogesh Patil is an engineer by education but landed into the world of weather accidentally. Presently he is the CEO of India's largest weather company, Skymet. He is a Climate IoT expert with extensive expertise in providing weather intelligence support to India's leading general insurance companies, financial institutions, commodity exchanges, power distribution companies, media, and so on. Frequent interactions with farmers and agri-value chain stakeholders helped him to build his strong and



Department of Entrepreneurship & Management & Institute Innovation Council IITH, organized an enthralling Entrepreneurship Talk by 'Mr Yogesh Patil, CEO - India's largest weather company, Skymet'.  
Video Abstract: <https://youtu.be/2fp3GVS9YzI>

### Symposium on DeepTech Entrepreneurship: Opportunities and Gaps

Organised by Department of Entrepreneurship and Management

#### About Symposium

Start-up and entrepreneurship are suggested to be the backbone of New India & are being considered to be the source of power to drive our nation into the future.

A prominent stream of entrepreneurship to allow our country to be self-reliant and self-dependent is entrepreneurship based on Science and Technology - DeepTech Entrepreneurship.

The growth story of deep tech entrepreneurship in India is aided by the availability of educated and trained technocrats who are able to identify problems and opportunities to be tackled through science and technology interventions. This symposium focuses on exploring the Opportunities & Gaps for DeepTech Entrepreneurship in 2022 through a keynote address and panel discussions.

#### About IITH

Indian Institute of Technology Hyderabad, with its fast-paced growth in quality research and teaching has emerged as one of the top 50 engineering institutes in India in the QS 2021 World Rankings.

By prioritizing highly futuristic and novel areas like climate change and AI, IITH has the early mover's advantage of becoming a trendsetter in various other areas as well.

We are also in an advantageous position of becoming a pedestal of interdisciplinary research and teaching by synergizing the strengths of our faculty in science, engineering, liberal arts, management & design.



#### About Department

IITH inaugurated the Department of Entrepreneurship and Management in 2020 with key focus on nurturing entrepreneurial mindset among the country's brightest minds.

The department has since been undertaking various activities such as Entrepreneurship Talk Series, Executive Development Programs and Courses on DeepTech Entrepreneurship.

IITH organised an Entrepreneurship Talk by Ms Nidarshana Saikia Das, Co-founder - The Bartan Company.

### "DEBRIEFING SESSION ON"

NASSCOM Zinnov India Tech Start-up Landscape 2021

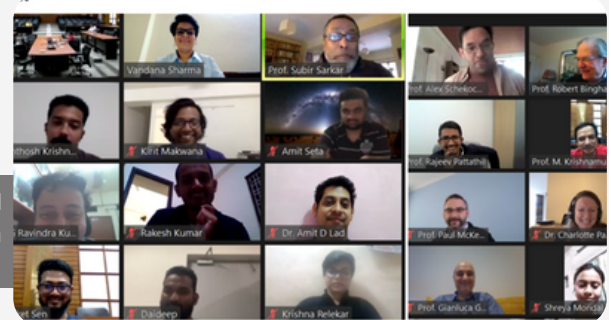


SPEAKER

**Mr Atit Danak**  
Principal and Head  
CoNXT, Zinnov

February 12, 2022

Department of Entrepreneurship and Management, IITH, iTICIncubator, & Institution's Innovation Council organized a Debriefing Session on NASSCOM Zinnov India Tech Start-up Landscape 2021.



Department of Entrepreneurship and Management & IITH are organizing a half-day online symposium on "DeepTech Entrepreneurship: Opportunities and Gaps"

### Intellectual Property Rights :Patents

#### Agenda

- Patentability Criteria
- Section 3: Inventions which are not patentable
- Patenting Process Timelines
- Expedited Examination Process
- Overview of Ipass: Patent Search



Speaker

**Mr. A. E. Kumar**  
Patent Analyst, IIT Hyderabad

#### Joining Details

14th Feb 2022, 10:15 AM to 11:15 AM

Session Link: <https://meet.google.com/sag-qmvg-nxw>

IPFC, IITH conducted a webinar on Intellectual Property Rights: Patents.

### "Entrepreneurship Skill, Attitude & Behaviour Development"

SPEAKERS

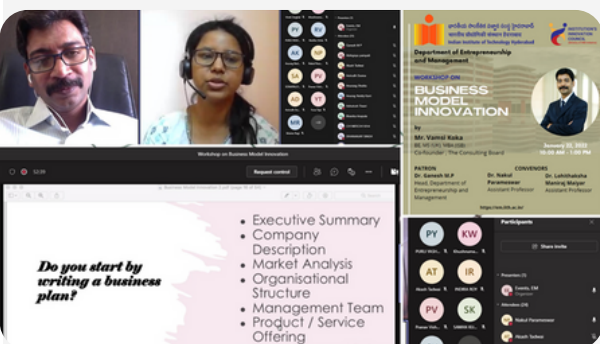


**Mr. Vamsi Koka**  
Entrepreneur & Founder  
(THE ONE SHOP)



**Prof. Prasad Teegalapelly**  
Professor, NITIE

Department of Entrepreneurship & Management, IITH in collaboration with iTIC Incubator & IIC, organized a "Workshop on Entrepreneurship Skill, Attitude & Behaviour Development".



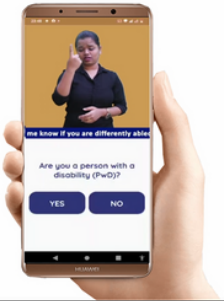
Department of Entrepreneurship & Management, IITH has organized a Business plan innovation workshop for the students by Mr Vamsi Koka - Co-founder and Senior Partner - The Consulting Board under the aegis of Institution's Innovation Council.



# Campus Corner

## Announcements

A VIDEO ASSISTANT THAT ASSISTS THE CANDIDATE TO REGISTER AND CREATE A VIDEO RESUME



IITH has jointly developed 'Swarajability', India's 1st AI triggered Job Platform for PwDs, with Youth4Jobs & Visual Quest with support from Kotak Mahindra Bank Ltd. Read more: <https://bit.ly/3KdmSX4> & View Video Abstract: <https://youtu.be/FLiCq-4JMyg>.



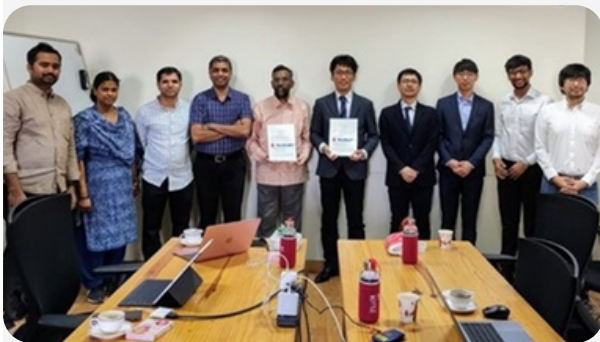
**Aksharamaala - Online Learning Interface**  
for 10th Class Telugu & English Medium Students



**Free educational services - available at all times, for all**

- e-library of video lessons, question banks, allied knowledge
- Online Exam
- Career guidance and mentoring
- Motivation by national level eminent persons
- Online subject coaching, doubt clearance, scholarships (Competitive test basis, register for test after student login)

IITH in association with Akshardaan, launched Free educational services, Aksharamaala - Online Learning Interface for 10th Class Telugu & English Medium Students.



IITH started first of its kind innovation center for knowledge exchange with Suzuki Motor Corporation (Japan) to further Academic and Technology Collaboration between India and Japan. Read more: <https://bit.ly/3OtPmIU>

Dept of Entrepreneurship and Management & ITIC Incubator, IITH jointly organized the Certificate Course on Deeptech Entrepreneurship.

**CERTIFICATE COURSE ON Deeptech Entrepreneurship**



Fee Structure for the Complete Course  
**₹1999\*** (Individuals)  
**₹ 999\*** (Students & Staff/Member)

**Courses**

- Semiconductor Devices
- Emerging Materials and Devices
- Flexible Electronics
- Next-Gen Technologies

**Research Facilities**

- Fundamentals of Semiconductor Materials
- Quantum Materials and Devices
- Functional Materials & Composites
- 2D Materials, Graphene, Nanomaterials and Nanoparticles
- Nanoparticle Synthesis, Purification & Growth
- Thin and Nanolayered
- Nanoscale Processing
- Semiconductor Materials
- Semiconductor Growth
- Semiconductor Characterization
- Nano Diffusion & Solids

**M.Tech. in Semiconductor Materials and Devices (A.Y. 2022-23)**

Materials Science & Metallurgical Engineering

Atoms to Applications

Materials Science and Metallurgical Engineering (MSME) Department, IITH, started a new MTech program (2 years) on Semiconductor Materials and devices from July 2022.

IITH announced a self-sponsored MTech program in Techno-Entrepreneurship, starting August 2022. Read more: <https://bit.ly/3vLcX5w> & View Video Abstract: <https://youtu.be/mvy9IIE28Is>.

**Self-Sponsored MTech program in Techno-Entrepreneurship**



Department of Entrepreneurship and Management





# Campus Corner

## Announcements



Department of Liberal Arts, IITH introduced Masters in HEALTH, GENDER, and SOCIETY, beginning August 2022. View Video Abstract: <https://youtu.be/IRZdhdMHE6o>.

**About Program**  
This is a unique interdisciplinary program is designed to enable innovative and rigorous research to address social problems in the area of health and gender in contemporary India. With a directory of faculty from Sociology and Anthropology, Development Studies, Economics, Linguistics and Cognition, Psychology, Literature and Cultural Studies, this program aims to provide a comprehensive understanding of the diverse health systems, infrastructures and policies that impact gender and family in complex ways. With dedicated internship and dissertation components, this two-year full-time program offers students a formidable and challenging platform from which they can engage with contemporary research and professional practice in India and across the globe.

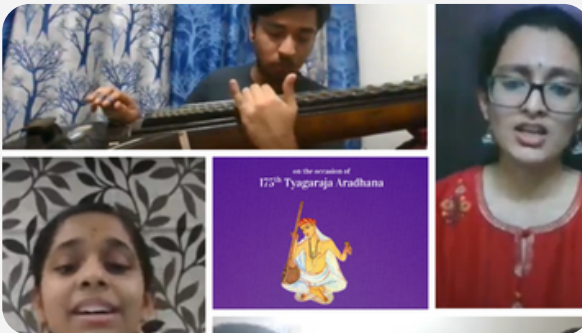
**About Department of Liberal Arts**

## Highlights



Republic Day celebrations at IITH. A Glimpse: <https://youtu.be/MZYdjmSE4lw>.

First Plantation Drive of 2022 was conducted in the month of January



Tyagaraja Aradhana is an annual Aradhana (lit. worship), celebrated on 22nd January. On this auspicious occasion, SPICMACAY, IITH hosted an event, Classical Evening.

Technology Research Park of 1,50,000 sq. ft. inaugurated at IITH. Read more: <https://bit.ly/3OxniuC> & A Glimpse: <https://www.youtube.com/watch?v=fZw1VOyxZM>



IITH released Brochure 2022, briefly encapsulating the academic, research & campus activities that define IITH as a dream destination. View Flipbook: <https://online.fliphtml5.com/qumqk/wrcr/>.

Plantation Drive at IITH for the month of February.





# Campus Corner

## Highlights



IITH Celebrated "International Mother Language Day" on February 21, 2022.  
View Video Abstract: <https://youtu.be/FLiCq-4JMyg>.



Dr BVR Mohan Reddy, founder chairman, Cyient, has inaugurated the Hybrid Classrooms at IITH. Read more: <https://bit.ly/3Mr5NKH> & have a look: <https://youtu.be/T03on3tHwml>.



Department of Physics & IIC, IITH celebrated National Science Day in full spirit. On this occasion, the OPTICA Student Chapter was also inaugurated by the Science Veterans of the IITH. A glimpse: <https://www.youtube.com/watch?v=EQNtFLyCPLM>



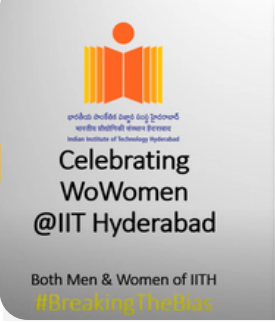
IIT Hyderabad received coveted Haritha Haram Awards from CII Telangana Chapter

IITH is pleased to receive the coveted Haritha Haram Awards by CII Telangana Chapter from Shri K T Rama Rao, Minister for Municipal Administration & Urban Development, Industries & Commerce, and Information Technology of Telangana.



Dr Chandra Shekhar Sharma was a part of the compendium featuring 75 under 50 Scientists Shaping Today's India published by Vigyan Prasar as a part of Azadi KaAmrit Mahotsav; Celebration of India's 75th year of Independence.

Plantation Drive at IITH for the month of March, 2022.



Both Men & Women of IITH #BreakingTheBiasCelebrating WoWomen @IITH. IWD2022 - International Women's Day 2022 has been marked with an event packed with Recognition for Women Excellence, Singing, Music, Knowledge Sharing Session, Motivational Talks & Speak Your Heart Out Memories.. A Glimpse: <https://youtu.be/qISRSKVExuQ>



# Campus Corner

## Highlights



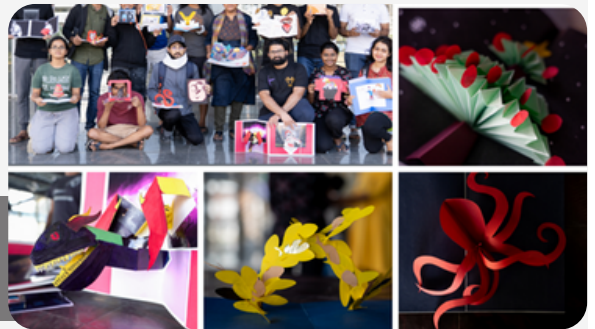
Smart IoT-based, indigenously-developed, ICU Ventilator "Jeevan Lite" inaugurated by Dr. (Smt.) Tamilisai Soundararajan, Hon'ble Governor, Telangana & Hon'ble Lt. Governor, Puducherry at IITH. Read more: <https://bit.ly/3EJkhCS> & have a glimpse: [https://youtu.be/-3\\_ueqe8\\_00](https://youtu.be/-3_ueqe8_00).

In coordination with the State Fire Department, Campus Fire Department IITH has organized a Fire safety awareness program for the residents of IITH.



Primary Health Centre Inaugurated at IITH by Continental Hospitals' Founder and Chairman, Dr T Gurunath Reddy. Read more: <https://bit.ly/3Kj1AHo>.

As part of the Design Minor course - Art of Paper Engineering, the students from various design & engineering backgrounds (BTech, BDes, MTech) at IITH displayed their coursework in an on-campus exhibition. A glimpse: <https://youtu.be/G-2haEIOZJE>.



Residents of IITH celebrated festival of colors colorfully.

Milan 2022 - An Inter-Hostel Tournament concluded with a lot of cheers & champion of champions IITH with DJ & Icecream nights.



IconicWeek - Azadi Ka Amrit Mahotsav program conducted at IITH.



# Campus Corner Views

**Blue ethereal**  
Pic Courtesy: Dr Digvijay S Pawar



**Flying Peacock**  
Pic Courtesy: Ankita Royr



**Academic Block-A (Department of Chemical Engg Building)**  
Pic Courtesy: Chinnam Sivateja



**Esthetic Eve**  
Pic Courtesy: Monu Singh



**Evening Empyrean**  
Pic Courtesy: Ganga Gopinath





# Campus Corner

## Views

A serene walk under the bright moon on illuminating pathways  
Pic Courtesy: M V Srinivas



Hostel Circle  
Pic Courtesy: Ankana



An early morning walk with a vivid flight of birds  
Pic Courtesy: M V Srinivas



Married Students' Housing  
Pic Courtesy: Mr M V Srinivas



Biotechnology & Biomedical Engineering (Chromosome) Building  
Pic Courtesy: Aju Kota



# What Next???



**INDIA-JAPAN WORKSHOP**  
on  
**Computational Modeling of Damage and Seismic Vulnerability Assessment during Earthquakes in Building Systems**

**12<sup>th</sup> & 13<sup>th</sup> May 2022**

**SPEAKERS OF THE WORKSHOP**

|   |   |
|---|---|
| <br><b>Dr. Takuro Yamashita</b><br>National Research Institute for Earth Science and Disaster Prevention (NIED)          | <br><b>Kishiki Kishimoto</b><br>National Research Institute for Earth Science and Disaster Prevention (NIED) |
| <br><b>Ism Fajriyasa (FUTP AKA Iain)</b><br>National Research Institute for Earth Science and Disaster Prevention (NIED) | <br><b>Prof. KYI Subramanian</b><br>Indian Institute of Technology Hyderabad                                 |
| <br><b>Prof. S. Suresh Prakash</b><br>Indian Institute of Technology Hyderabad   | <br><b>Prof. Anirban Bhargava</b><br>Indian Institute of Technology Hyderabad                                |
| <br><b>Prof. R. Umeshankar</b><br>Indian Institute of Technology Hyderabad   | <br><b>Prof. Mahendra Kumar Mallikarjun</b><br>Indian Institute of Technology Hyderabad                      |
| <br><b>Dr. Somnath Das</b><br>Indian Institute of Technology Hyderabad   | <br><b>Dr. Ash Agarwal</b><br>Indian Institute of Technology Hyderabad                                       |
| <br><b>Dr. Mahendra Kumar Pillai</b><br>IIT Hyderabad  | <br><b>Dr. Rajeev Pika</b><br>IIT Hyderabad  |

**Indo Japan workshop on Seismic Vulnerability of Building systems on 12th - 13th May, 2022. For details visit: <https://www.iith.ac.in/events/2022/05/12/Indo-Japan-workshop-on-Seismic-Vulnerability/>**

**International Symposium on Nonlocal Mechanics Approaches for Modeling Localized Deformation** <http://www.nmamld2022.com/ons> (NMAMLD 2022) on **07th - 08th June, 2022**. For details visit: <https://www.iith.ac.in/events/2022/06/08/nonlocal-mechanics-approaches/>

### Overview

Nonlocal models have drawn increasing interest from scientific and engineering communities in recent years, due to their ability to describe physical processes which are not well described by classical local theories. Classical models in Continuum Mechanics are set in a differential framework which assumes that solutions of the systems must be smooth. However, in a variety of applications, the functions may exhibit singularities, discontinuities as classical equations cannot hold. The framework of integral operators assumes little regularity or smoothness for the inputs, thus making it ideal in applications such as image processing, biology models, dynamics, fracture. While applied communities have been using nonlocal models successfully, their rigorous mathematical analysis still lacks foundational results that would be needed in complex applications that exhibit a sudden change in behaviour of material, or for which there would be a nonlinear response. In solid mechanics, for instance, periphenic models have been proposed to model material failure and damage, since they can naturally represent crack nucleation and growth, unlike classical continuum mechanics models. Nonlocal continuum models have been also proposed to describe anomalous diffusion and transport, which are not correctly modeled by classical theories. Nonlocal models possess length scales, which motivates their use as multiscale models in capturing microstructure influence on the macroscopic behavior of materials. Although there have been many recent advancements in the understanding of nonlocal models, there remains much to be explored. The purpose of the symposium is to bring together experts from the mathematical, computational, scientific, and engineering communities who work with nonlocal models in order to disseminate the state-of-the-art on the subject and disseminate ideas. The workshop is intended to survey the state-of-the-art in modeling, mathematical analysis, and computational practice for nonlocal theories, while exploring new application domains and promoting new collaborations.

### SPEAKERS AT THE SYMPOSIUM

|  |   |   |   |
|--|---|---|---|
| <br><b>Prof. M. Brackley</b><br>Trinity University, USA                                 | <br><b>Prof. Paul Steinmann</b><br>University of Erlangen-Nuremberg, Germany | <br><b>Prof. S. Gangadhara</b><br>Indian Institute of Space and Astronautics, India      | <br><b>Prof. Debanish Roy</b><br>Indian Institute of Space and Astronautics, India |
| <br><b>Prof. Enrique Madenci</b><br>Istanbul University, Turkey                         | <br><b>Prof. Arun Srikanth</b><br>IIT Bombay, India                          | <br><b>Prof. Suresha Bhattacharya</b><br>Indian Institute of Technology Hyderabad, India | <br><b>Prof. Ashok Pandey</b><br>Indian Institute of Technology Hyderabad, India   |
| <br><b>Prof. Srinivasan M. Shankar</b><br>Indian Institute of Technology Madras, India | <br><b>Dr. Pablo D. Steinhilber</b><br>Bosch Research Center, Spain         | <br><b>Prof. Anirban Bhargava</b><br>Indian Institute of Technology Hyderabad, India    | <br><b>Dr. Ali Javidi</b><br>Sahlgrenska University, Sweden                       |

### Benefits of Attending the Symposium

This symposium is intended to provide graduate students, engineers, and researchers working in aerospace, automotive, civil, mechanical engineering, and materials and manufacturing industries with the theory and applications of nonlocal mechanics approaches for modeling localized elastic and inelastic deformations. The program attending the symposium will benefit in gaining knowledge and information in the following areas:

- Nonlocal / Non-Classical Mechanics
- Continuum Mechanics Formulations
- Nonlocal Approaches in Fracture / Damage Mechanics
- Applications of Nonlocal Mechanics in Defense and Aerospace Sector



**MAMM2022**

**The 6th Conference on Microactuators, Microsensors, Micromechanisms**  
IIT Hyderabad, India, 2-4 December 2022, Hybrid (Offline and Online)

**Microactuators, Microsensors and Micromechanisms (MAMM 2022) on 2nd-4th December 2022.** For details Visit: <https://www.iith.ac.in/events/2022/12/02/MAMM-2022/>

**Patron**  
B. S. Murty, Director, IIT Hyderabad

**Scientific Advisory Committee**  
Chair: Nagchandanmaiah, Director, CMTI, Bengaluru  
Co-Chair: Lena Zentgraf

**Pre-Conference Symposium:** December 1, 2022  
**Under the patronage of IFToMM: TC Micromachines**

**Important Dates:**  
Abstract and Paper Submission: 1 March 2022,  
Acceptance Notification: 31 May 2022,  
Final Paper Submission: 31 July 2022

**Conference Chair:**  
Ashok Kumar Pandey, IIT Hyderabad

**Conference Co-Chair:**  
Prom Pal, IIT Hyderabad

**4th Structural Integrity Conference and Exhibition on 14-16th December 2022.** For details visit: <https://www.iith.ac.in/events/2022/12/14/4th-Structural-Integrity-Conference-and-Exhibition/>



**InSIS**  
Indian Structural Integrity Society

**SICE 2022**  
**4th Structural Integrity Conference and Exhibition**  
Pre-Conference Workshops: 12<sup>th</sup> – 13<sup>th</sup> December 2022

**Conference: 14<sup>th</sup> – 16<sup>th</sup> December 2022**  
Announcement and Second Call for Abstracts  
For more details and registration, visit the website: <https://mae.iith.ac.in/sice22/>  
Abstract submission link: <https://bit.ly/3uA8CTE> Abstract Template link: <https://bit.ly/3iP6uWG>



**Domains**

- Defense and Aerospace Applications
- Nuclear Technologies
- Renewable Energy
- Advanced Manufacturing
- Civil and Naval Structures
- Petro-Chemical & Process Industries
- Transportation and Railways
- Integrated Computational Materials Engineering
- Integrated Vehicle Health Management
- AI and ML in Structural Integrity

**Research Areas**

- Composite Structures
- NDE and SHM
- Novel Sensors for SHM
- Automated NDE Inspections
- Reliability and Structural Integrity
- Experimental Characterization
- Fracture and Fatigue
- Creep and High-Temperature Failure
- Computational Mechanics
- Damage Mechanics
- Nano-Mechanics and Nano-Materials

**Abstract Template link: https://bit.ly/3iP6uWG**

- Multi-Physics Modeling
- High Strain Rate Loading
- Impact and Blast
- Thin Films and Coatings
- Wear and Tribology
- Structural Joints
- Design for AM
- Additive Manufacturing
- Structural Optimization
- Repair and Maintenance
- Integrity of Weldments
- Energy Storage Devices
- Wind Energy
- Gas Turbine Components
- Nuclear Structural Materials
- Life Management of Nuclear Structures
- Biological and Bio-Inspired Materials
- Medical Devices and Implants
- Integrity of Concrete and Steel Structures
- Offshore and Marine Structures
- Oil and Gas Inspection
- Automotive Structures

**Proceedings and selected extended papers will be published in SCOPUS indexed Journals**

**Important dates: Submission of abstracts: 15<sup>th</sup> April 2022 & Submission of manuscripts: 15<sup>th</sup> June 2022**

For sponsorship and exhibition stalls, please email us at: [sice22ses@mae.iith.ac.in](mailto:sice22ses@mae.iith.ac.in)  
Organized by: Department of Mechanical and Aerospace Engineering, IIT Hyderabad under the aegis of InSIS Contact us at: [sice22@mae.iith.ac.in](mailto:sice22@mae.iith.ac.in)

**In-Person**  
Venue: IIT Hyderabad



# Moment of Pride



**Dr Arabinda Haldar**  
**Department of Physics**  
 Elevated to the rank of Senior Member of IEEE



**Ms Suparna Mercy Basu**  
**PhD Scholar, Dept. of Biomedical Engineering**  
 Received the Asian Polymer Association (APA) Nanoforum 2022, Best Poster Award by APA & CSIR-NPL



**Dr Shelaka Gupta**  
**Department of Chemical Engineering**  
 Selected as one of the 75 Women in STEAM to be featured in the second edition of She Is by Office of the PSA to the Go!



**Dr Sikandar Shaikh**  
**DMRD, DNB (Radiology), MNAMS, FICR, EDiR (European Board Of Radiology) Adjunct Professor, Dept. of Biomedical Engineering.**  
 An entrant to World Book of Records & India Book of Records for conducting the continuous Online Teaching Programme by ICRI



**Mr Vineet Gairola**  
**PhD Scholar, Department of Liberal Arts**  
 Received Stephen Mitchell Award 2021 from the Society for Psychoanalysis & Psychoanalytic Psychology, Division 39 of the American Psychological Association



**Ms Hemalatha**  
**Executive Assistant, Office of Career Services**  
 Employee of the Month" - March 2022



**Dr Raavi Sai Santosh Kumar**  
**Department of Physics**  
 Became member of the INYAS.



**Ms Yeleswarapu Sriya**  
**Department of Biomedical Engineering**  
 Received the best poster presentation in the 3D cell culture workshop at ICT Mumbai, 2022 (3D Bioprinting category).

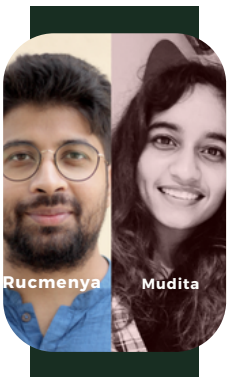


**Prof V Kanchana**  
**Department of Physics**  
 Elected as an executive council member of "The society of Materials Chemistry".



**Team NUMASFP**  
**(Prof Bheemarjuna Reddy Tamma, and Dr Antony Franklin) Venkatarami Reddy Chintapalli, Sai Balaran Korrapati(L-R &T-B)}**  
 Best Paper Award at 14th International Conference on COMMunication Systems & NETworks (COMSNETS 2022) held in Bangalore.

# Moment of Pride



**Rucmenya & Mudita**  
**MDes, Department of Design**  
Received 2nd Prize at Road to Shine Ideathon, Japan



**Prof Dr Rao Y Surampalli,**  
**Honorary Professor,**  
**Department of Biomedical Engineering**  
Elected to the U S National Academy of Construction (NAC)



**Ms Behatha Anuroopa**  
**Department of Physics**  
Won the Best Oral Presentation Award at the ICReAch -2022



**Ms Aritri Biswas**  
**PhD Scholar, Dept. of Chemistry**  
Received the ACS Best Poster Award from the National Conference on Molecular Modeling and Simulations (NCMMS 2022)



**Dr Devesh Nlgam**  
**Department of Liberal Arts**  
Appointed as Registrar, University of Hyderabad.



**Prof Mahendrakumar Madhavan**  
**Department of Civil Engineering**  
Received HUDCO design award under the "Cost-Effective Rural/ Urban Housing deploying Innovative/ Emerging & Disaster Resistant Technology" category



**Dr. Falguni Pati**  
**Department of Biomedical Engineering**  
Elected as an executive council member of "The society of Materials Chemistry".



**Dr Mudrika Khandelwal**  
**Department of MSME**  
Received Women Excellence Award 2022 from Science and Engineering Research Board (SERB)



**Dr Suryanarayana Jammalamadaka**  
**Department of Physics**  
Admitted as 'Associate Fellow of the Telangana Academy of Sciences'.



**Mr Siva Krishna Reddy**  
**JE(E), CMD Section**  
"Employee of the Month", Feb 2022





1st set of 3D Models at Digital Fabrication Lab @IIT Hyderabad

**Please send your suggestions to:**

**Public Relations Officer**

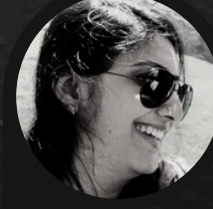
Public and Corporate Relations Office  
**Indian Institute of Technology Hyderabad,**  
Kandi, Sangareddy - 502284, Telangana, India  
Contact: +91 40-2301 6099, +91 83310 36099  
E Mail: pro [at] iith [dot] ac [dot] in



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Mr Lijin  
Lohithakshan,  
Dept of Design



**Back Page Image**  
**Courtesy:**  
Mr Srikanth Vootla  
Dept of MAE



**Creation & Content:**  
Ms Mitalee Agrawal  
Public Relations  
Officer, IITH