

किरIITH

the crowning glory

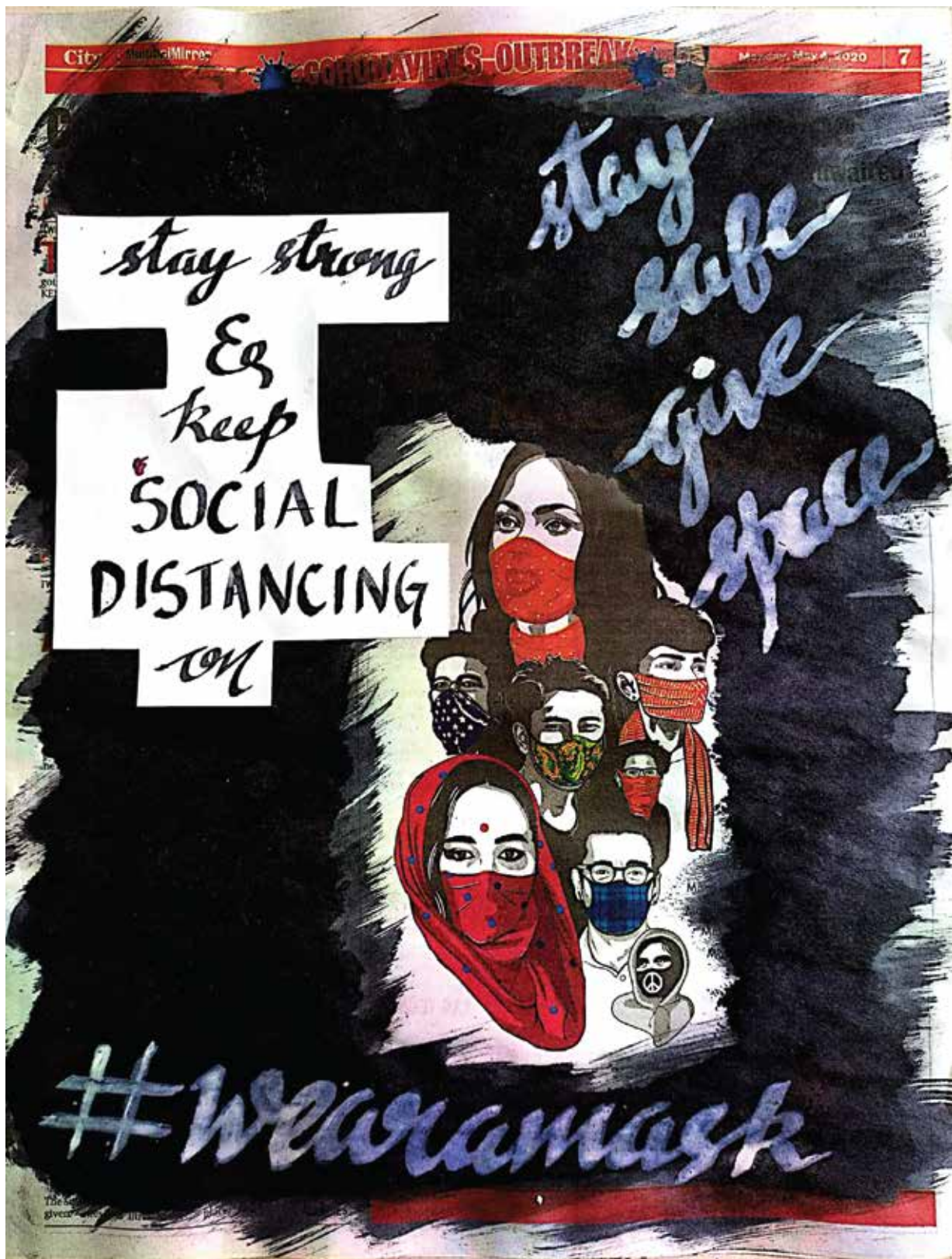


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IIT Hyderabad

A quarterly newsletter of IITH | Issue - 2 | April 2020

#COMBATING
#COVID-19@IITH

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Calligraphy Art by Ms. Meenakshi G. - MD20RESCH01001

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FROM DIRECTOR'S DESK

I wish all of you are safe, making best out of this time professionally and certainly having quality time with your loved ones.

Though COVID-19 outbreak has shaken the world economically and emotionally, but has given us a chance to come together and create a better ecosystem. An ecosystem unaffected of any such or even worse situation which can erupt in future.

IIT Hyderabad (IITH) envisions its researches to serve a more inclusive segment of society. To join the fight against COVID-19, a number of faculty have come forward with various technological solution statements. Solutions like affordable ventilators are in their final stage of being mass-produced by our industry partners. A couple of studies have also been published in scientific journals. A customized application has been shared with the local administration for better man-management. SERB grant has been obtained for the project on "developing economical and effective screening kits". A few more proposals have been submitted to solicit grant from the various agencies, and others are in the different stages (Conceptualization, Prototyping and Testing). This issue of किरिIITH encapsulates a few of these works.

On the social front, IITH has supported local administration with PPEs and distribution of sanitizer. IITH has even ensured the safety of the surrounding villages which have been adopted under "Unnat Bharat Abhiyan" (UBA) by creating awareness on the malignant implication of COVID-19 spread and how to avoid its transmission.

Even our incubators have also not left any stone unturned, to join the task of fight against COVID-19 and has come with different PPEs & Medical Equipment Aids.

IITH has looked into the safety of its residents and was among the first few to declare work from home for the faculty and staff, and furthermore, we have ensured all its students travelled back to their home town safely well before the Lockdown-1.0 came to effect. We have also assured untainted academic activity via means of on-line classes, assignment and exams for the final year students.

Hope, we will soon see the normalcy in our life again with the new normal of maintaining basic hygiene and optimized work-life.

Together we can and we will!

Best Regards,
Prof. B. S. Murty
Director, IIT Hyderabad

Annotation from Dean (Academic) - **Prof. Ch. Subrahmanyam**



In a short period, IIT Hyderabad has emerged as a prestigious institute of higher learning producing students of great calibre. It's mainly because of the unique and career-oriented programs like fractal academics, with interdisciplinary approach and departments such as AI, Climate Change and Engineering sciences. IITH is creating a unique holistic educational ecosystem that will foster interactive learning, cutting edge research, strong industry collaboration, and entrepreneurship. It is providing an environment wherein students and faculty are not afraid to experiment and celebrate their ideas. The BTech program in AI, a minor in entrepreneurship and Executive MTech in Data Science with the Design and Liberal Arts departments represent the distinguished and diversified academic fabric.

We are launching 8 new MTech Programs looking at industry's demand and in collaboration with the organization which possesses unique expertise in that particular domain.

Admission for these courses have already begun and will be effective from August 2020. These programs are based on quite popular and trending topics like Additive Manufacturing, E-Waste Resource & Engineering Management, Medical Device Innovation, Network & Information Security, Smart Mobility and a few more.

IITH aims to train well-rounded engineers who are ready to tackle real-world problems. We are confident that it will be an exciting opportunity for those aiming at industry-adaptive higher education and also for the industry personnel. This will strengthen and add value to the existing academic program.

Happy Learning....

Research Recap from Dean (Research & Development)

- **Dr. Sumohana S. Channappayya**



The research community at IIT Hyderabad (IITH) has risen to the challenge of tackling COVID-19. Research efforts have focused on the development of sanitizers, masks, face shields and protective wear, ventilators and other hardware, drugs and vaccines, sensors, detectors and air purifiers, mobile apps and software, and understanding the socio-economic effects of COVID-19.

IITH has been actively serving the local community through the preparation and supply of 100 litres of sanitizers to the district collectorate. IITH faculty have been preparing sanitizers for supporting the operations of essential services of the IITH campus. An IITH incubated startup has helped in the manufacture of sanitizer bottles and masks for the local community.

The Center for Healthcare Entrepreneurship (CfHE) has been playing a major role in developing solutions to the problems thrown up by COVID-19. Startups incubated at the CfHE have designed low-cost portable ventilators, designed face masks and personal protective equipment (PPE), wearables for patient monitoring, designed antiviral coatings for PPE among other extremely useful solutions.

Faculty at IITH has been focused on designing UV based disinfectants, low-cost portable and scalable mechanically actuated

ventilators, Li batteries for thermal scanners and equipment, identifying drug targets for SARS-Cov-2, developing vaccine candidates, air purifiers, to name a few. Additionally, faculty are engaged in the development of software and mobile apps for data collection, IoT solutions for remote temperature monitoring, cough simulators, data analytics solutions. Further, since the pandemic is expected to have serious socioeconomic consequences, faculty are engaged in understanding the effects of the virus on the financial markets, and other socio-economic factors and indicators.

Importantly, IITH faculty are building models to predict the evolution of the pandemic based on various factors such as the aggressiveness of contact tracing and isolation, movement of the population, lockdown period etc. It is hoped that these models could be shared with the local and state government for planning and intervention.

Overall, IITH has risen to the occasion and has contributed on several fronts in the fight against COVID-19. IITH will continue these efforts and leave no stone unturned in its efforts to combat and curb this pandemic that has affected not just our city, district, state or country but humanity at large.

Editorial Epistle

Dear Readers,

In the first place, we would like to express our sincere thanks to all our readers for lauding the किरIITH Issue-1, accord us with the valuable suggestions and motivated to go for the Issue-2.

COVID-19 outbreak has drastically changed our routine, but it has also given us new ways to route our life. Alike academic, research @IITH has also continued to tackle ongoing circumstances. Almost all the engineering departments have collaborated and proposed solutions to different problems posed by Covid-19 and its implicated Lockdown.

Hence, we made a call to dedicated this entire issue to the research undertaken to Combat COVID-19 @IITH and named this issue किरIITH The Crowning Glory #Combating COVID-19@IITH.

We hope you will commend the incisive initiatives taken at IITH and encourage us to keep on delivering the latest issues of किरIITH - The Crowning Glory.

Happy Reading...

Wish you all a safe and great stay!

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A Glance at COVID-19 Combating Initiatives @ IITH

Research Area

I. Sanitizers:

1. Prof. Zafar Ali Khan (EE dept.) is working on UV-C based LED sanitizer.

II. Masks, Face shields & Protective wear:

2. Pure EV, under the leadership of Dr. Nishanth Dongari (MAE dept.), is working on to bring out a face shield in large quantity in collaboration with RCI Hyderabad.
3. Dr. Renu John (BME dept.), Dr. Suryakumar (MAE dept.) and their team are working on Design and production deployment of reusable face masks. These PPE face masks, which provide better protection than cloth masks are autoclavable and can be reused by changing the filter.
4. One of the incubates of CfHE, Dr. Sai Laxman under the mentorship of Dr. Renu John (BME dept.) has come up with a full design of PPE (protective gear, and face shield), "USafe - Sterilisable Face Shield & Protective Gown", designed, tested and prototyped.
5. Dr. Jyotsnendu Giri (BME dept.) and EaffoCare Innovation developing Antiviral coating for PPE and common surface.
6. Dr. Kousik Sarathy is working on UV box for disinfection of Masks.
7. The fellows of CfHE are working on an isolation hood for COVID-19 positive patients where healthcare providers can go near without fear and do procedures like intubations and inoculations.

III. Ventilators and other Hardware:

8. Aerobiosys, a startup of Centre for Health Care Entrepreneurship (CfHE) at IITH, has developed a low-cost portable ventilator, Jeevan Lite.
9. Dr. Prashant Kumar and his student Mangesh Ratolikar (MAE dept.) have developed a remotely operated mobile robot for hospitals and isolation wards for the purpose of interacting with patients or persons in quarantine, distributing food or medicines, and collecting trash. Dr. Harish Dixit (MAE dept.) is working on developing flow sensors for the ventilator system.
10. Dr. Prashant Kumar, Dr. Syed Khaderi and Dr. Viswanath (MAE dept.) are developing low cost, portable easily scalable mechanically actuated ventilator.
11. Dr. Nishanth Dongari (MAE dept.) is developing DC motors for ventilators.
12. Dr. Nishanth Dongari (MAE dept.) is developing Lithium batteries for thermal scanners and medical equipment.

13. Dr. Amit Acharyya & Dr. Ashudeb Dutta (EE dept.) and their team through their startup "Sensehealth" at iTIC IITH, has developed "Low-Cost One-stop ECG Solution functional as (a). Ambulatory (inside ambulance), (b). Hospital, (c). at home (during isolation period) and as (d). Holter in COVID-19 pandemic."

14. Dr. Renu John (BME dept.) is working through CfHE at IITH on efficient pulmonary rehabilitation system for post ventilator patients for efficient prognosis and a low-cost lab on a chip for detection of COVID-19 virus with fast turn over results.

IV. Drugs & Vaccines:

15. Dr. Ashudeb Dutta, Dr. Soumya Jana and Dr. Shiv Govind Singh (EE dept.) are developing a smart wearable patch for the prevention of quick spread COVID-19 pandemic.
16. Dr. Ranjith (MSME dept.) & Dr. Aravind Rengan (BME dept.) are developing Smart accessories for control and mitigation of infectious organisms.
17. Dr. Aravind Kumar Rengan's group (BME dept.) is working on the repurposing of anti-malarial nano-formulation targeting lung tissues to tackle virus-mediated inflammation/ fibrosis and acute respiratory distress.
18. Dr. Ashish Misra's Laboratory (BT dept.) is working on designing and developing DNA and mRNA based vaccine candidates for SARS-CoV-2.
19. Dr. Ashish Misra's Laboratory (BT dept.) is also working on repurposing FDA approved drugs to block SARS-CoV-2 infection in humans.
20. Dr. Rajkumara (BT dept.) is working on In silico engineering of putative epitope peptides from proteins of SARS-CoV-2 on nano-particles to develop vaccine candidates.
21. Dr. Mudrika Khandelwal (MSME dept.) and Ashish Misra (BT dept.) are developing Pulmonary delivery of antiviral herbal oils for adjuvant therapy
22. Dr. Thenmalarchelvi (BT dept.) is identifying potential drug targets in the structural proteins of SARS-Cov-2.
23. Dr. Jyotsnendu Giri (BME) is working on a peptide-based vaccine for SARS-Cov-2.

V. Sensors/Detection and Air purifiers:

24. Dr. Shiv Govind Singh (EE dept.) is developing rapid, ultrasensitive biomolecule sensor for detecting coronavirus in individuals.

A Glance at COVID-19 Combating Initiatives @ IITH

25. Nemocare and Heamac, two startups of CfHE, mentored by Dr. Renu John (BME dept.) are working on wearables for COVID-19 patient monitoring in isolation wards without having to go near to the patient unless there is an emergency. Nemocare Raksha is a wireless wearable for monitoring COVID-19 patients. This device is for COVID-19 patients in the ICU segment and home care segment. The device is ready to be manufactured on a large scale.
26. Dr. Ashudeb Dutta, Dr. Gajendranath Chowdhary and Dr. Soumya Jana (EE dept.) are developing an "A Handheld Contact-less Temperature Recording Device" for measuring the temperature for advanced fever screening in the COVID-19 pandemic.
27. Kvyat Medical, a start up from CfHE, under the mentorship of Dr. Renu John (BME dept.) has developed a product "Traqaro", which enables organised tracking and monitoring of COVID-19 patients with the help of a Bluetooth-based wearable.
28. Heamac Solutions, a start-up from CfHE, under the mentorship of Dr. Renu John (BME dept.) has developed A Tracker to diagnose & prevent COVID-19 spread with the help of a wrist band to detect symptoms of COVID-19 infection, screening & support.
29. Dr. Jyotsnendu Giri and Dr. Hari Krishnan (BME dept.) are working on rapid, affordable, portable SARS-Cov-2 screening kit.
30. Dr. Ch. Subrahmanyam (CHY dept.) and Dr. Shashidhar (CE dept.) are working on Air purifiers that can help residents, hospitals and malls to purify air contaminated with viruses.
31. Dr. Chandrasekhar (CHE dept.) and Dr. Anindya Roy (BT dept.) are developing a nano biosensor for rapid and early detection of SARS-CoV-2.
32. Dr. Lopamudra Giri and Dr. Suahanya (CHE Dept.) have started designing a 3D printed device that can be used for the detection of multiple proteins by using immunoassay for SARS-CoV-2 infection diagnosis and severity categorization.
33. Prof. Zafar Ali Khan (EE dept.) is working on Real-time detection of COVID-19.

VI. Apps and Software:

34. Dr. Harish Dixit (MAE dept.) is building a cough simulator to test the efficacy of masks and this work is being carried out based on discussions with colleagues at IIT Bombay, TIFR Mumbai and ICTS Bangalore.
35. Dr. Rajalakshmi (EE dept.) is working on IoT enabled remote monitoring of temperature and respiratory rate for COVID-19 infected patients.

36. Dr. Mohan Raghavan and Dr. Kousik Sarathy (BME dept.) have been working on Data analysis and modelling of COVID-19 disease spread.
37. Dr. Krishna Mohan (CSE dept) is leading a team to work on using visual surveillance to detect social distancing & people wearing masks.
38. Dr. Vineeth (AI dept.) and his team are working on AI to explain decisions on detecting Covid-19 using chest X-ray
39. Dr. Kishalay Mitra (CHE dept.) is working on deep learning based cost-effective and rapid prognosis of COVID-19 to aid the state-of-the-art PCR & serology based diagnosis in India
40. Dr. Kishalay Mitra and Lopamudra Giri (CHE dept.) are working on development of computational and visualization software for evaluating GPCR targeting drugs with the aim of mitigating coronavirus infection level

VII. Other Areas:

41. Dr. Digvijay Pawar and Dr. Pritha Chatterjee (CE dept.) are modelling the Impact of COVID-19 outbreak on the daily commute and vehicular emissions during the transition phase.
42. Dr. Mahati and Dr. Haripriya (LA dept.) are working on exploring working mothers' experiences, regarding housework, childcare and professional work during the lockdown through regular interviews.
43. Dr. Satya Prakash Singh (Maths Dept.) is working on A cost-effective approach to the design and analysis of multiple experimental groups: a useful methodology for comparing potential treatments for COVID-19
44. Dr. Shuhita Bhattacharjee (LA) is working on "Urban Patterns of Gendered 'Productivity,' Emotional Abuse, and Anxiety during COVID-19."
45. Dr. Prabheesh (LA dept.) is working on the impact of COVID-19 on financial markets.
46. Mr. Shiva Ji (Design Dept.) is working on "Design for the New World: Post COVID-19: A Disruptive Change in Context".
47. Dr. Ambika (CE dept) is working on the Impact of COVID-19 on Environmental Sustainability
48. Dr. Sathya Peri and Dr. Vineeth have initiated work on Effective Framework for Managing supply and demand post lockdown using Federated Learning

Publications on COVID-19 related topics

49. Dr. S. Narendra Nath, Seismic Noise Changes during COVID-19 pandemic: A case study of Shillong, India, Natural Hazards

A Glance at COVID-19 Combating Initiatives @ IITH

Inter-disciplinary and Rural Development Projects approved by IITH #fight against COVID-19

ID-RD Projects:

- Objective: Promote inter-disciplinary research and innovation along with specific focus on Rural Development
- Duration - 2 years
- Funding - up to 10 Lakhs
- Outcome - Product/prototype

ID-RD Projects 2020-2021:

105 faculty (half of the total faculty strength of the institute) participated in the call for ID projects, 23 faculty are involved in the selected projects. In case of RD projects, 29 faculty were involved in the proposed projects and 8 are involved in the selected projects.

- Project proposals received: 75 Inter-disciplinary + 18 Rural Development
- Projects selected: 15 Projects (10 Inter-disciplinary and 5 Rural Development) are selected for 2020-2021
 - ~ Of these 2 projects are COVID-19 related as mentioned above
 - ~ Project starts from 1st, June, 2020.

S.No.	Title of Project	PI Name	Co-PI	Deliverables
1	Study of Response Control and Mitigation of Bio Organisms/Molecules Under Small Voltage electrical signals on Ferroelectric Polymer and/or Polar Surfaces (COVID-19 related project)	Dr. Ranjith Ramadurai (Dept. of Materials Science and Metallurgical Engineering)	Dr. Aravind Kumar Rengan (Dept. of Biomedical Engineering)	A successfully tested face mask with the filter developed in this project should be demonstrated.
2	Anti-viral coatings of electrochemically reduced metal nanoparticles for respirators (COVID-19 related project)	Dr. Suhash Ranjan Dey (Dept. of Materials Science and Metallurgical Engineering)	Dr. N. K. Raghavendra (Dept. of Biotechnology)	A successfully tested face mask with the filter developed in this project should be demonstrated.

A Glance at COVID-19 Combating Initiatives @ IITH

Students' Proposal approved under BUILD #fight against COVID-19

BUILD program: Bold and Unique Ideas Leading to Development

- Objective - Promote creativity and innovation among students
- Duration - 6 months
- Funding - up to 1 Lakhs
- Outcome - Product/prototype (hardware or software or app)
- Open to all students of IITH
BTech/BDes/MTech/MDes/MSc/PhD

BUILD 2020 program:

- Total Project proposals received: 34
- 5 member Committee constituting of Director, Dean Students, 1 Faculty from 3 departments - CSE, EE, MAE evaluated the proposals under 3 categories
 - ~ Hardware, Software and COVID-19
- Total of 16 projects are selected for BUILD program 2020
 - ~ Of these 8 projects are COVID-19 related (50 % of selected projects)
 - ~ Grateful that 5 COVID-19 related projects are supported by IITH ALUMNI
- Project starts from 1st, August, 2020 to 31st, January, 2021

Projects selected and supported by IITH

S.No.	Title of Project	Team Members (Name, Roll Number including PI)	PI Name
1	Swatchh Air	Priyabrata Rautray (MD17RESCH11001), Nibedit Dey (HC17FCI11006)	Priyabrata Rautray (MD17RESCH11001)
2	Pairing of BT Devices to Measure Distance	Sushanta Banerjee (George), (EE19MTECH11034)	Sushanta Banerjee (George), (EE19MTECH11034)
3	Gamification Of Online Education (Physics)	Raghav Gupta (CS19MTECH11024)	Raghav Gupta (CS19MTECH11024)

A Glance at COVID-19 Combating Initiatives @ IITH

Students' Proposal approved under BUILD #fight against COVID-19

Projects selected and supported By IITH Alumni

S.No.	Title of Project	Team Members (Name, Roll Number including PI)	PI Name
1	Face Shield for Doctor and health workers	Priyabrata Rautray (MD17RESCH11001), Nibedit Dey (HC17FCI11006)	Priyabrata Rautray (MD17RESCH11001)
2	Self-sanitizing coatings for germ spreading surfaces.	Parth Bhala (ME17BTECH11036), Akshat Loya (ME17BTECH11003)	Parth Bhala (ME17BTECH11036)
3	Post-Pandemic Food Safety & Hygiene	Dharmgya (ME17BTECH11021), Aditya (ME17BTECH11048)	Dharmgya, (ME17BTECH11021)
4	Automatic Disinfectant Tunnel	Dhanalakshmi (ME16RESCH11003), Surendra Kumar Soni (ME13M15P000004) Soundar (PH13P0002)	Dhanalakshmi (ME16RESCH11003)
5	Mobile robot for food, medicines and other essential items delivery in isolation ward for COVID-19 patients	Mangesh (ME17RESCH11003)	Mangesh (ME17RESCH11003)

Research Diary

Cardio-Sense

There is an exponential increment in human mortality rate, caused due to the lack of proper distribution of health care facilities and prognosis centres in the vicinity, prognosis centres or maybe because of delayed diagnosis of a disease. Doctors diagnose several CVDs by analyzing the Electrocardiogram (ECG) signal from the heart. This process of diagnosis of patients for CVDs is in the stage of transformation from traditional hospitalized approach to automated health monitoring remotely by battery-powered mobile devices to avoid premature deaths due to CVDs and also to reduce the burden on Cardiologists which occurred due to excessive patients. There is an utmost necessity to classify even the minute abnormalities of the heartbeat in the current scenario. There is a need for a robust automated method for the early detection of the vital abnormal ECG signals in chronic CVD patients.

Hence, to help mitigate the pandemic situation as well as to address the consequences of CVD in healthcare infrastructure, there is a tremendous necessity of developing a personalized CVD monitoring device powered by battery backup and with a very low form factor to achieve unobtrusiveness that works under the emerging cyber-physical system setup.

These battery-powered devices stand in need for low complex methodologies on-chip like ECG signal feature extraction and ECG signal classification. Accounting this we are presenting our new smart ECG product "Cardio-Sense".



Cardio-Sense is our smartest ECG technology! It can detect ECG changes suggestive of cardiovascular disease in real-time. It is a personal ECG heart monitor which provides its users with analytic results for physicians that allows them to supervise remotely their patient's heart rate variability (HRV) via this device. This pocket-sized ECG device lets clinicians widen their practices and enables effective diagnosis of cardiac conditions daily.

Cardio-Sense is your one-stop solution for all your cardiac needs.

This tiny device works in:

- Ambulance
- Hospital (bed-side)
- Home-care (user-friendly)
- Holter

What we offer:

1) Complete Data: Cardio-Sense constantly captures 12/3 Lead data and stores in the cloud. Only the specified user/doctors have secure access of ECG recordings on any device, accessible anytime, anywhere. It can easily switchable between Holter and standard 12 lead ECG machine. Also, the user can easily interact with this device using a Mobile App that we offer.

2) Complete Analysis: Cardio-Sense's proprietary algorithms run full statistical analyses based on the complete data set. It includes boundary detection, all fiducial points, intervals extractions and HRV. Apart from these, Cardio-Sense's predictive analysis that will evaluate the patient's health condition regularly, will be done based on the ECG recordings that present in the cloud. All these analyses will be done in the cloud in a secure environment.

Research Diary

Cardio-Sense

3) Complete Reporting: Cardio-Sense is a unique monitoring type technology that gives the quantitative analysis of ECG signal and provides easy-to-read graphical charts and full data sets to create a complete picture of the patient's heart rhythm. All these reporting will be done in a Mobile App that we offer. Doctors can monitor the patients' health condition via the Mobile App that we offer. Also, Cardio-Sense's predictive analysis and reporting will make the doctor's job easier to assess the patients' health condition.

Salient features of Cardio-Sense:

- Small pocket-sized, portable and user friendly
- No of Leads: 12 / 3 reconfigurable
- Reconfigurable recording time
- Leadoff indication
- Battery operated: Rechargeable battery and raw power supply
- Wirelessly connected to a smartphone (via Wi-Fi/Bluetooth)
- Analytics part running in cloud and report generation
- Mobile App to configure the device
- Memory card access to store the data locally

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Dr. Amit Acharyya

*Associate Professor,
Department of Electrical Engineering*

Research Diary

Repurposing of anti-malarial Nanoformulation targeting lung tissues to tackle virus-mediated inflammation/ fibrosis and acute respiratory distress

The COVID-19 outbreak has drawn the attention of researchers around the world. Currently, there aren't any clinically approved medications for the treatment of COVID-19 infection. Although chloroquine, remdesivir, etc, have exhibited a significant inhibitory effect of the viral infection, their clinical efficacy is yet to be established. The cardiotoxic effect and hepatic damage of these drugs limit their usage. Our group intends to develop an injectable hydrogel depot embedded with nanoparticles entrapping repurposed drugs. The drug entrapped nanoparticles get released from the gel matrix into the bloodstream and localize in the inflamed lungs region. The main advantage of the hydrogel is to enable sustained drug release, that eliminates the need for repeated drug administration thereby minimizing the dosage. This would significantly reduce the adverse effect, and improve the therapeutic output.



Dr. Aravind Kumar Rengan
Assistant Professor,
Department of Biomedical Engineering

India must prepare for the manufacture of millions of low-cost ventilators

The following article has been submitted to Govt. of India to initiate immediate action to identify the best designs to manufacture low cost portable ventilators. We are happy that Indian Govt. has immediately formed a committee chaired by Dr. Satish Reddy, Chairman, DRDO, to come up with specifications for such ventilators, which was immediately done. This committee has called for designs that satisfy these specifications and identified the best ones, which were connected to industry for their speedy manufacturing.

There are two ways to defeat the current coronavirus India is currently in the second stage of the COVID-19 crisis. The cases till now have been mostly related to travel abroad and transmission between family members and close contacts. But if the virus spreads into the general population, which is called "community transmission" and is labelled Stage-3 of the pandemic, there will be a very rapid increase in COVID-19 cases. Experts believe that it is an eventuality that must very rigorously be prepared for even while we are in this 21-day lock-down period to prevent the virus from spreading. Apart from India, the whole world faces the same threat and many countries will inevitably be unable to control the virus in the second stage and it will progress into the general population. The 3rd stage is a period in which the number of infected people increases exponentially - their number doubling every few days until, if not stopped by some means, 60% to 80% of the population is infected - which would mean millions would be infected in any country where this happens, and in India, it would mean hundreds of millions. While it is fervently to be hoped that our prompt actions would prevent that from happening, we must prepare for that possibility. Even if we are providentially spared, we must be prepared to help others in the world who may not be so fortunate.

The COVID-19 virus has a strangely varied effect on different people it infects. Some barely show symptoms and may not even realize that they are infected, while they still pass on the virus to others who may be more seriously affected. Others show symptoms after a few days even while in the interim they are passing on the infection to others. Of those infected, it is estimated that up to 85% will have mostly mild symptoms and will recover within two weeks. Of the remaining 15% who may need hospitalization, around one-third, i.e., 5% of the total infected persons, would pose the greatest challenge. They would develop respiratory difficulties for which ventilators for assisted breathing will become necessary. It is concerning these ventilators that the rest of this article will focus.

Research Diary

A Ventilator is a device designed to force breathable air into the lungs of patients who are unable to breathe for themselves. Modern ventilators are very expensive and sophisticated devices, which are generally found only in the ICUs of large hospitals. The most sophisticated ventilators, with computer controls, etc., cost around Rs. 40 lakhs, more modest foreign-made ones cost around Rs. 15 lakhs, Indian-made ones around Rs. 6 lakhs. There are around 40,000 ventilators in India right now, mostly in private hospitals.

The Indian industry has a manufacturing capacity of at most 6000 such units per month, but even the Indian-made devices use a lot of foreign-made parts whose availability would now be uncertain when every country would be maximizing their own ventilator production.

Let us now consider the requirements in the case the Covid-19 crisis reaches Stage-3 in India. Assuming a low 6% infection rate in the Indian population of 1.3 Billion, that would mean that around 80 million people would get affected. (Please note we are avoiding the more alarming 60-80% infection rate proposed by most models of a general Stage-3 epidemic. To get those figures just multiply our figures by ten). Of these 80 million, at least 5% would require ventilators, i.e., 4 million. Each of these 4 million patients would need the ventilators for around 21 days, thereby blocking that machine for at least that amount of time. Further, the machines are not portable and are found only in high-end hospitals in large cities, so patients from villages would need to be transported to these cities, which would be a logistics problem of unimaginable complexity. It is quite clear that even a mild 6% Stage-3 would overwhelm the country's capacity to a devastating degree. Even if the Indian Industry was at peak production it could manufacture only another 60,000 machines in the next 10 months, at a cost of 3600 Crores. Therefore, the total number of ventilators would barely be 1 lakh devices - at a time when millions of machines may be needed. It is clear that we cannot depend on conventional ventilators for a solution to this crisis.

Yet, even with these grim figures, there is hope. While the conventional ventilators are expensive, hard to produce, and not portable, there are small devices which are used to deliver breathing support in emergency situations that are inexpensive, easy to produce, and portable - which therefore have every quality that is required in this crisis. The most common of these devices is the bag valve mask, often called by the propriety name of Ambu Bag, that is used for resuscitation in emergency situations. Such devices are hand-powered and therefore not suitable for continuous use as a ventilator.

However, it would be easy to design a similar device powered by an electrical source, which could be a car battery, say, apart from the conventional power supply. It could be made portable, and therefore could be used in villages and areas without a power supply, and be inexpensive enough to manufacture in bulk. Our estimate of the cost is that it can be manufactured for less than Rs 5000, i.e., one-hundredth the cost of a conventional machine. The cost of manufacturing 6 million of these devices will be probably less than that of the inadequate number of 60,000 conventional machines mentioned above. The cost is so low that it can be considered a single-use device that will be given over to a single patient and never used again. It needs to be manufactured, however, on an industrial scale, in millions, within a short time of a few months.

It must be mentioned that this idea is not new. In the past few weeks, many countries have come up with this idea of manufacture of low-cost ventilators, and have even started competitions where the winning design would be declared open-source, i.e., not patented, and given free for anyone to copy if so inclined. Several designs are already available for 3-D printing, and so can be manufactured on a small scale on a 3-D printer. There have been several designs

proposed within India itself, with IIT Hyderabad having at least one proposed design. While this is reassuring, we mention that there are some caveats involved - these designs are untested and uncertified. Even if inexpensive, the designed devices should be capable of continuous and faultless 24x7 operation for at least one month - which requires very high performance both of the design and the manufactured components. Also, while 3-D printing could be part of the manufacturing solution, conventional manufacturing may be much more effective for making the millions of devices most rapidly and cost-effectively. It is on the steps required for this manufacture we will now focus.

We are proposing that the Government of India (through the DST/DRDO, or some other nodal organization) constitute a highly empowered task force, directly answerable to the highest levels of Government, which will carry out tasks mentioned in the accompanying Table-1 (which should be taken merely an indicative guide, as all the details will need to be worked out by the task-force).

Table-1: Tasks at hand and proposed timeline

S.No.	Task	Time line (weeks)
1	a) Create an expert committee to lay out the design parameters for low-cost ventilators, designed for inexpensive manufacturability and easy transportation that can run on alternative power supplies in addition to regular power supply. b) Announce these parameters and ask for design submissions with prototypes within 1 week. These may include international open-source designs, whose prototypes should be given over to specific IITs for making.	1
2	Waiting period (which should be used for publicity and soliciting design/prototypes from Indian Institutes and Industry).	2
3	a) Evaluate the submitted designs based on actual prototypes. (The evaluations should also continue beyond this period for durability, etc.). b) Choose the best few designs (allowing for a diversity in applications and manufacturing process, etc., so that our industrial capacity is fully engaged, with the different designs). c) The chosen designs should be simultaneously medically certified for use on human patients.	2
4	a) Assign manufacture of the several designs to different Public and Private industries and ask them to immediately prepare for production. The number of devices being produced will finally have to be several lakhs per week, so the manufacturing effort involved will need to be on a war-footing. b) Set up testing facilities for product testing and quality control and plan for their distribution. c) Set up training facilities all over the country for training volunteers	2
5	Total time till production starts (items 1-4 above)	7 Weeks
6	Start the manufacture of the devices	Continuous
7	Train the tens of thousands of volunteers (from all regions, cities, towns and villages) in the use of these devices. They will be needed to deliver the devices to the patients' home and train the patient's care-takers in its use.	Continuous

We believe that this plan is completely within the reach of our nation, but should be conducted with the utmost speed and efficiency to be useful at the time of the direst need. In the happy circumstance that the millions of devices so manufactured are not needed, i.e., if the virus is contained in Stage-2, say, India could then give these devices to other nations who may not be so fortunate. Even otherwise, due to the low costs involved, India can manufacture them beyond its own requirements for distribution to other nations. It is the least we can do for humanity in such dire circumstances.



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Research Diary

Post COVID-19 Education

Jio Institute organized a webinar on “Internationalization of higher education in the post COVID-19 era” by Dr Allan Goodman President, Institute of International Education, USA and Dr Francisco Marmolejo, Education advisor at Qatar Foundation on 14 May 2020. The author was invited to participate in the discussions. The webinar began with introductory remarks by Dr. Raghunath Mashelkar, Chancellor, Jio Institute & former Director-General, Council of Scientific and Industrial Research (CSIR) and concluding remarks by the Dr Dipak Jain, Vice-Chancellor of Jio Institute. This write-up gives you the essential part of the deliberations.

This pandemic has made all the educational schools across the world to adopt online teaching. Courses are conducted online, examinations are conducted online, assignments are submitted through email. For countries like India, this is a good opportunity to strengthen internet connectivity across rural India and spread education to rural students. Every village and towns in India should be digitally connected for better interaction between the students and teachers. Institutes like IITs have “a sort” of infrastructure to connect students but the experience shows that not all students have good interaction due to various reasons. Some of the students are quick to adapt to this system and some take little longer time to acquaint with this system. India should establish a good infrastructure for online education like some of the advanced countries. The greatest advantage of such a system is education can be internationalized. Advance institutes like IITs and IISc can globalize online education while Universities, initially, can nationalize online education. Fundamental structural changes should be made in the curriculum/syllabi and programmes should be popularized to attract students across the countries. Skill development should be part of the curriculum in engineering and science degree programmes. This will create future entrepreneurs. This is one way to beat unemployment and increase business skills amongst the youth. The business community should play a leading role in this new educational system. What is the opinion of the experts? The strength of this system lies in the faculty the institute it nurtures. Faculty need to change their mundane teaching methods and adapt to evolving technology-centred teaching.

The faculty should establish themselves as “competent” individuals who can deliver what the students (industry) expect. To establish such system faultily should be active in research and research publications and gain experience /skills in online teaching. In a way, the learning institutes become virtual institutes. Every student’s home becomes his institute. This will reduce the demand for the infrastructure of the institute. However, research labs should function as usual to support research. Research collaboration can go online and can be internationalized.

Higher education in India needs to be more international, more flexible(curriculum), should be innovative and should be open for more collaboration.

According to Dr Francisco Marmolejo, higher education should be re-designed. It should be flexible, more innovative, more international but more locally connected and socially responsible, more collaborative and less risk-averse. Innovative models should be introduced. Universities/institutes could be online-providing internet-based flexible offerings (open universities); traditional learning with hands-on work; collaboration with other schools. Of course, there are challenges one has to face at the initial stages: e.g. leveraging technology to deliver better and more inclusive education, contributing to digital economy and society and responding to global demand but shifting demographics. Faculty play the most important role in this system. True international engagement comes with curriculum integration (CI) and active participation by the faculty. Faculty need to be motivated and actively involved in curriculum integration. Online education does not mean without laboratory experience to students. Skill development needs laboratories/workshops. There could be centres across the countries to support skill development activities. These centres could be institutes, colleges, universities. On the research front: it is all collaboration and not competition. Projects need to be designed through collaboration so that laboratory/research facilities could be shared. This will lead to strong centres of research laboratories on the scale of a region. For example, there could be a strong collaboration within the SE Asia region. There is none till now. Many Institute routinely signs broad-based MoUs (Memorandum of Understanding). A component in this MoU should be Curriculum Integration.

Research Diary

And this should be implemented with all its seriousness. Post COVID-19 is an opportunity to transform the higher education system. Institutes/ universities should utilize this opportunity to transform itself. Curriculum design, collaborations, skill development and faculty involvement ---all should focus on internationalizing higher education.

Today it is COVID-19. we don't know what lies ahead in future for the million youngsters. Experienced teachers can now get affiliated with universities/institutes to offer an online course that fits into the curriculum. The curriculum also needs to undergo drastic changes (CI) to accommodate the courses without losing the standard and content. Institute like IITs and IISc should now go global and be part of the international education system.

Faculty need to change their mundane teaching methods and adapt to evolving technology-centred teaching. The faculty should establish themselves as "competent" individuals who can deliver what the students expect. Here the faculty should be active in research and research publications and gain experience /skills in online teaching. In a way, the learning institutes become virtual institutes.

The greatest advantage of CI is that a student can choose a course of his choice across the globe while fulfilling the academic credit requirement of the institute/university where he is registered. Student migration will be curtailed. Without spending a substantial amount, the student can get international credits and he/she can sell herself in the job market. If the institutes cannot do it now, then these institutes will die in future because no student will register for any programme in such institutes. The head of the institute plays a key role in this transformation. They cannot sit back and go back to the old style of education post COVID-19. However, research labs should function as usual to support research. Research collaboration can go online and can be internationalized. Future institutes/universities will be virtual and only research activities will be carried out through international collaboration. Here it is important to establish "trust" amongst faculty at International level. The amount saved on infrastructure (hostels, mess, water and electricity bills etc.) can be diverted to strengthen

research laboratories. The research collaboration will replace research competition. Institutes can accommodate a large number of students and quality education can be given to all the students.... whether it is within the country or abroad. The additional advantage is that institutes/universities can engage experienced faculty to get involved in this system. Experienced faculty will strengthen the academic and research foundation as many have already been well established internationally. Education is a continuous and evolving process and there is no retirement for those who can render their expertise.

I am sure the forthcoming academic year will start with an entirely new education system at school and university levels. Faculty evaluation becomes very easy. Based on the number of students registering for a course offered by a faculty. Within a few days of this Webinar, the Government of India, while announcing economic package laid strong emphasis on online education. The Finance Minister announced that the top 100 universities in the country will be able to start online courses via radio and television for students who don't have constant access to the internet amid the COVID-19 lockdown by the end of May 30, 2020. Online education is being taken up in a big way. In addition to existing TV channels, another 12 channels will be added to help the students in the rural area. The current lockdown period is an excellent opportunity for online transformation. IITs should lead the role and guide the other 100 universities. Govt. has come-out with connectivity to rural areas. This could be strengthened in future with good internet connectivity. The impact of the COVID-19 crisis is already being felt across sectors and higher education is no exception. While some participants, during the discussions, have argued that this is not the time to talk about internationalization of higher education, the majority indicated that for countries like India -which have been "late comers" in the highly competitive international education sector- the after-crisis offers a unique opportunity to "leap-frog" and rapidly advance towards an effective internationalization. Nevertheless, for India to more effectively position its higher education in the international scene some fundamental shifts may be needed, including curriculum reforms, a diversified revenue generation, immigration conducive norms as well as innovative modes of learning. With strong government support, I am sure this can be achieved.



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Research Diary

“Why would anyone want to buy folk paintings at a time like this?” How the COVID-19 is affecting an artisanal household in Telangana

Even as the Prime Minister appeared on national television yesterday just before announcing lockdown 2.0 in light of the COVID-19 pandemic, members of Danalakota household (living in Uppal a suburb in Hyderabad), like many viewers across the nation, had already anticipated that their hopes to actually leave their homes and conduct business, as usual, were already bleak. Like many of us, business is also on their minds. But unlike many of ours, theirs is a business that has always faced the fear of getting crippled. They are part of what many economists have called the ‘sunset industry’ of India, the handloom and handicraft sector.

Vaikuntam Danalakota, his wife Vanaja, and their three children – Sakshi, Rakesh and Vinay – belong to the community of traditional painters, wood-workers and sculptors in Telangana, called Nakash. Till 2013 the family lived and worked in Cheriyal, 80km from Hyderabad; the place also lends its name to the narrative paintings that the family produces, ‘Cheriyal Paintings’ registered as a Geographical Indication. Their decision to move to Hyderabad was motivated by the fact that bulk of their customers and retail clients, including Lepakshi Handicrafts Emporium (of erstwhile united Andhra Pradesh) and Golconda Handicrafts Emporium (of the new Telangana state), are located in the capital. Today the family works out of their two-bedroom home producing intricately painted canvases, boxes, figurines and plates.

They also only recently expanded their customer base, by publishing their work on social media platforms, and communicating with distant clients via WhatsApp, to who finished work is couriered. Canvases being passed

from one family member to another, brushes being dipped in small containers of colour, unfinished paintings lying around, finished paintings rolled-up, colour-stained corners, and a fair number of awards and photographs of Vanaja and Vaikuntam receiving them punctuating the walls – these are some of the things which one notices when one walks into their house on an ordinary day.



But these are not ordinary days. The profusion of activity has come to a halt in this house in Uppal. ‘We are usually really busy’, says Rakesh, Vaikuntam’s eldest son, who is also a trained mechanical engineer, but is completely involved in the family practice. ‘On most days we begin work around 7 in the morning, and it could go on till 8-9 at night. In the middle, we also need to do the cooking, cleaning and other chores. But now we barely have enough work to occupy us for even a few hours.

The lockdown, first announced on 24 March, came as a shock to the family, who like most of the country, was not prepared. “We didn’t expect a complete lockdown for three weeks”, says Rakesh. “If we knew this would happen we would be better prepared. Our work involves some essential raw materials. We need to source cloth on which we do our paintings, we need to source colour, and our work requires a very specific kind of glue, which is not available everywhere in the city. Usually, we keep enough stock for 15 days, depending upon the quantum of work. But when this lockdown was announced, we didn’t get a chance to go and stock on materials. Getting food and groceries is not difficult because those are ‘essential’ items. But for artisans like us, colour and other items without which we cannot work is also absolutely essential”.

Research Diary

Rakesh laments that they ran out of supplies two weeks after the first lockdown was announced. As a result, the family is unable to produce new work and keep it ready once retail markets eventually open. But a bigger concern for the family is the volume of finished paintings, which is rolled and piled up in one corner of the house. "If we were informed even a week before that there was going to be a lockdown, we would have put in more hours, finished the work, sent them to our clients, so that they could pay us. Now that the work is finished, we have no option but to wait till 3 May to be able to courier it to our customers. Our payments are stuck, and we can only hope that our customers will not backtrack. One never knows. Everyone fears financial cringe. Why would anyone want to pay for folk paintings at a time like this?"



With 'work-from-home' becoming the acceptable norm, many businesses and companies that ordinarily require employees to be in offices can sustain themselves through virtual participation. On the other hand, it seems that this lockdown presents a huge disadvantage for many artisanal families like Rakesh's whose work was always located within the home. This certainly is an irony, but the COVID-19 crisis has also exposed the kind value that we as a society place on certain kinds of work, namely artisanal work.

Vaikuntam is fully aware of the kind of priority the handicraft industry is given within the larger scheme of the economy. 'The coming months are going to be tough for my family. In the current situation, companies are running at a loss. But what the government must understand is that most small artisanal households get a lot of work from companies. A bulk of our orders is actually corporate gifts – small paintings, painted boxes, etc., which we keep getting throughout the year. We fear that companies in an attempt to cost-cut will stop placing such orders. Handicrafts are after all considered decorative items; people can do without them. I feel it will take at least 8 months to one year for businesses and corporate houses to recover. Until that happens artisans will face a severe crisis.'



One can only wait and see what plans the Ministry of Textiles, that encompass the handloom and handicraft industries of this country, has to boost the handicraft sector. But it does seem strange that members of a sector that is considered the largest generator of employment after agriculture and have a high potential for foreign exchange, perceive themselves as engaging in some only 'decorative', some dispensable. While governments celebrate individual artisans, including Vaikuntam, with Master Craftsman Awards, and avow them as the true bearers of India's technological and aesthetic heritage, the revivalist attempt during post COVID-19 needs to extend beyond rhetoric.

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Because Vaikuntam has been supplying to various Andhra Pradesh and Telangana state emporiums across the country for the last three decades, he has a grounded understanding of what artisans should expect from respective state governments. "It is only fair that a time like this the government steps up and ensures that we are able to sell what we produce. In fact, each state government should buy local handicrafts of their region. Organizing exhibitions will not be enough to salvage our situation. Each state government should encourage the different departments – Electricity, Municipal Corporation, Engineering, Health, Transport and Civil – to support local handicrafts; they can do this by using artisanal products in their offices, and by offering them as gifts during formal events and visits. Without this kind of intervention from state governments, artisans across the country will suffer."

The COVID-19 epidemic has affected the lives of millions in 210 different countries across the world. But more significant is how a history of technological and transnational relations has led us to a situation where the effects of the epidemic in a country like the United States and the United Kingdom doubly complicate situations in other already affected countries. Rakesh points out that a number of their Telugu clients in Hyderabad have relatives who are diaspora in countries like the United State, United Kingdom and France. This was another growing customer-base that the family had just started exploring. "A lot of our Telugu clients would recommend our work to their relatives living abroad and order on their behalf."

The situation would not have been so dire if we could rely upon orders from those places till the situation in India stabilizes; but America, the United Kingdom and France are the worst affected, more than India."

Despite uncertainties about the future, and especially about whom they could turn to, these artists are making sure that their work has relevance, especially during the exceptional time.

Vinay, who is Vaikuntam's youngest son, over the last week has made two paintings depicting the themes of 'Stay at Home' and "Social Distancing'. Imagined through their collective style, these paintings testify the kind of innovation and resilience these artists are capable of demonstrating. "This period is going to go down in history. I thought we should represent it through our medium of expression. Nakashi paintings have always depicted what is happening in society. So we are simply continuing that tradition."



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Research Diary

Impact of Social Distancing due to Novel Coronavirus (Sars-cov-2) on daily travel for work during Transition to Lock Down

Summary

The outbreak of COVID-19 pandemic resulted in a change in both commute and personal travel patterns. Though in India, the lockdown was implemented from 25th March 2020, change in commuter behaviour was observed from the beginning of March due to self-awareness and pandemic fear. This study attempts to use decision tree approach to investigate the modal preference of 1542 commuters in association with socio-economic and travel characteristics, and safety perceptions with respect to public and private mode during the transition to lockdown due to COVID-19 (i.e., from 14th March 2020 to 24th March 22) in India. About 41% of commuters stopped travelling during the transition phase, 51.3% were still using the same mode of transport and 5.3% commuters shifted from public to private mode. The study findings revealed the various interactions of factors influencing the decision to use public or private mode of transport for daily commuting, even in a threatening situation like COVID-19. Interestingly, safety perception of commuters (associated with personal health) did not play a significant role in their mode choice behaviour during the transition phase. Though people perceive public transportation is unsafe over private, the actual commute pattern did not validate this due to possible reason that commuters do not have enough alternatives with respect to the modes available. Given the uncertainties in the minds of commuters regarding their travel behaviour due to social distancing, the insights from this study are important to the policymakers and local transport authorities to understand the change in travel pattern.

Introduction

Few millions of people around the world are affected due to the Novel Coronavirus (SARS-CoV-2) pandemic that started in China's Wuhan city early December last year. As on 2nd May 2020, no vaccine or treatment is available for COVID-19. Besides its worrying effects on human health and life, the novel virus has potentially slowed down the transportation system among other things. Avoiding personal physical contacts and reducing interaction between individuals (i.e., social distancing) became a compulsory norm in most of the countries. Therefore, governments of various countries are in the process of isolating themselves and some countries like India have already restricted the human movement by incorporating lockdown to ensure social distancing and promote self-isolation. The timeline of positive cases recovered patients and deaths in India due to COVID-19 are shown in Figure 1.

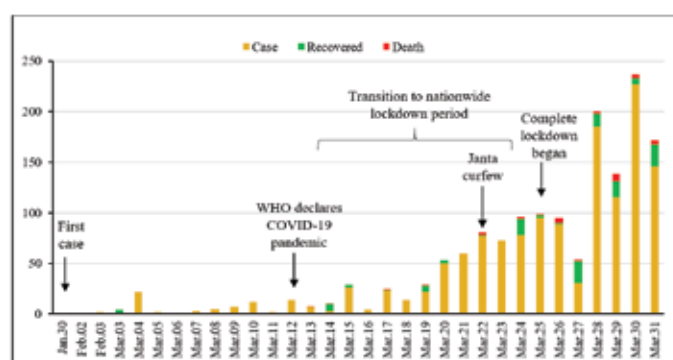


Figure 1. Timeline of cases, recovered and deaths in India due to COVID-19

Study Method

An online questionnaire survey was designed to gather information about the travel behaviour of commuters before and during the transition period of COVID-19 outbreak. The responses were collected from 18th to 28th March and the participants were specifically asked to fill data with respect to the third week of March (i.e. 15th March to 21st March). The questionnaire enquired about the commuters' socio-economic characteristics (age, income, and city of residence) along with travel characteristics (preferred mode of transport, distance from home to work, travel time and frequency of travelling to work) and health-related safety perceptions with respect to public and private mode. A detailed description of the research organizations involved and the objective of conducting this study was provided to the respondents at the beginning of the questionnaire. The online survey link was posted on various social media platforms, public forums and circulated through personal communications.

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Figure 2 shows the research methodology adopted in this study.

The present study analyzed the decision making of commuters with respect to selecting the public or private mode during the transition period of COVID-19 outbreak. A decision tree approach was used to understand the underlying interactions among various explanatory variables. The relative importance of various interaction variable features used in the decision tree analysis is shown in Figure 3. It can be observed that people give the highest importance to travel time followed by the distance covered between the residence and workplace. The next deciding factors are age and income of commuters, followed by the frequency of going to work, safety shift and the city of residence.

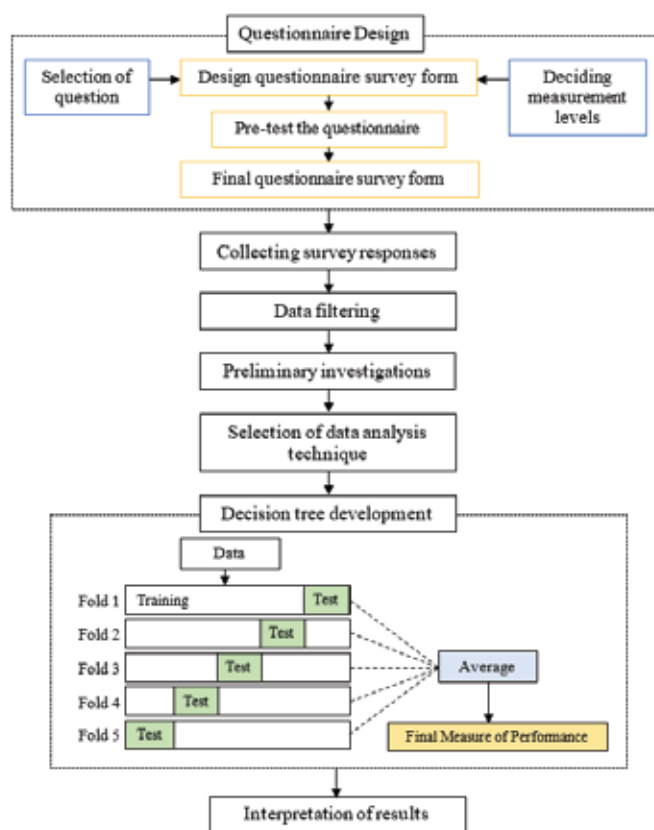


Figure 2. Research methodology of the study

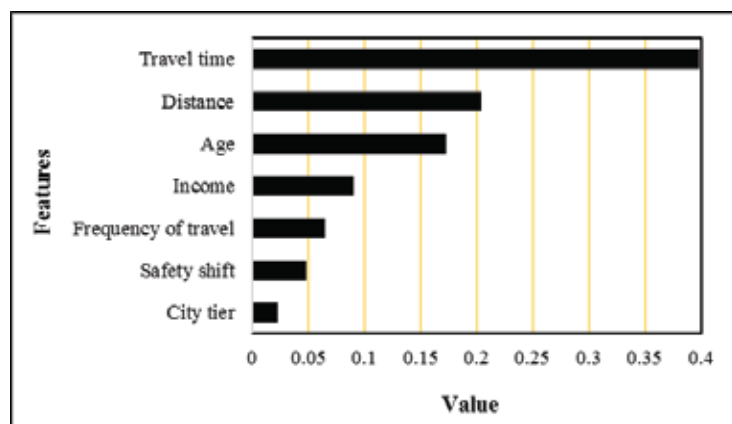


Figure 3. Feature importance of decision tree variables

Discussion

The present study demonstrated that commuters' decision to select a favourable mode of transport during the transition to lockdown due to COVID-19 outbreak. The effect of complex combinations of their socio-economic and travel characteristics was analyzed and studied. An interesting observation from the study is that, although public transportation was rated most unsafe among other modes, the mode choice decision did not significantly rely on the safety perception of the commuters during the transition phase. It was observed that about 18.3% of the commuters continued using public transportation during this period. Irrespective of the public health effects and safety risks of COVID-19, passengers did not give much importance to safety aspects while taking the mode choice decision for daily commute during the transition to lockdown. This behaviour probably would be due to a) Lack of alternative modes of transport from home to work and vice-versa. b) Less awareness of the ill effects of COVID-19 among Indian commuters during the initial phase of COVID-19.

In the Indian context, the issue of COVID-19 outbreak is critical as it instils fear among the population due to its rapid spread, lack of vaccine treatment, number of fatalities increasing every day, and the gaps in knowledge and understanding of its behaviour (Jacob John, 2020). As India is the second-most populous country in the world after China, there is a high chance of viral transmission due to public movement in mass, which is quite common while using public transportation. In this regard, strict monitoring of infected individuals and efficient enforcement of preventive measures such as social distancing needs to be followed effectively.

Research Diary

The lockdown approach adopted by the Government of India is crucial in minimizing the spread of COVID-19. If there would be no lockdown, people would still be using public transportation for their commute, which would have led to increased transmission of COVID-19 among the Indian population.

The researchers recommend spreading more awareness about the ill-effects and spread of COVID-19, especially in the lower strata of society. This study is quite useful in understanding the decision-making behaviour of commuters while selecting their preferred mode of transport during a pandemic like COVID-19, which is a threat to public health as well as the economy of the world. The rapidly changing diaspora of the pandemic is making human life more challenging. More research is required to investigate the public concern over modal choice during disastrous situations like COVID-19.

Public transportation is an integral part of billions of people's lives, and therefore governments from the different states of India may run the system with strict norms on social distancing and sanitization to keep riders and employees safe. Moreover, the policymakers may need to think about possible approaches to integrating these preventive measures into the daily commuting habits of public transit users when the lockdown period is over. It would be challenging to effectively manage such a huge population at transit stations and during the entire journey. Additionally, there would be a requirement of behavioural shift with respect to the attitude in the usage of public transportation from the users' side. This attitudinal shift would only be possible with adequate awareness about the COVID-19 transmission and proper education on its preventive measures.

Consequently, there would be a need to increase the frequency of public transport as the number of passengers per vehicle would reduce and demand may not see significant reduction due to the lack of alternatives, especially among the poor population.

Note from Author: *This study has been done in collaboration with Dr. Nagendra R. Velaga, Associate Professor, Transportation Systems Engineering, Department of Civil Engineering, Indian Institute Of Technology (IIT) Bombay.*



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Research Diary

Rapid, affordable, portable SARS-CoV-2 screening kit

Viruses such as SARS-CoV-2 (COVID-19) continue to be a significant long-term public health concern because of their genetic mutability, rapid transmission, and ability to move from species to species. Current nucleic acid tests rely on RT-qPCR based method which required longer time (4 to 7 hours) costly machine and trained personal. In this project, we want to overcome current limitation of detection method and develop novel detection platform of SARS-CoV-2 for rapid (2 to 3 h), cost-effective (INR 400 to 500 per sample), sensitive detection in resource-limited settings (without costly RT-qPCR machine). This project is funded from CRG Short-term special call on COVID-19, Science and Engineering Research Board (SERB).

Antiviral coating for PPE and common surface

The virus SARS-CoV-2 (COVID-19) is primarily spreading through the infected aerosol resulting from the infected person coughing or sneezing, the face mask is one of the foremost protective agents from the infection of COVID-19. 3-layer surgical mask is affordable but it has limited efficiency to protect from SARS-CoV-2 as a face mask (including N95) do not have the capacity to kill the COVID-19 virus. The respiratory virus such as COVID-19 can survive on the mask surface from 72 h or longer, leading to possible accidental infection from the mask, particularly for medical personal or front-line worker.

There is an urgent need for a novel solution to make the existing facemasks with effective antiviral (anti-COVID-19) function allowing reuse for a long duration of time. Here we have developed a novel platform to make an anti-SARS-CoV-2 surface by simply spraying our novel formulation on different PEE surface and common area. As shown in Figure -1.

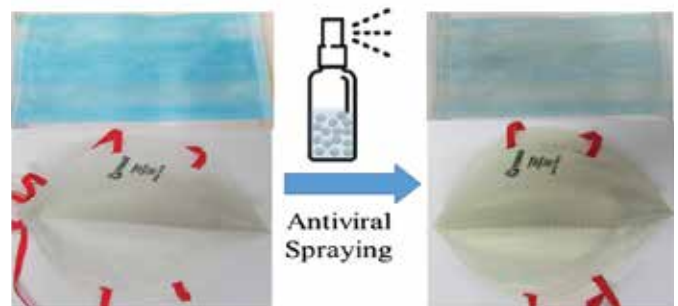


Figure 1. Representation of common face mask before and after anti-viral coating



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Research Diary

Designing a low cost Ventilator during the COVID-19 crisis

Introduction

Ventilators are some of the most critical medical devices needed by COVID-19 patients. Given the projections of numbers likely to be affected by the virus in India, and availability of ventilators in the country, a team was set up by the MAE department to develop a low-cost ventilator for emergency use in case supply of ventilators does not meet the demand. This ventilator with minimal specifications is termed as an 'emergency ventilator' in popular trending literature. The objective of this article is to give an elementary introduction on the design aspects of a ventilator, the challenges and the way forward.

Design requirements

From a simplistic point of view, the purpose of the ventilator is to provide a certain number of breaths every minute. During each breath, it has to supply a certain volume of air and monitor the pressure during the breathing cycle. However, the ventilators used in a typical ICU set-up in a hospital provide medical doctors with fine control and continuous monitoring of the respiratory function of a patient. In view of COVID-19 situation in the country and anticipating high demand for low-cost ventilators, GOI has recently provided specifications to be met by any ventilator that could be used in emergency care and are summarised briefly below.

One of the specifications mentions that the ventilator should be based on a turbine or compressor. The objective is that the ventilator can be used in hospitals/care centres which do not have a compressed air connection. Let us understand its implications. Let us say that an inhalation pressure of 30 cm of water was prescribed during an inspiration. Accounting for various losses, we can design a centrifugal air compressor to supply a pressure of 50 cm of water (this is equal to 5% of atmospheric pressure).

If the device has to be portable, it is preferable to have the compressor size to be less than 70 mm. Basic thermodynamics dictates that the impeller should have a speed of more than 20,000 rpm. Such compressors are usually made by specialized firms and not easily made in India, especially during the lockdown.

Another specification is that the ventilator should be capable of providing CPAP (continuous positive airway pressure) and PS (pressure support) modes. In the CPAP mode, the ventilator continuously supplies air to the airway such that the pressure is above atmospheric (typically about 5-20 cm of water). The objective is to prevent the alveoli from collapsing during exhale. A stand-alone CPAP machine is gaining its own importance due to which their portable versions are available even on e-commerce sites starting at INR 30,000. In the PS mode, the ventilator provides additional pressure during inhalation when compared to exhalation. In this mode, the ventilator detects when a patient is attempting to inhale (by monitoring the line pressure) and provides assistance so that the patient's effort is significantly reduced. The challenge here is that the ventilator should be able to rapidly adapt to the patient's breathing cycle.

Hence, the components such as pressure sensor, flow meter, compressor and flow control valve are required to have a fast response time (better than 0.1 s). This requirement may not be satisfied when we adopt a bag-valve-mask-based design of a ventilator.

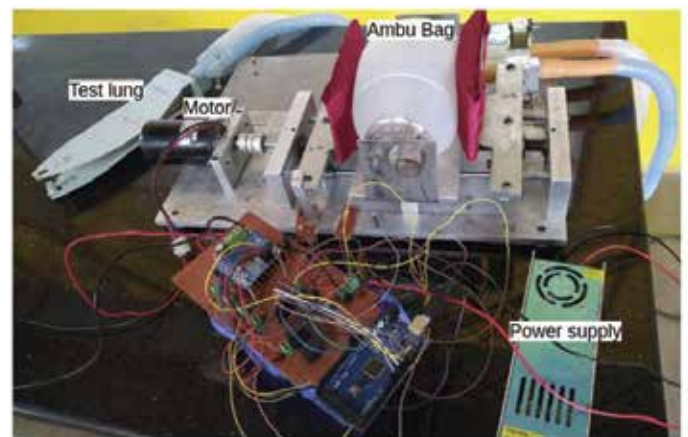


Figure 1. Ambu-bag based low-cost ventilator prototype Work at IITH

Research Diary

Like many other institutions in the world, a small team began work on a ventilator design with a modest aim to cater to the need of emergency ventilators. Such emergency ventilators are based on periodically compressing an air sac called an AMBU bag, which is used by medical practitioners when a patient is being transferred to a regular ventilator. These are very low cost and simple devices that can be assembled with locally available components. Although the AMBU bag operator cannot precisely control either the pressure or volume flow to the lungs, it is possible to set and control these parameters to some extent using mechanical actuation of AMBU bags. With the addition of pressure and volume flow rate sensors and other flow control devices, the mechanical ventilator can be improved in performance.

We have explored several mechanisms of automating the AMBU bag for compressing, such as pneumatic, slider-crank, cam and lead-screw based (shown in figure 1). We found that pneumatic is in-fact best suited among all, however, due to lack of availability of compressed air we focused on lead-screw based design. We have developed one-side and two-side compression for single AMBU bag and one-side compression of double AMBU bag lead screw models. All three models are ranked with an increase in its performance. Further, the double AMBU bag gives flow close to that of a blower. We have fabricated these models at IITH central workshop and with the help of HMT and CITD -Hyderabad we are currently making industrial prototypes.

With the aim of developing a fully functional ICU ventilator, in addition to the AMBU bag-based ones, we are exploring a design based on compressor/turbine. Note that this is one of the specifications which a ventilator has to satisfy according to GoI. Since we are unable to procure a compressor that satisfies our requirements (50 cm of water at a flow rate of 40 lpm), we are developing an air compressor using the motor of a drone rotor and making an impeller in our central workshop. A prototype ventilator based on a blower design is shown in figure 2.

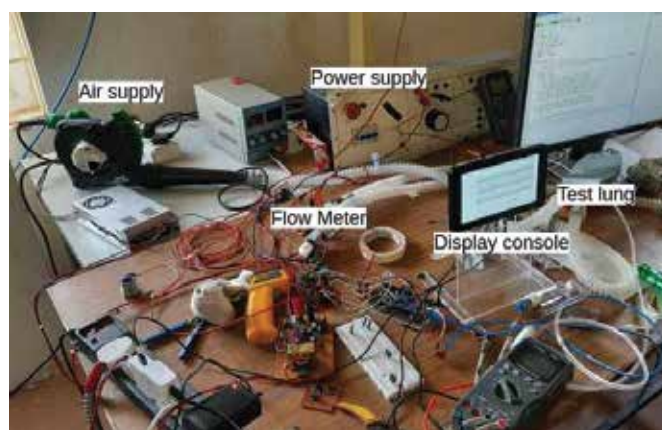


Figure 2. Blower-type low-cost ventilator prototype

Automation of the AMBU bag or the setting up of the right compressor is only one-third of the ventilator development. Ventilators also need a good flow circuit and fine electronic controls. Flow circuits consist of valves and sensors to control the flow as per the required specifications. Cost of the ventilator is dictated by the cost of sensors and valves. Most of them are imported, especially during lockdown it is difficult to find them. However, we have developed in-house flow sensors to calibrate the flow, which will be discussed later in detail. One of the crucial components of a ventilator is a volume flow meter which can precisely measure the quantity of air being delivered to the lung. Due to non-availability of flow meters during the ongoing crisis, a new low-cost volume flow meter was developed for the ventilator project. A variety of designs were pursued ranging from an ultrasonic flow meter which uses time differences between sound pulses travelling in the medium to determine flow rate to a hot wire anemometer which uses changes to the resistivity of a wire when air flows over it. After many attempts, a paddle flow meter shown in figure 3 was developed. This sensor has a tiny blade connected to a needle

Research Diary

IR sensors are used to calculate the rotation rate and the flow meter was calibrated using a commercial spirometer.



Figure 3: Paddle flow sensor connected to the Ventilator

The final part of the ventilator is the input-output console, we have used Arduino-Mega and python scripting to develop user-friendly interface and ventilator control. Efforts are currently underway to refine current designs in order to meet Gol norms.

We would like to acknowledge support from Profs. Eswaran and Murty, the efforts of the staff of MAE department and central workshop team during this development, Dr. Siva Kumar (Electrical Engg.) for help with the electrical circuit for the industrial blower and to Dr. KVBN Phanindra (Civil Engg.) for providing the pressure sensors.



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Research Diary

Inhale The Herbs and Contain COVID-19

We have seen the emergence of various deadly infections including swine flu, Asian flu, AIDS in the last few decades and now the COVID-19 or SARS-Cov-19. It is worth thinking about how an entity which is not living by itself but gets activated only when inside an organism can bring lives, economy to a standstill - the virus. The recent emergence of COVID-19 has made virus a known contagion in every household. While various sanitisation practices have gained importance, containment of such viral infection demands vaccines and antivirals.

Adjuvant therapies are going to play a vital role in the treatment of COVID-19 infected patients until a specific drug is discovered or a vaccine is invented to prevent the infection. COVID-19 has been identified as one of the severe acute respiratory syndromes (caused by SARS CoV-2) and has emerged as a global public health crisis. The most common signs and symptoms of patients are fever and cough. In the early stages, the patients show the acute respiratory infection symptoms, with some that quickly develop an acute respiratory failure, and at later stages results in multiple organ dysfunctions ultimately leading to death. As the SARS-COV-2 majorly invades respiratory system and causes pneumonia, the virus mainly resides and replicates within the alveoli of lungs. Hence, pulmonary targeting of antiviral drugs would be most beneficial. The pulmonary route provides a large surface area for rapid absorption provided by terminal bronchioles and alveoli, a thin (0.1–0.2 mm of alveolar epithelium) physical barrier, thus promoting rapid uptake into the bloodstream, and minimal extracellular enzyme levels for metabolic breakdown compared with the gastrointestinal tract.

Indian people have long relied on consuming Indian traditional medicinal herb extracts and Indian spices to boost the immune system.

Various herbal agents/extracts are well studied and known for antimicrobial activity against various bacteria, fungus and anti-viral activity against viruses such as Corona, Herpes, HIV Dengue, Hepatitis. The main proteins in this virus and those previously identified in SARS-CoV or MERS-CoV exhibit a high similarity.

Due to this similarity, the herbal compounds found to be effective on SARS-CoV and MERS-CoV viruses, provide a promising opportunity to create anti-SARS-COV-2 formulations. Thus, our group is working on making formulations from 4 plant extracts, namely, Carvacrol, Thymol, Eugenol, 6-gingerol, extracted from oregano, thyme, clove, basil, and ginger.

Pulmonary drug administration is in the form of an aerosol and is based on one of the three platforms: nebulizers, a pressurized metered-dose inhaler (pMDI), and dry powder inhalers (DPIs). Amongst various formulations (nanosuspensions, solid lipid nanoparticles, liposomes, microspheres and microcapsules), microcapsules and microspheres are of interest as they offer better loading efficiency and possess good control over release kinetics. Our previous work has shown microencapsulation of the synergistic combination of three essential oils – eugenol, carvacrol, and thymol with high efficiency (Figure 1).

Similar formulations can be made from other plant extracts of interest here. Thus, we aim to formulate the selected phyto-pharmacological agents as microcapsules/microspheres, test their anti-viral activity and examine drug release in respiratory fluid and ultimately prepare an adjuvant therapy of lyophilized powders for pulmonary delivery for relief for COVID-19 infected people.

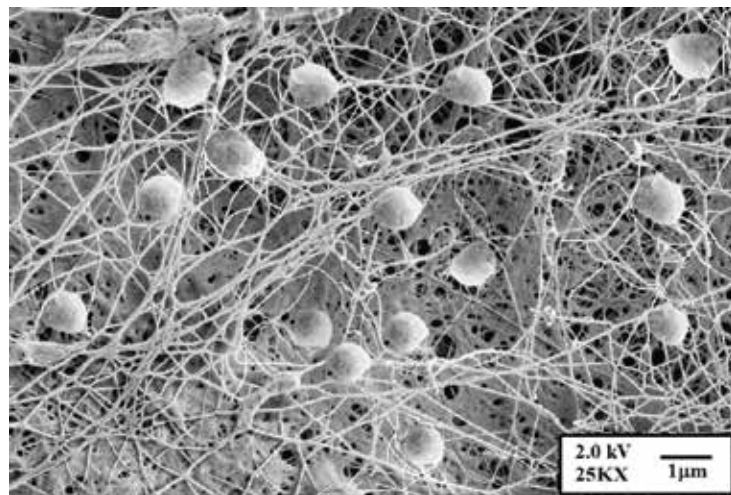


Figure 1: Microcapsules of eugenol carvacrol thymol embedded in a nanofibrous matrix



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Research Diary

COVID-19 and its Impact of Indian Financial Markets

The financial markets of India have experienced excessive volatility during the present pandemic period. The Indian stock market index, SENSEX, crashed from 40,000 points to 25,980 during March. Similarly, Indian Rupee depreciated from 72.2 to 75.3 against USD. This is the month in which COVID-19 was announced as a pandemic by the WHO. Due to the increased number of COVID-19 infections in India, the Govt. announced lockdown in the country from March 25th to May 3rd. The foreign exchange market experienced higher volatility, especially in March (Fig.1). This depreciation pressure on Rupee against USD led to the liquidity crunch in the domestic money market, as the interbank lending rate is also experienced higher volatility during March. The RBI intervened in the foreign exchange market by selling USD to stabilize the exchange rate. In this context, the present research addresses various issues related to financial markets in India, such as the stock market volatility, exchange rate volatility, and the role of central bank intervention.

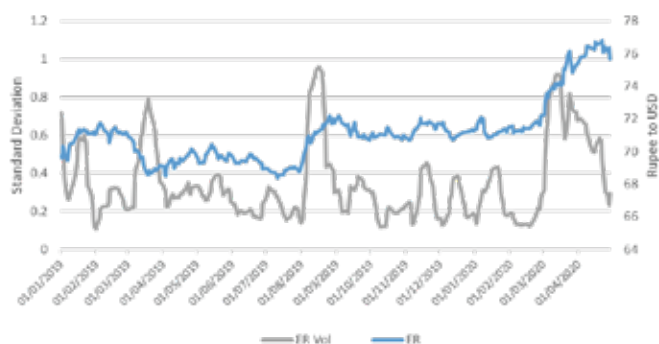


Figure 1. Rupee-USD Exchange rate and its volatility



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In silico engineering of putative epitope peptides from proteins of SARS-CoV-2 on nano-particles to develop potential vaccine candidates

There are two ways to defeat the current COVID-19 pandemic that the world is facing, one is to get an impeccable drug and second is to emerge with a potent vaccine. Virus-like particles (VLPs) or protein cages are potentially safer vaccine candidates as these multiprotein structures mimic the native viruses but lack the viral genome. These self-assembling protein nanoparticles can effectively be combined with the emerging discipline of structural vaccinology complemented with the design of protein cages. Engineering of protein nanoparticles fused with foreign antigenic epitope is promising and, also emerging vaccine technology against both infectious and non-infectious diseases. Computational approaches have been used to minimize the time and maximize the success of rational engineering of vaccine antigens on protein nanoparticles. Protein nanoparticles engineered with vaccine antigen have advantages over pure vaccine antigen: (a) can simultaneously display diverse and multiple antigens, (b) can present antigen/epitopes in a particular pattern that mimic pathogen surface, for robust immune response. In addition, can tailor immune responses by modifying the nanoparticles.

One of the main limitations of using protein nanoparticles as a vaccine platform is that only a negligible number of foreign peptide or antigenic epitopes can be successfully fused into nanoparticles that can correctly self-assemble. Another major concern is, generation of genetically conjugated nanoparticles with peptide epitopes, and testing their ability to assemble through experimental studies, since its laborious and, also less economically feasible.

Computational tools can be used to predict suitable nanoparticles, site on the particle for antigen insertion and, also to tailor the antigen to fit the region of the nanoparticles. We plan to use computational tools to select the appropriate protein nanoparticles and also to engineer multiple and multivalent peptides antigens of SARS-CoV2 virus on nanoparticles to develop potential vaccine candidates against COVID-19.

Research Diary

Developing Smart accessories for control and mitigation of infectious organisms

Further, we want to genetically engineer these chimeric nanoparticles carrying antigens of SARS-CoV2 virus in E. coli bacteria which will be used as a factory to produce the antigenic protein nanoparticles. Finally, we plan to take the snapshots of chimeric nanoparticles using transmission electron microscopy to know whether these nanoparticles assembled correctly and also whether the antigen of SARS-CoV2 virus got stably assembled on the nanoparticle.



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A commercially available polymer has been engineered under specific conditions to obtain a particular phase that could be of potential use to control and mitigate infectious bio-organisms under small DC-voltages. The proof of concept clearly shows that it works very well for Staphylococcus aureus a commensal bacteria that affects the upper respiratory tract and skin. The testing of these polymers for their antiviral characteristics using non-pathogenic viral strains are under progress. Further, the films will be potentially tested for their activity against COVID-19 in collaboration with CSIR-CCMB, Hyderabad. The processing used in this work is scalable and suitable for large scale production. This could potentially be used as a personal protective accessory for the frontline health care workers and for patients to prevent/control the spread of infectious organisms. These films could also be used in air purifiers, ACs etc. to mitigate viral load in quarantine zones/isolation wards.



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Dr. Aravind Kumar Rengan

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Research Diary

Jeevan-Lite: Center for Healthcare Entrepreneurship, IIT Hyderabad

Aerobiosys Innovations Pvt. Ltd. a Medtech startup incubated at Center for Healthcare Entrepreneurship (CfHE), Indian Institute of Technology Hyderabad has developed a portable, cost-effective, IoT-enabled, battery-operated pressure and volume triggered ventilation system called "Jeevan-Lite" to save lives from COVID-19 infected patients.

JCB India Ltd. has come forward to support Team Aerobiosys to take this product for mass manufacturing. Currently, JCB has incorporated the design and product engineers to work on this project with an intention to go for mass manufacturing in a few weeks. A working prototype is ready with team Aerobiosys, currently, they are building Alpha Prototype with actual production intent parts and the required functionality as outlined in ICMR and MoHFW guidelines. Jeevan Lite is a class 2-B product currently in TRL 6 and expected to move to mass manufacturing by end of May 2020.



Jeevan Lite can perform both the invasive and non-invasive ventilation across a comprehensive set of modes and settings. It can be used for both Pediatric and adult patients. Ventilator being a life-saving device, Aerobiosys has incorporated rechargeable Lithium-ion Batteries in Jeevan Lite that can give uninterrupted ventilation for 5 hrs continuously without power supply. Jeevan Lite comes with an App-based software wherein the ventilator can be controlled using the app and real-time display of 4 critical waveforms and can be monitored virtually from anywhere, making it user friendly and easy to handle. The idea of the team is to provide a remote and non-contact operation mode to reduce the chances of viral infection for healthcare providers. Hence each breath of the patient is recorded and transferred to doctors via connected App to enable telemedicine support.

The Start-up company Aerobiosys has been set up as part of the one-year Entrepreneurship Program in Healthcare Entrepreneurship at the CfHE by two young entrepreneurs Cyril Antony and Rajesh Thangavel. The Company has been supported through the seed grants from BIRAC BIG grant and CfHE seed grant.

Nemocare Raksha Plus from Center for Healthcare Entrepreneurship

An IoT enabled smart Wearable device with geolocation capabilities and an intelligent integrated decision support platform to provide disease surveillance by remotely monitoring suspected COVID-19 patients and tracking signs of disease progression.

Nemocare, a Start-up from CfHE, IIT Hyderabad has developed a continuous monitoring wearable device that will aid in remote monitoring of vitals along with geolocation and prognosis of affected and quarantined patients.



It will also aid in tracking their symptoms and the doctors will be alerted on detection of deterioration. We will also be able to understand the disease itself by monitoring positive cases and will help biopharma companies and academic institutes that are developing therapies by helping understand the efficacy and effectiveness of candidates.

Research Diary

The device is ready with a design for manufacture and the clinical testing are currently running. The team is looking for scale-up manufacturers and deployment in various places.

As per ICMR guidelines, Nemocare Raksha will be able to track symptoms such as cough, fever, respiratory illnesses such as shortness of breath, heart rate, SpO2, respiration rate, body temperature, cough sounds, Geolocation of the subject and a few passive symptomatic data.

Nemocare Raksha can:

(a) Provide disease surveillance by remote monitoring quarantined patients with suspected COVID-19 and detecting signs of disease progression

(b) Remotely monitor diagnosed cases to learn how this new strain of the virus affects the body

(c) Geotagged remote symptoms monitoring of most vulnerable /prone subjects and aid in timely reporting

Post the initial academic study, based on the results we have further designed with the help of UNICEF (AP and Telangana state office) studies to evaluate the health outcomes of the usage of our solution in both public and private setups.

Manoj Sanker and Pratyusha Pareddy, Cofounders of the Nemocare Wellness Pvt. Limited are part of the one-year Fellowship in Healthcare Entrepreneurship at CfHE, IIT Hyderabad. They have been winners of various prestigious International grants like the Bill and Melinda Gates Foundation Grant and Indo-US Millennium grant. The Company has been supported by BIRAC BIG grant and CfHE seed grant, Pratyusha Pareddy has won several awards including the Niti Ayog Women Transforming India (WTI) 2019 award and the BIRAC TIE Women Entrepreneur Award 2019.



Prof. Renu John

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Entrepreneurship (CFHE)**

"Work on Effective Framework for Managing supply and demand post lockdown using Federated Learning"

Post lockdown when the situation moves towards normalcy there can be supply shock on the local grocery store as believed that there will be a new lifestyle after this lockdown. Rather than people going directly to the store will prefer ordering the grocery using other means so that they can maintain social distancing to avoid the situation of COVID-19. We propose a solution where consumers can be able to place the order via chat or phone to the local grocery store. The other problem arises here is the inventory management for the stores as the local grocery stores don't know all the demand for goods by the people post lockdown. If they are not able to maintain the proper inventory management for their stores it can affect the supplies of groceries to the people. Good inventory management revolves around a single contradiction: keeping enough stock in the warehouse to ensure the business keeps moving but not enough stock to drain its limited cash reserves.

Usually to avoid such kind of circumstances large stores have their own machine learning-based inventory management system with the help of which they can maintain the inventory stock in their stores. Since they have a large amount of customer data they can train the system good enough to perform well in real-time scenarios. But the same is not the case with small local grocery stores. The customer base of these local stores is not huge to train a model that can perform well in real-time scenarios. To overcome this situation one can have a centralized system where all the local grocery stores share their data to the central unit and the central unit will train the system using the data accumulated from all the grocery stores. After that, all the local grocery stores can use the same system that is prepared by the central unit. By sharing data to the central unit creates a sense of invasion of privacy for the local grocery stores. Being in this competitive world no one wants to share its customer's data as the other vendors can take benefit from it.

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Federated Learning is a distributed machine learning approach that enables model training on a large corpus of decentralized data. Federated learning enables the training of a model from data that are distributed across multiple nodes/devices while keeping the data private. We can use federated learning for the local grocery store to train its inventory management system without sharing their data among vendors. This way local grocery stores can never have a sense of invasion of privacy. Federated Learning is the approach where all the nodes have their own data and instead of sharing the data to the server, all nodes train the model locally on their own machine and then share the model to the server. After receiving the trained model from all the local grocery stores, the server will aggregate all the models at the server and share the same to all the stores to use. The major problem with the centralized system is the single point of failure if the server fails the whole system fails.

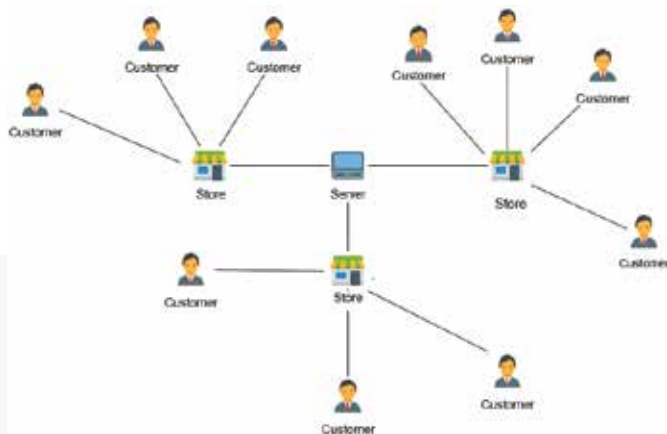


Figure 1. Server Based Inventory Management System

To overcome a situation like this we can come up with a federated learning system that doesn't include any server. All the nodes are connected to other nodes in the peer to peer communication or by other network topology. In decentralized FL all the local grocery stores rather than sharing the model to the centralized server will share the model to all other grocery stores. A store after receiving the data from other stores can aggregate the model and use it.

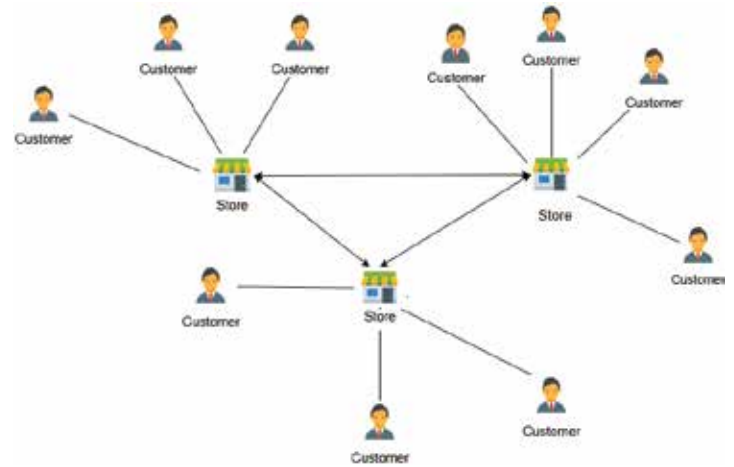


Figure 2. Server-less Inventory Management System

Basically, Our main aim is to streamline the supply chain management of local grocers post lockdown and help them keep up with the demands of customers by predicting every user's shopping list and by providing suggestions. We aim to help customers by making ordering groceries extremely convenient just by accessing a common portal and place their orders.



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Research Diary

A cost effective approach to the design and analysis of multiple experimental groups: a useful methodology for comparing potential treatments for COVID-19

Scientific research often requires the comparison of two or more experimental groups. The successful conduct of such investigations requires a study design appropriate for the scientific question at hand, a valid testing procedure for the hypothesis of interest, and an adequate sample size which guarantees suitable power. Sample size determination, or equivalently power calculations, are usually based on two-sample and two-sided alternative hypotheses designed to test whether the mean response of the treatment group is different from that of the control group (1). Such calculations are simple and very widely used and numerous software packages, such as SAS and SPSS, have built-in routines for such tasks. As discussed in this article, studies designed for assessing two-sided hypotheses are often grossly inefficient in terms of power and therefore may require a much larger than necessary number experimental units. Since in many experimental sciences a substantial portion of the budget is devoted to acquiring the sample, ill-designed studies incur increased costs. Of course, beyond the financial burden, ethical consideration arises when the subjects are animals and even more so when human. Here, we describe an alternative approach that, when appropriate, yields higher power per experimental unit and consequently substantially lowers the cost of experimentation.

In many applications, such as dose-response studies, time-course gene expressions studies or multi-drug trials, researchers may have a priori beliefs about the experimental groups. These beliefs are usually based on earlier studies or an understanding of the underlying scientific phenomenon and are often formulated as mathematical inequalities or constraints, known as order restrictions. For example, in a dose-response study, toxicologists may expect that the mean response increases (or decreases) with the dose of a chemical. This constraint is known as the simple order. Observational data are also often of this form. For example, in (2) the length of the ramus bone of 20 boys

was measured at three equally spaced time points from age 8 to 9. The question of interest was: did a significant growth spurt occur during the observed period? In a time-course gene expression study, the mean expression of a gene may increase up to a certain point, reflecting its biological activity (3) and then decrease. This constraint is known as the umbrella order. In clinical trials, a researcher may be interested in demonstrating that the standard treatment is inferior to one of the new treatments, or, that a new treatment is at least as efficacious as the existing ones. This constraint is called the tree order. For example, (4) compared the effect of various doses of cytosine on a dysphoric-like state in rats. In some cases, the study design may include multiple control and multiple treatment groups. For example, the US National Toxicology Program (NTP) evaluates toxicity and carcinogenicity of chemicals using the concurrent control group as well as historical controls (which are controls collected from similar studies conducted by the NTP). This set up leads naturally to a bipartite order restriction (5, 6). The above-mentioned order relations are represented graphically in Figure 1 by their corresponding order graphs. In each of the Figures, a circle represents a group mean, or more generally any other statistical parameter, and a pointed arrow implies an inequality among the two means or parameters. The roots of the order graph are the nodes with the largest means, whereas the leaves are the nodes with the smallest means. A variety of other constraints, or order restrictions, arise in applications and there exist over six decades of literature on this subject (7).

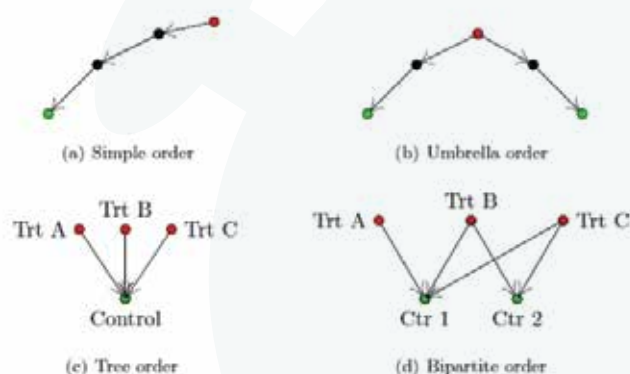


Figure 1. Order graphs for some common order restrictions. Circles represent group means and a pointed arrow indicates an inequality among the means. Green circles correspond to leaves of the order graph and red circles to their roots. We refer to the leaves and roots as the extreme groups. The intermediate groups are designated by a black circle

Research Diary

Standard methods for the above-mentioned analyses, often based on two-sided F or permutation tests, were not designed to address scientific problems in which ordering is inherent. Moreover, as mentioned earlier, their use typically results in a considerable loss of power. Thus, in this proposal, we emphasize that statistical methods which incorporate the underlying constraints are available, and should be used whenever appropriate. This collection of methods is known in the literature as constraint statistical inference (CSI). We illustrate the consequences of using such methodologies in both the design and the analysis of experiments. Doing so addresses the scientific questions motivating the study in a principled manner. Moreover, such methods may provide the power to uncover clinically important features in the data missed by standard methods. There is a current worldwide outbreak of a new type of coronavirus (COVID-19). There is no specific effective antiviral treatment available. However, some potential treatments based on drugs such as Remdesivir, Favipiravir, Lopinavir/ritonavir, and Hydroxychloroquine among others are actively used (8,9,10). Using the methods of the CSI and experimental designs, multiple comparisons among these treatments can be done effectively with a significantly reduced budget. Moreover, carefully designing and planning the experiment the using the methods such as a bipartite, tree, and umbrella order comparisons might result in the insightful in-depth interpretation of the study.

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Dr. Satya Prakash Singh

Assistant Professor,

Department of Mathematics

Design for the New World: Post COVID-19: A Disruptive Change in Context

Originating from China to almost every country and every state, COVID-19 has spread to every habitable corner of this planet. It has brought significant damages and loss of lives across humanity. The world, as we know it, is a changed place now. The practices and behaviours which were considered normal and were even not noticeable are now disrupted. The world has become helpless to run its routine and it looks like we've ended up at the beginning of establishing civilizational traits for humanity. The biggest question is how to cope up in the No-Touch world!? Well, strange times. But the same 27

Research Diary

extended a challenge to come up with novel and fitting solutions on all fronts. However, it is the opportune moment to show human creativity and resilience to thrive and prevail. Scientists, engineers, designers, manufacturers, distributors, servitors, everyone is looking forward to inventive ways to cope up.

COVID-19 is highly contagious and as of today, avoiding touch/contact is said to be the best way to deal with it. But humanity is used to meet and greet people, touch and feel objects in our surroundings, but not anymore. Touch is one of the basic senses and life without it will be a reductive one. Will it be? The design process sees it as a disruptive change to the normal. This is phenomenal and has never happened at this scale before. For whatever manmade tangible objects we're beholding today, are designed and produced. General interaction with these involves our senses. Starting from the home to workplace, entertainment, food, travel, etc. There is always an interface between things and a user. For example, in the public domain, mostly it involves touching, like a door handle, knobs of taps, staircase railings, switches, stuff we buy, etc. Suddenly, touching them is prohibited. This is an unparalleled scenario which everyone is facing. We need rethinking on designs of most of these things. The situation demands a protective layer in between us, to objects. This may be done in several ways. Redesigning is the first one, but poses an even greater challenge of replacing objects from all around us. Its huge requires mammoth resources, money and time. coming up with innovative makeshift arrangements could be the other one, tweaking one thing at a time. the global emergency is enabling for reflective ways through the design discipline. The top-down and bottom-up approaches are being framed formally and informally to come up with a tentative solution for various needs.

One more fallout of COVID-19 is revisiting the globalization. Traditionally there were very limited exchanges in earlier times and societies used to be living mostly out of touch from others. They lived and died in one place. The history of pandemics also suggests that death has brought misery to one or two places which were in contact. Rest of the world was saved. But in the age of this global village, it is evident how fast the pandemic spread to every corner of the world putting all humanity at risk. It is time to go independent and be interdependent rather than becoming dependent. This notion is a trait of sustainability. It encourages the local strengthening of

resources to minimize migration and bring resilience in societies. For an example, workspaces will go defragmented with multi-location placements, wider spaces with restricted touch, virtual work stations, work from home, neat and tidy workspaces with minimal items, in turn, reducing consumerism, etc.

This may need a revisiting to the furniture design for workspaces. Staggered seating, communicating from a distance, no more open plans but going back to personalized spaces (cubicles?). The material and finishes have to be microbial growth retardant. A lot of applications are possible in the public domain. Seamlessness and minimal joineries could play a key role in workspace designs. Central air-conditioning and HVAC may get some rectifications in its present form. But with all this, the personal spaces are going to be relatively lonelier. There could be psychological impacts. How is design going to handle the renewed context is what we're going to see soon.

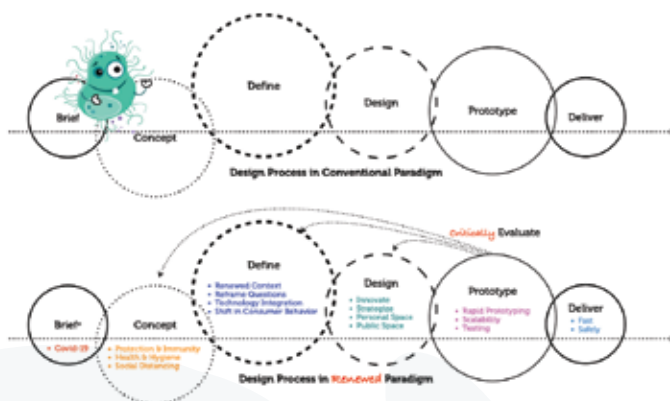
Communication design also going to get a boost as it is critical to convey the desired information to the recipient in time. The information dissemination is important to save on time, resources and most importantly to avoid a mistake which may prove costly in the present circumstances. Traffic movements on-road and even within a premise is crucial to control in an efficient non-clashing fashion. Print media is going away for instant news delivering online mediums. Graphical online representations of information may become more relevant than ever before.

Virtual and augmented reality is set to find a bigger role in various application. The first victim sector is tourism where VR/AR can play a vital role. It bridges the gap, of not being physically present at the location, quite effectively. Virtual Reality tours are going to be the next trend to watch places from across the world. Even for conducting classes for selected topics such as experiments, giving virtual tours from history, explaining complex geometries and systems, this may play an important role. My research in this area is on developing an understanding of the disruptive changes coming to the design of regular objects. The impact has come suddenly and subsequently, impacts are ranging from short-term to mid-term and long-term. Upon a preliminary observation, it is opined that it's not all negative. Some sectors are going to rise, some may be affected mildly and of course, some are being impacted in a big way. The study aims to understand the changes in context for the design and role of design discipline in dealing with such complex challenge at various levels.

Research Diary

The impact of change on individuals and communities. It is to document case examples, design processes, actual projects, intermediate interface developments, experiments carried out deal with peculiar circumstances. How this phenomenon is taking shape at local/regional/national/international levels differently. To think for distributed solutions, their scalability, inclusiveness, frugality, participatory contributions, and of course, sustainability.

Overall, the design is going to be very different in the post COVID-19 life driven by changes in human behaviour, social dynamics, restricted community interaction, rise and fall of industries, changes in geopolitical policies and rise of local economic dependence, followed by technological evolution with respect to the changes in the context.



Mr. Shiva ji
Assistant Professor,
Department of Design

Home Alone - Urban Patterns of Domestic Violence, Emotional Abuse, and Anxiety during the COVID-19 Lockdown

The disturbing data emerging from across the world reveals that in countries that include among others China, United States, United Kingdom, Germany, Italy, Brazil, Tunisia, France, Australia, South Africa, and India, domestic violence and intimate partner abuse have registered a sudden spike during the COVID-19 lockdown because of the home-trapped situation in which people find themselves. In the United States, domestic violence programs across the country have cited increases in calls for help, from Cincinnati to Nashville, from Portland and Salt Lake City, and statewide in Virginia and Arizona. In China, the number of domestic violence cases reported to the local police tripled in February compared to the previous year. In South Africa, operating under the Department of Social Development, the Gender-Based Violence Command Centre (GBVCC) received increased calls on its helpline and accommodated as many as 131 abuse survivors between 27th March and 13th April. In India, between the beginning of March and the 5th of April, the National Commission of Women received 310 grievances of domestic violence and 885 complaints about other forms of violence against women, many of which are domestic in nature. The Child Helpline in India (1098) saw a 50 % spike in the number of calls from across India between March 20-31, totalling 3.07 lakh calls that reported cases of child abuse.

According to the World Health Organization (WHO), one out of three women in the world experience physical or sexual violence in their lifetime. This has worsened significantly in the current global lockdown. Being borne out of the abuser's desire for power and control, the current global uncertainties and financial losses that deprive individuals of a sense of control over their lives only serve to perpetuate this disaster in the form of domestic violence, where the abuser criminally controls and abuses the powerless victim. The fact that there is an increase in violent, abusive, impulsive, compulsive, and controlling behaviour and aggression towards cohabiting partners during times of economic hardship has been recognized and researched extensively such as in studies of the Great Depression by several scholars such as Mirra Komarovsky (in *The Unemployed Man and His Family*). The increase in cases of domestic and intimate partner violence is the direct result of factors typical to situations of home-incarceration that exacerbate the conditions which facilitate these forms of abuse. These extended home-locked situations worsen the impact of patriarchal power structures that unduly affect not only women but also men who occupy gender-subordinate positions.

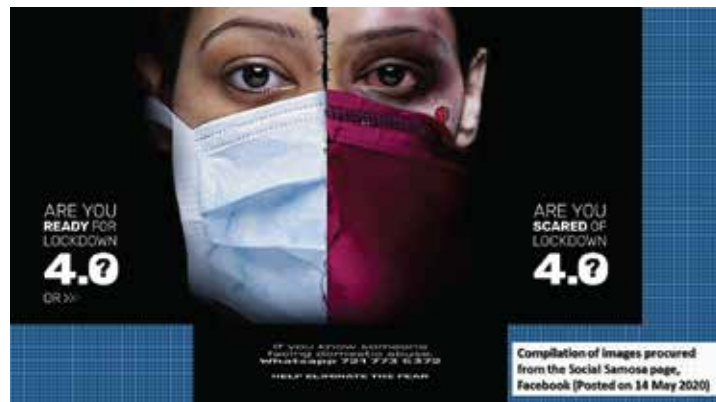
COVID-19

Research Diary

Firstly, these individuals are trapped within the interiors of their living quarters for extended periods of time that provides their manipulative abusers with greater freedom and access in enacting their abuse, whether emotionally or physically. What we note, as a result, are increased rates and intensity of threats, humiliation, intimidation, controlling behaviour, and explicit physical, sexual, and psychological abuse. Secondly, the economic uncertainty and losses of these troubled times lead to rising stress levels within the family structure that instigates and sustains violence against the partner by fostering emotional justifications of criminally violent behaviour. Thirdly, lockdowns provide for phases of isolation when the victims of abuse - otherwise able and empowered to access channels of social and interpersonal support—are starved of these networks of help. Alarming, often low-earning and minimally assertive in relationships, these victims are also therefore restricted by their abusers from accessing the public realm in general and critical health services in particular.

According to WHO, domestic violence and intimate partner abuse are the most widespread but among the least reported human rights abuses. Starting from a rights-based perspective, the project is directed at studying the underlying patterns that bolster these structures of abuse and suggests concrete ways of recognition and redress that can be adopted at governmental and social levels. This is a qualitative study that collects responses from a large group of individuals inside and outside India who were recently or are currently affiliated to higher education academic institutions, and who have considerable and demonstrable access to the internet and social media. The study addresses issues such as the level of awareness of the meaning of abuse—especially emotional abuse—among this demographic, and their ability to seek for themselves or for other victims relief and redress from these traumatic situations. A particular emphasis of the project lies in the area of mental health. The responses are being studied to understand the extent to which mental health is comprehended and prioritized by these individuals as part of their 'Right to Health,' and as part of the continuum of health services which they typically consider essential.

The current reality we are encountering has made it abundantly clear that domestic violence and mental health repercussions need to be incorporated into all programs of public health and pandemic preparedness at the governmental and social levels. Nationwide campaigns need to be envisaged and launched by the social sector, and by national and local administrations, that classify and project the 'protection from domestic and emotional abuse' as a human right and as an 'essential service' during emergencies like pandemics. Moreover, the state and other stakeholders need to find ways to make personalized treatment by mental health professionals both more accessible and more affordable - a situation that is far from the current reality. Thus, weighing responses collected internationally with the data procured from within India, the project aims to inform and innovate when it comes to ways of strategizing public mental health and freedom from intimate partner abuse - especially during periods of global crises such as the current one which upsets domestic balances of power and mechanisms of relief.



Dr. Shuhita Bhattacharjee
*Assistant Professor,
Department of Liberal Arts*

Research Diary

Lab on chip device for the detection of multiple proteins for SARS-CoV-2 infection diagnosis

The novel coronavirus formally SARS-Cov-2 has recently emerged to cause the outbreak of COVID-19 which has expanded into a worldwide human pandemic and also continued to affect our country to an exponentially increasing extent. Due to the rapid rise in the number of cases and uncontrolled worldwide spread of this virus, it is crucial to diagnose asymptomatic carriers to prevent further virus transmission and treatment of patients. Although the virus nucleic acid RT PCR test has become the standard method for diagnosis of the coronavirus infection, there is an urgent need for developing and optimizing other methods to quickly identify the infected patients. So that various instruments and national resources can be of use in handling the critical situation. Furthermore, since this virus can cause severe respiratory infections in humans, it is also important to classify the disease stage through the detection of the amount of inflammation present.

We propose a prototype imaging device that can be fabricated using 3D printed templates. Additionally, we envision a test kit and the protocol that can be used for testing the coronavirus infection in facilities that have fluorescent microscope/laser-based microscope.

In particular, we propose an immunofluorescence assay on the device that can be used to have high sensitivity and specificity for detecting the SARS-Cov-2 N protein, E protein, S protein, and interleukin-8. The proposed prototype can be an important supplement method for rapid screening of COVID-19 carriers, symptomatic or asymptomatic, in hospitals, clinics, as well as test laboratories.



Dr. Lopamudra Giri
Associate Professor,
Department of Chemical Engineering



Dr. Suahanya Duraiswamy
Assistant Professor,
Department of Chemical Engineering

Research Diary

An application to collect data and provide to local administration constantly for better crisis management during the outbreak of COVID-19

The idea was to develop an application that gathers the data about the health conditions of the citizens and provide it constantly to the local administration. On the request of Telangana state government, our group has developed an application to monitor quarantining.

IITH's administration and infrastructure have played a major role in actualizing this concept and were of great support in terms of permitting the use of data centre and required facilities.

We have developed and deployed an application to track the distribution of rice and money to the migrant workers. With the help of this application, our team has tracked the distribution of the essentials to more than 3 Lakhs migrant workers. As a part of this project, we have also sent hourly reports to the officials to regulate the distribution of needful and plan future activities.



Dr. Sobhan Babu
Associate Professor,
Department Computer Science and Engineering

Seismic Noise Changes during COVID-19 pandemic: A case study of Shillong, India

Asking a billion-plus people to remain home, was only possible for Shri Narendra Modi, the honourable Prime Minister of India. It was a few days before the 22nd of March 2020 that he had announced "Janata Curfew" as a first step in mentally preparing everyone for a more prolonged complete lockdown. What this meant for Engineering Seismologists, who have to use seismic instruments typically to capture earthquakes (signal), to shift their attention towards background earth's vibration (noise).

The complete lockdown of India has given a once in a lifetime opportunity of quantifying the contribution of anthropogenic/cultural seismic noise. It was a unique time period during which trains, buses, heavy operating machinery have all come to a standstill thereby letting us listen to the Earth's hum better.

Human-induced vibrations are prominent in higher frequencies, unlike distant earthquakes which are rich in longer periods. The higher frequencies decay rapidly away from the source of vibration. Usually, noise power can throw light on diurnal changes or seasonal variations. I chose to assess the pre- and post-lockdown differences in amplitudes. Examining the power at short periods clearly showed a significant decrease in post-lockdown.

My group here also works on the seismic studies at LIGO-India detector, which is only going to the third in the entire world, when it comes up. The other two LIGO detectors in the US have not had a chance to conduct such seismic studies before their installation. One of the US detectors is facing downtime issues due to Oklahoma earthquakes, work with my collaborators published in Classical and Quantum Gravity.

Research Diary

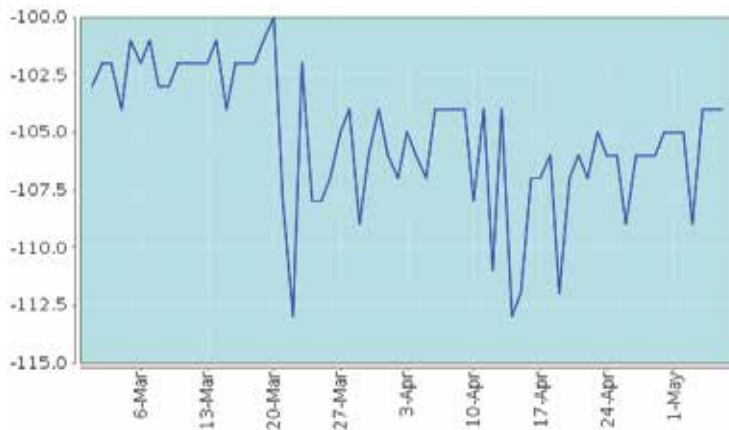


Figure 1. Shillong's seismic noise take a sharp due to human contribution on the day of 'Janata Curfew' which has not yet caught up to the pre-lockdown levels as we progress through lockdown2.0 to lockdown3.0

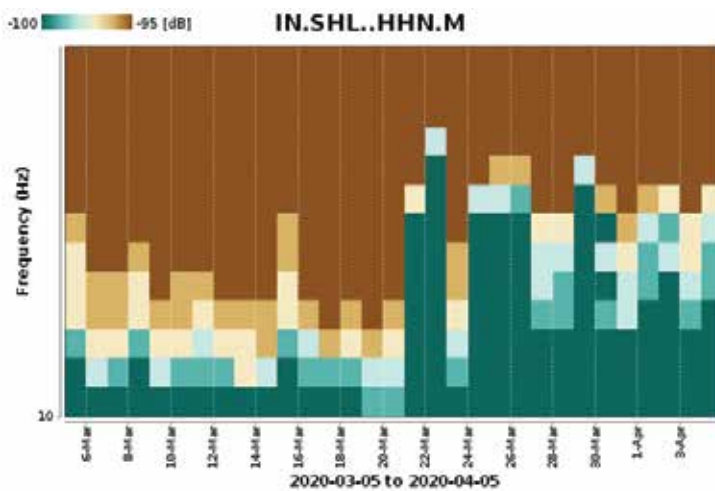


Figure Caption: Spectrogram of Shillong's seismic recording



Dr. Surendra Nadh Somala
Assistant Professor,
Department of Civil Engineering

Social Diary: Social Initiatives taken @IITH

1. Lab-made Sanitizer

Dr. Mudrika Khandelwal (MSME dept.) has developed sanitizer and distributed to various essential services in the IITH campus.

Expected number of Beneficiaries: 500

2. Lab-made Sanitizer for Local Administration

Dr. Jyotsnendu Giri (BME dept.) has developed hand sanitizer and at present under his leadership about 100 litres of Sanitizer is being prepared daily and supplying to the District Collectorate and Government Hospitals in Hyderabad

Expected number of Beneficiaries: 30000

3. Lab-made Sanitizer for Local Administration

Pure EV, a company incubated out of IITH and situated just outside IITH Campus, with one of our faculty (Dr. Nishanth Dongari, MAE dept.) leading the research activities there, has made about 3000 bottles of sanitizers (250 ml).

Expected number of Beneficiaries: 20000

4. Self-made mask for needy

Pure EV have manufactured about 5500 3-ply masks and distributed to local needy people.

Expected number of Beneficiaries: 5000

5. UV-C based LED sanitizer

Prof. Zafar Ali Khan (EE dept.) is working on UV-C based LED sanitizer.

Expected number of Beneficiaries: 50000



*Dr. Shivakalyani
preparing Sanitizer*



*The Hand Sanitizers
developed by IIT
Hyderabad Researchers for
use in the Institute
Community.*



*Prof. B S Murty using the
Lab made Sanitizer*

6. App for Data Collection

a) Dr. Sobhan Babu (CSE dept.) is developing apps that collect data about health conditions of the citizens and provide to local administration on a constant basis.

b) On the request of Telangana state government, Dr. Sobhan Babu group has developed an app that helps to monitor quarantining.

Expected number of Beneficiaries: Mass population

7. Support to State administration

Dr. Mohan and Dr. Kousik (BME dept.) and their team are providing COVID-19 prediction daily to the state administration.

Expected number of Beneficiaries: Mass population

8. Supporting villages adopted under 'Unnat Bharat Abhiyan' with COVID-19-related activities & preparedness

IIT Hyderabad has adopted the five villages under Unnat Bharat Abhiyan (UBA) activities. The details are as given in Table 1. Even before the COVID-19 situation, the institute has been interacting with the villages from January and February of 2020 to in the context of UBA. The institute coordinator, Dr. Prasad Onkar, with a team of faculty visited four villages and conducted Gram Sabhas to assess the prevailing situation. This also coincided with the 72nd Republic Day celebrations which were mandated by NCI, UBA – IIT Delhi.

Name of Village	Name of the Mandal & District
Anthram	Chilpched, Medak
Salabatpur	Kowdipally, Medak
Mohammed Nagar	Kowdipally, Medak
Kan Navaram	Kowdipally, Medak
Bujarampet	Kowdipally, Medak

As soon the COVID-19 pandemic broke, in the mid of March 2020, The Institute reached out to the villages through the respective panchayats. The initial ground report from the village panchayats was collected over the telephone and there were no issues of COVID-19 and the villagers were asked to take basic precautions to wash hands with soap, cover the face while sneezing, keep premises and locality clean, etc. Once the lockdown was declared, A WhatsApp group was formed with all the Mandal Panchayat Secretaries. Further based on the instructions of RCI, UBA. A screenshot of the WhatsApp group is shown in Figure 1.

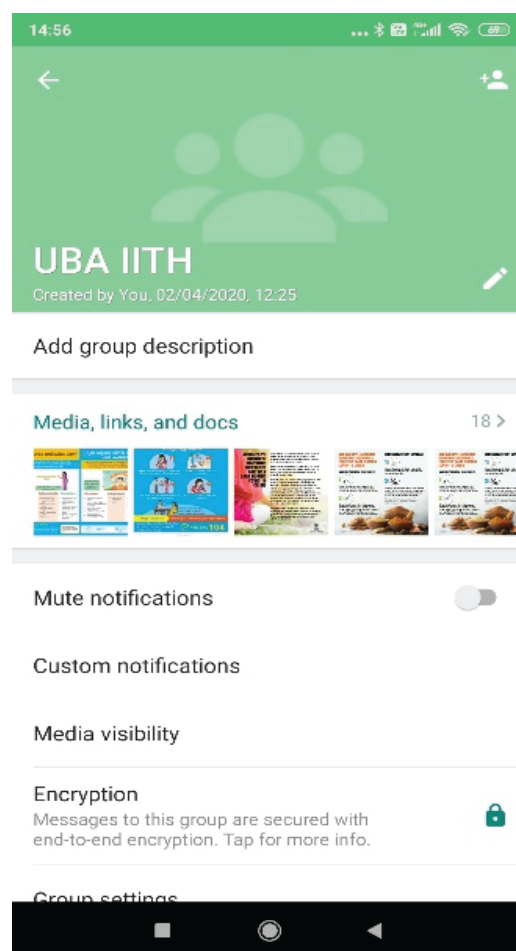


Figure 1: Screenshot of the WhatsApp group of UBA village representatives

In coordination with NIRD –PR Hyderabad (RCI, UBA), informative material is shared with the group. We have translated the material in the local language (Telugu) and shared with the villages. Figure 2 and 3 show some examples of the posters shared with the villages.



Figure 2. Poster for safe disposal of masks (Translated to Telugu language)

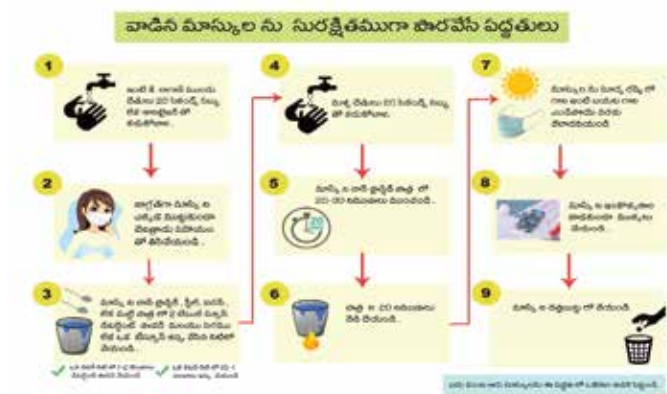


Figure 3. Poster for safe disposal of masks (Translated to Telugu language) - 2

Activities under MNREGA scheme have started in the villages and Secretaries are asking for some face-masks for MNREGA workers. Hence, we have come up with a procedure to make a cloth mask locally. We have prepared a brochure/ video and shared with the village SHGs to produce the masks. (Figure 4). We are also in the process of supplying some more essential materials including masks, gloves, sanitizers, some groceries.



Figure 4. Step-by-step Instructions to prepare masks

We also had a web meeting with the UBA Coordinating Institute, (IIT Delhi) and all the Participating institutes of NIRD-PR on 13th April 2020 to coordinate the activities of the participating institutes. The screenshot of the same is attached as Figure 5.



Figure 5. Screenshot of web-meeting with NIRD-PR (RCI) and IIT Delhi (NCI, UBA) representatives.

The village representatives are also instructed to download Arogya Setu app as informed by government agencies to be installed by the villagers who are having smartphones. Similarly, farmers in the villages are asked to install KISAN RATH app which will guide them in farming activities.

Updates from the Village on awareness of COVID-19 and other details:

IIT Hyderabad is in constant touch with the villages and monitoring the situation in villages through telephonic interaction and WhatsApp group. Many village representatives have updated on the activities which are specific to the COVID-19 situation. Some of the common activities carried out in most villages include Distribution of masks, Awareness to the people to maintain cleanliness. Implementing Lockdown instructions like restricting the movement of people, monitoring working of shops to maintain social distancing, ensuring the supply of essential goods like water, groceries, etc. Health workers (ASHA and ANM) have been actively conducting a survey to assess the awareness about the COVID-19 situation. Two villages Panchayat has also shared the measures taken for COVID-19 situation.

Academic Diary: COVID-19 Calligraphy

Calligraphy: The lyrical flow of letters and their strokes have a lasting impression of beauty and aesthetics on every admirer. Irrespective of regions, countries and cultures, calligraphy has found a place in every language. The fluidic and spontaneous characteristics of text and other expressive art form are enchanting to look at. Whether it is Indic (Sanskrit, Hindi, Urdu, Telugu, Bengali, Tamil, Malayalam, etc.), Tibetan, Chinese, Persian, Islamic or any other calligraphy from ancient and mediaeval times or modern and contemporary styles, it has been used always with fondness. It expresses the important text, forms a piece of artwork and amazes the viewer. It uses geometric principles yet looks like a work of poetic narration.

The Course Work: COVID-19 Calligraphy was done under course Calligraphy DS4023 under the Guidance of Mr. Sivaji, Assistant Professor, Department of Design. This is a course under the Department of Design as an elective and Design Minor for BTech students as well. Along with MDes students, BTech students also have shown keen interest and have produced nice concepts and work. Keynote is that this has been conducted under the period of lock-down. Being a hands-on course it was challenging to teach from distance through online mode. The lecture material was prepared and videos were shared beforehand with students to enable them to understand the whole process.

Further, online lectures were conducted over Google Hangout / Meet to elaborate and clarify their doubts. Since students are confined in their homes with no access to stationary or papers. The first lecture was to train to make their own home-made Calligraphy tools. Initially, there was some stigma but students not only made the tools but prepared all assignments and successfully completed the final assignment as well.



Mr. Ajay
MD19MDES11001

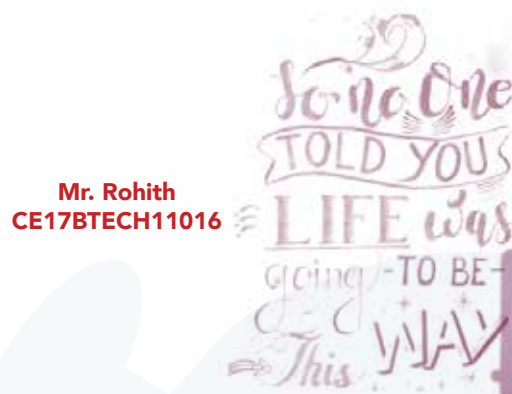


Mr. Arun Krishna
MD19MDES11004

Their final works are presented here. The objective was to make something related to COVID-19 Virus crisis, a thought, describing a situation, some emotion, hope, etc., using Calligraphy. Students have used relevant thoughts and hope inducing phrases. The whole course delivery shows their skills in handling challenging situations and delivering desired outputs.



Ms. Namratha
EP19BTECH11011



Mr. Rohith
CE17BTECH11016



Ms. Shreya
MD19MDES11005



Mr. Shiva ji
Assistant Professor,
Department of Design

Campus Corner

Jan 2020

Alumni reunited and relived their memories of life @ IITH on Alumni Day on Jan 5th 2020.



Jan 2020

'Ek Bharat Shreshtha Bharat Club' inaugurated at IIT Hyderabad to celebrate, promote and showcase campus diversity.



Jan 2020

The Plantation day - The Green Day of the Month. Homestead about 3,500 Golden Durlanta (shrubs/ border plants) and replacement of Wilted plants in the campus (in Main Boulevard, Peripheral road, Faculty/Staff lanes etc.) with the new ones.



Jan 2020

Armament Research Board conducted a workshop at IIT Hyderabad on 'R&D Projects & Opportunities in #Armament Field' to spread awareness. Participants included Scientists from DRDO, India, Faculty & students from IIT Hyderabad, NITs & other universities



Jan 2020

Prof B.S. Murty, Director, IITHyderabad unveils 'IIT Hyderabad's Vision 2024' today in the presence of Prof. C. Krishna Mohan, Dean (Corporate and Public Relations), IIT Hyderabad.



Campus Corner

Jan 2020

IITH has conducted a 5-day workshop for 29 Junior Lecturers of 12 TMRJC. The Lecturers got trained in the laboratory of the Dept. of Physics & Chemistry. The workshop was a part of follow up to the MoU signed between IITH and TMREIS in October 2019.



Jan 2020

Center for Healthcare Entrepreneurship (CfHE) @IITH hosted a MedTech Symposium to bring together key leaders in the field of medical & healthcare technologies to discuss the key challenges & developments in medical devices startup ecosystem



Feb 2020

Green Day of the month - A total of about 1,400 Croton & Duranta has been planted on this day.



Feb 2020

Dr. Kotaro Kataoka, Associate Professor at Dept. of CSE, IIT Hyderabad gave a talk titled "IIT Students: Indian Top Talents in the Global Human Resource Market" at a seminar at JETRO Japan by the embassy of India, Tokyo, Japan.



Feb 2020

A demo on firefighting techniques has been given at IITH Security Personnel. Around 150 personnel attended it including students, Research Scholars, staff. Objective is to spread awareness about common causes of fire & other critical aspects.



Campus Corner

Feb 2020

PhD Student at Dept. of CSE Mr. Thamilselvam has given demo & training on fundamental electronic devices and product to the School kids at Government HS School - Kottanattampatty & Science Knowledge Park - Sonaipatty - Tamil Nadu.



Feb 2020

PURE EV, a startup that has raised funding at a valuation of USD 35 Million and incubated by IITH, launched its High Speed Electric Scooter 'EPluto 7G' today. The vehicle has a range of 116 km per full charge (in ICAT range test).



Feb 2020

Embassy of India Tokyo organized a unique brainstorming event (AWSAR). It was coordinated by S&T Wing & about 40 Researchers made 20 presentations. Out of 20 presentations, 5 were by IITH's Alumni. His Excellency Ambassador & Deputy Chief of Mission applauded IITH Alumni.



Feb 2020

New edition of Smart India Hackathon 2020 is back now. For selection of teams, this year onwards internal hackathon has been conducted. All the participating teams @IITH have presented their ideas in front of the Judges and four teams were shortlisted.



Feb 2020

IITH has organized a Plastic Waste Free Campaign. A strength of 130 students participated in this Plastic Waste Free Campaign. The areas targeted were Hostel Area, Academic Block, Canteen Area and Mess Area.



Campus Corner

Feb 2020

1st issue of करिIITH-The Crowning Glory (an exclusive IITH's e-bulletin) has been inaugurated by IITH's BOG Chairman, Dr. B. V. R. Mohan Reddy during 11th Edition of Elan & nVision.



Feb 2020

International workshop on Precision QCD@LHC held @IITH supported by MHRD (SPARC Programme). Aim was to bring together the experts of perturbative QCD & research scholars from Europe & India to discuss the latest developments of the field & to also forge new intl. collaborations.



Feb 2020

Dept of Design @IITH announced resuming of the Wednesday Film Screenings. DOD has screened 'The Swallows of Kabul'. The 2019 French animated movie directed by Zabou Breitman is based on a novel of the same name by Algerian writer Yasmina Khadra as the first movie of the Film Screening Event.



Feb 2020

Dept of EE @IITH has organized talks on Lifestyle analysis & its application to authentication by Prof. Rie Shigetomi Yamaguchi & Lifestyle Authentication Utilizing Wi-Fi Information around Smartphones owned by Users by Dr. Kobayashi Ryousuke from The University of Tokyo.



Feb 2020

INAYAS organized a workshop on Academic & Professional Development for Young Scientists. As a part of which Prof BS Murty, Director@IITH, told students the need of developing a passion for research & urged them to focus on fundamentals



Campus Corner

Feb 2020

IITH announced 2nd Cohort of AI & Emerging Technologies Program, designed for college students & young professionals aspiring for high end tech careers & international PG programs which includes 5-week boot camp.



Feb 2020

IITH was honored to host Dr. Y.V. Reddy, a Padma Vibhushan Awardee, a celebrated Economist, Ex-Governor RBI and a retired IAS officer. He had a wonderful interactive session with students on a diverse range of topics on Technology, Innovations and Indian Economy.

Feb 2020

As a part of Cultural Exchange Programme of EBSB, MHRD, IIIT Raichur mentee Institute to IITH has conducted an interaction session with the students of IIIT Sonepat and Dean (Students) Prof. P. Rajalakshmi, followed by an orientation and Campus Tour. It was five program filled with exchange of thoughts, culture, tradition, literature, language and knowledge.



Feb 2020

Website of the 3D Printing & Additive Manufacturing Research Group @IITH named as "Srusti Hub" has been relaunched. With 10 different types of 3D printers and researchers from various fields, IITH is an active hub of AM research.



Feb 2020

IITH has proposed a major boost to the 'FRIENDSHIP' Project with JICA in Phase-II. Phase-I saw many significant achievements including 51 patent applications, 56 MOUs with Japanese Universities, research labs & industries.



Campus Corner

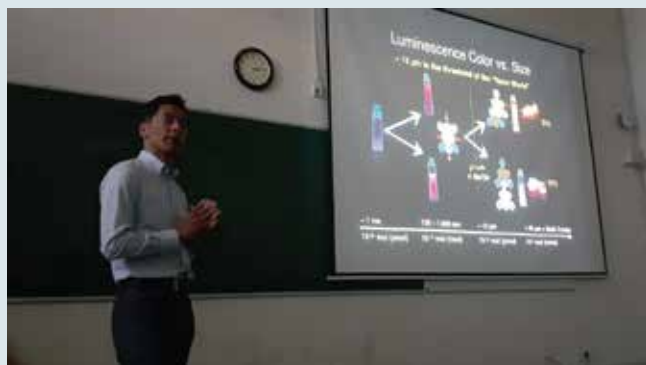
Feb 2020

To observe International Mother Language Day EBSB Club @IITH & IIIT Raichur has organized Poster Making, Slogan, Essay Writing & Antakshari Competition in their mother tongue. Even a ML Vlogathon (Video about IITH in respective Mother Language) was carried by Sunshine Club @IITH



Feb 2020

Dept of Chemistry @IITH was delighted to host Dr Osamu Tsutsumi, Vice Director of the Career Center & Prof. of Polymer Materials Chemistry, Ritsumeikan University, Japan. Prof. Osamu has delivered a lecture on Tunable Luminescence of Gold (I) Complexes with High AIE Character.



Mar 2020

NMDC and i-TIC Foundation @IITH has signed an agreement to support start-ups through a collaborative joint incubation program, NMDC Innovation & Incubation Centre (NICE).



Mar 2020

Dept of Biotechnology @IITH has organized some special talk by eminent speakers and Poster competition in view of National Science Day.



Mar 2020

The Design Innovation Center (DIC) @IITH has conducted two day hand holding workshop with its spokes institutions IIIT Kancheepuram, IIIT Sri city and IIIT Hyderabad.



Campus Corner

Mar 2020

EBSB club @IITH has organized a workshop termed "Nrityanjali" illustrating the significance of diverse classical dance forms spread across our country India.



Mar 2020

A Health Talk on Awareness about COVID-19 Pandemic by Dr Vishnu Rao (Infectious Disease Specialist-Apollo Hospitals) has been organized @IITH, followed by an interactive doubt clearing session. On the whole, we do not need to panic. Just follow basic hygiene, itself will help us to stay safe.



Mar 2020

Honourable Governor of Himachal Pradesh Shri Bandaru Dattatreya has made an exclusive visits to IITH. Shri Bandaru Dattatreya has also interacted with the faculty, students & staff of the IITH and shared his invaluable advice.



Mar 2020

On occasion of International Women's Day, Women Cell & NSS under Fit India Movement, hosted runners of Pinkathon (120 KM) who have shared secret of fitness @IITH. Women Cell has also screened "RBG", RBG, a documentary on 2nd female Associate Justice, Supreme Court of the US, Ruth Bader



Mar 2020

In line with the Fit India Movement, Fit India Club @IITH has started regular Yoga & Meditation session for the IITH folks with special focus on Relaxation, Knee and Leg health, Trunk health (Lower and (Upper portion), Neck, face and hands flexibility.



Campus Corner

Mar 2020

Green Day of the month@IIITH has been successfully concluded with plantation of about 90 tree saplings (Mango, Guava, Badam, Ficus, Jamaica Cherry, Sapota, Pomegranate, Sitaphal) along the periphery of the upcoming school building by faculty, staff & students of IIITH.



Mar 2020

'Ek Bharat Shreshtha Bharat Club' inaugurated at IIT Hyderabad to celebrate, promote and showcase campus diversity.



Mar 2020

To mark the closing ceremony of Cultural Exchange Programme of EBSB, IIIT Raichur celebrated Bathukamma with IIIT Sonepat followed by some Cultural Events, Prize Distribution and Food Festival.



SKIoT Tech develops low-cost device for power infra monitoring

MSOMASEKAR

Hyderabad, January 9

SKIoT Technologies, a start-up from the IIT Hyderabad, has developed a low-cost device that helps monitor and maintain power infrastructure, especially in large industries.

SKIoT Tech has tapped into the strengths of Internet of Things (IoT) and Data Analytics to support both invasive (that require cutting of wires) and non-invasive (device clamped across the supply wire) to come up with monitoring solutions.

Launched in 2017 by three PhD scholars from IIT Hyderabad - MPR Sai Kiran, Akshay Ramesh Jadhav, and Ramakrishna Bharath - the start-



The device helps detect faults in electrical lines and power equipment in real time

power equipment in real time, which can lead to energy savings and upkeep of infrastructure.

maintenance. The real-time monitoring offers many benefits such as detection of machine abnormalities, identifying unnecessary resource utilisation, and energy savings," Sai Kiran told Business-Line.

In comparison, existing methods use electric meters, which require cutting of wires. Further, physical inspection is necessary to get regular readings and to take action, he said.

The device has undergone testing in multiple companies such as NestAway, Zenith ESL, PeeVee Textiles and United Breweries and is ready for commercialisation, the promoters said.

The Hindu Business Line

Cancer: Combo therapy developed

DR. MURUGA KHANDALEL

Hyderabad, January 9

Researchers at the Indian Institute of Technology (IIT) Hyderabad have developed a combination of two drugs to treat cancer, which is a significant step towards curing the disease.

The researchers developed a scientific combination of two drugs, one of which is a targeted therapy and the other is a chemotherapy drug. The combination is expected to be effective in treating various types of cancer.

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Dr. Muruga Khandalel is an associate professor at IIT Hyderabad where she developed her research.

The researchers developed a scientific combination of two drugs, one of which is a targeted therapy and the other is a chemotherapy drug. The combination is expected to be effective in treating various types of cancer.

Telangana Today

IIT-H researchers find new molecule to help cure ALS

Gene Mutation Leads to Nerve Degeneration

By: Akshay Jadhav

Hyderabad, January 9

Hyderabad: Researchers from Indian Institute of Technology (IIT) Hyderabad have found a new molecule that could help in finding cure to Amyotrophic Lateral Sclerosis (ALS), a rare neurodegenerative disorder that cripples the functioning of body muscles. About a lakh cases of ALS are reported in India and it is gaining popularity worldwide as it has affected eminent scientists and authors like Stephen Hawking. During 2014, ALS became a hot topic thanks to "ice bucket" challenge in different parts of the world.

While Hawking overcame ALS through sheer determination and continued to pursue new theories for almost five decades, others affected by this genetic disorder remain paralysed for life.

There is no known cure for ALS and the latest finding of the IIT Hyderabad team co-



Stephen Hawking suffered with ALS for almost 50 years

UNDERSTANDING ALS

ALS, or amyotrophic lateral sclerosis, is a progressive neurodegenerative disease that affects nerve cells in the brain and the spinal cord.

SYMPTOMS

- Muscle weakness
- Atrophy
- Spasms throughout the body
- Trouble swallowing, or nasal breathing
- Slurred speech
- It has no known cure
- Around 1 lakh people are affected every year in India
- The disorder mainly affects people above 50 years of age
- Once diagnosed, patients live for around 2-4 years
- During 2014, ALS became a hot topic thanks to "ice bucket" challenge in different parts of the world



research was published in the recent issue of the leading scientific journal, International Journal of Biological Macromolecules. The research team included Dr. Prasad Kumar Patel, Dr. Sandeep Singh and Dr. Rajkumar Eswarappa.

Times of India

IIT-H aims to be in Top 400 global institutions

PHS HYDERABAD

Hyderabad, January 9

Indian Institute of Technology Hyderabad has set a target of generating Rs 200 crore per year for funding institute research by 2024. This is four times the current level of Rs 50 crore a year research funding, the institute said.

RS Murty, who took over as the director of IIT Hyderabad in August, unveiled IIT Hyderabad's Vision for 2024 on Thursday.

The new director is also keen to take to higher levels the national as well as global rankings of IIT-H. The Institute is also targeting breaking into the top 400 global institutions, from its current rank, which is between 600 and 800.

Prof RS Murty, who took over as the director of IIT-H on August 10, 2019, unveiled the IIT-H Vision for 2024 to the media on the campus on Thursday.



Other major highlights of the roadmap to vision 2024 include, enabling 40 companies at IIT-H Research Park from the current five companies. Increasing the start-ups incubated from the present number of 20 to more than 50. Doubling faculty strength of the Institute to 600 and increasing the student strength to 3,000 from the current level of 2,850.

Prof RS Murty said, "Since August 2019, IIT-H has entered into four MoUs with Japanese institutes and entered into five collaborations with Indian research centers, private companies and the state government."

He said, "The institute is also focused on strengthening industry connections through initiatives such as industry projects for M-Tech/PhD students, research fellowships, and industry internships."

Further, he said, "A research park and an incubation cell spanning 1.5 lakh square feet each are also coming up, which will be a major boost to start-ups and industry solutions. The Institute is also introducing an M-Tech in Healthcare."

The Institute is also planning to launch industry-supported M-Tech programmes in sectors such as e-waste management, cybersecurity and advanced manufacturing.

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Pioneer

EDUCATION

LATEST STAFF NEWS CAREER

Women In STEM: 5 IIT Researchers And Their Incredible Journey In Science

With more and more academic institutes opening their doors to women in the form of special schemes and reservations, more women have shown interest in STEM studies.

Dr. Muruga Khandalel, Associate Professor, Department of Materials Science and Metallurgical Engineering, IIT Hyderabad



Dr. Muruga Khandalel is an alumna of IIT Bombay where she completed her

NDTV.com

IIT-H startup among top five at BioAsia summit

75 startups from five countries were in the race

SPECIAL CORRESPONDENT HYDERABAD

A startup incubated at Indian Institute of Technology-Hyderabad (IIT-H) has made it to the top-5 list from among 75 startups from India, Switzerland, Germany, Australia and the UK that took part in a competition held as part of BioAsia 2020 in Hyderabad.

The 'Startup Stage' contestants were short-listed from over 350 applications on the basis of the innovativeness of their products or solutions, development stage and market readiness.

The startup in question - Heamac Healthcare, incubated at the IIT-H's Center for Healthcare Entrepreneurship (CHHE) - provides solution to neonatal jaundice management using an evolutionary phototherapy device called 'nLite360', which reduces by 70% the burden of the doctor struggling to treat every newborn with minimal resources available. It also reduces 35% of the total treatment time, say founders Prasad Muddam and Akitha Kolloju, who graduated from the unique one-year fellowship programme offered by the CHHE.



Heamac Healthcare team receiving the award during BioAsia 2020 in the city. BY ARRANGMENT

Kolloju credited the achievement to the biodesign fellowship program at CHHE, where she was trained to identify the need in this segment. Highlighting the role of CHHE in developing such a start-up, IIT-H director B.S. Murty said centre has been a cradle of biomedical innovations with special focus on creating social impact by addressing unmet medical needs of the rural population.

The Hindu



The latest from IITH

Indian Institute of Technology Hyderabad researchers have developed an essential-oil-based drug delivery systems to treat fungal infections without running the risk of inducing drug resistance. This medication can even counter fungi that have developed resistance to conventional antifungal drugs.

New Indian Express

All IITs Told to Give Plans for Combating Covid-19 in Two Days

HRD secretary asks institutes to draw up short and medium-term technology plans

Anubhuti Vishnoi
@timesgroup.com

New Delhi: India's leading institutions have proposed some technological solutions to the government to help combat Covid-19. On Monday, the human resource development (HRD) ministry also asked all Indian Institutes of Technology (IITs) to submit comprehensive plans within two days to help deal with the coronavirus outbreak.

In a videoconference held with directors of IITs on Monday, Amit Khare, secretary, HRD ministry, is learnt to have asked the institutes to draw up clear short-term and medium-term technology solution plans to combat Covid-19 and all

types of protective masks and face shields," Khare told ET. "IIT Delhi and IIT Guwahati are working on better quality personal protective equipment for doctors and attendants dealing with Covid-19 patients. While prototypes are ready in several cases, scaling up requires industry collaborations and funding. Many have proposed research on Covid-19 virus but samples are not made available yet and we hope to facilitate that."

Masks, protective gear and chamber ventilators are among the short-term proposals that could soon be implemented at scale. IIT Roorkee has developed a prototype

ON LARGE SCALE
Health min and Covid-19 Response Task Force to enable scaling-up of prototypes



INYAS gets new president

STATE BUREAU
Sangareddy

Chandrashekar Sharma, Associate Professor, Department of Chemical Engineering, has been elected as chairperson of Indian National Young Academy of Sciences (INYAS).

During the fifth annual general body meeting held in New Delhi on February 20 and 21, the INYAS members elected him as the third chairperson of INYAS. He had been a core committee member since February 2018. INYAS announced the election on Friday night. He will hold the post for next two years.

INYAS was founded in 2015 with an objective to support and guide young scientists in India in their research career by guiding them and helping them in



Chandrashekar Sharma

getting funds. It works closely with Global Young Academy. During the general body meeting, INYAS also inducted 20 new members taking the total number to 96. Of the 96, nine are from Hyderabad and four from IIT-H, including the chairman.

Prof Sharma thanked members of INYAS for keeping faith in him. He vowed to take INYAS to new heights by forming local chapters and connecting them with Indian National Science Academy.

Telangana Today

Socio-economic status decides on migration in Bihar, says IIT-H study

ENS @ Hyderabad

A study on migration of people from rural areas of Bihar to other states for work by an IIT Hyderabad researcher has revealed that social hierarchy in the State plays an important role in the migration destination and the kind of work a migrant undertakes.

The researcher reports that majority of the migrants, 78 per cent of the study sample, moved

to urban areas of the country. However, those who moved to urban areas were mostly from the upper echelons of the society, whereas, those from lower socio-economic classes moved to rural areas.

The researcher found that migrant workers who are higher placed in the socio-economic ladder, and more educated tend to step out of the village without having worked at all in the local rural economy. Whereas,

those placed at the bottom of the ladder predominantly undertake manual work and when they migrate, are more likely to move to other rural areas.

Titled 'Poverty Migration and Development in Rural Bihar,' the study was undertaken by Dr. Amrita Datta, assistant professor, development studies, department of Liberal Arts, IIT-H. This work has been done in collaboration with Institute for Human Development, New Delhi.

NIE

IIT-H researchers unravel working of protein that mends DNA

The Indian Institute of Technology Hyderabad (IIT-H) has unveiled the intricate working of a protein that repaired damaged DNA.

According to the IIT-H, any damage to DNA (deoxyribonucleic acid) can cause from sudden appearance of a hereditary disease, cancerous diseases

work, both as an academic exercise as well as the foundation for therapeutic interventions. DNA is a self-replicating material, which is present in nearly all living organisms as the main constituent of chromosomes, and is the carrier of genetic information. The DNA integrity is essential for proper function and survival.

work, Department of Biotechnology, IIT-H. The institute has discovered the mechanism by which these repair proteins assemble where DNA is under threat. The researchers studied the action of one specific protein, called alkB homolog-3 (ALKBH3).



The Sentinel

E-Summit 2020 in Hyderabad



A plethora of competitions, networking events, talks, and panel discussions focused on entrepreneurship are scheduled in the E-Summit 2020.

Talks and Panel Discussions

35+ Speakers across India take part in various panel discussions and talks

Competitions

- Pitch Storylines
- E-Pic
- Case Study
- Stock Trading Competition
- BotQuiz

Networking

- Chance to meet speakers/investors/mentors
- Workshops
- Android App Development
- Ethical Hacking
- Machine Learning
- Humamind Robotics

Hans India

IIT-H celebrates Alumni Day



During the annual IIT-H Alumni Day, the institute also announced the first set of Alumni Awards.

CITY BUREAU, HYDERABAD
Indian Institute of Technology, Hyderabad, celebrated its

2020 awarded 'Excellence in Academics'. Prof. B. Murthy, Director, IIT Hyderabad, awarded the award.

Founder and Executive Chairman, Cytel Ltd, said, "IITians are valued across the globe for their intellect and IIT Hyderabad alumni

exclusive mentoring session for the new students." He further added, "To increase the Alumni connect, IIT Hyderabad

Telangana Today

IITH's Bank of Knowledge



December 2019

Dr. Ambika S.: Assistant Professor, Department of Civil Engineering.

Dr Ambika has a PhD from IIT Madras and ME in Environmental Engineering from Anna University. She was the first woman to receive WARI fellowship during 2016 and did short-term research at the University of Nebraska, Lincoln, the USA for six months. Before joining at IIT Hyderabad, she has served as the faculty at the Department of Civil Engineering at NIT Warangal during April 2018-Dec 2019.

Life@IITH: I feel happy and proud to be a faculty at IIT Hyderabad. Thanks to my colleagues and an administrative section for their timely help in settling down with my family on campus. I'm exploring all the opportunities to be a better teacher, researcher and life-long learner.



January 2020

Dr. Saurabh Kumar Singh: Assistant Professor, Department of Chemistry.

Dr. Saurabh has done his M.Sc. (Chemistry) from C.S.J.M University, Kanpur, and PhD from Department of Chemistry IIT Bombay (2010-2016). He moved to the Department of Molecular Theory and Spectroscopy at Max-Planck Institute for Coal Research, Germany as a post-doctoral researcher for two years (2016-2018). Subsequently, Dr. Saurabh moved to the School of Chemistry, University of Minnesota, the USA where he stayed as a post-doctoral research associate (2018-2019). His research interest broadly lies in the area of applied computational chemistry with a particular emphasis on understanding the structure, bonding, reactivity, and spectroscopic properties of inorganic complexes/materials relevant for catalysis and new generation magnetic materials.

Life@IITH: It has been a fantastic experience! I feel honoured to be part of the IITH family. With great colleagues, a healthy research environment, and a vibrant campus, I look forward to contributing to the growth of the institute.



January 2020

Prof. Gabbita Durga Janaki Ram. Professor, Department of Materials Science & Metallurgical Engineering.

Prof. Janaki Ram received his masters and doctoral degrees in Metallurgical and Materials Engineering from IIT Madras. He served as a scientist in DRDO from Sept. 1998 to July 2005. After his post-doctoral work at Utah State University, he joined IIT Madras as an Assistant Professor in July 2008. He became an Associate Professor in July 2013 and a Professor in July 2019. During his tenure at IIT Madras, Dr. Janaki Ram has worked on several sponsored research and industrial consultancy projects and taught courses in the fields of materials joining and additive manufacturing. He has authored or coauthored more than 100 research papers in refereed journals till date.

Life@IITH: Campus life is good. Looking forward to exploring new opportunities here.

IITH's Bank of Knowledge



February 2020

Dr. Mayur Vaidya: Assistant Professor, Department of Materials Science & Metallurgical Engineering.

Dr. Mayur has worked as a post-doctoral researcher at the Institute of Materials Physics, University of Münster, Germany for 1.5 years and obtained his PhD from IIT Madras in 2017. He has received Bachelors and Master's (Dual degree program) from Department of MME, IIT Madras in 2010. After graduation, he has worked for two years in Research & Development group at ESSAR Steel, Hazira, Surat.

Life@IITH: I have just been here for a few months, and it already feels like home. All the colleagues have been warm and welcoming, and have ensured a smooth transition for me. The quality of accommodation is excellent, and it is amazing to see the Institute's support to ensure as much comfort as possible for its employees even in these difficult times. Looking forward to exciting research and teaching career at IITH.



February 2020

Dr. Mohd Suhail Rizvi: Assistant Professor, Department of Biomedical Engineering.

Dr. Suhail did PhD from the Department of Biological Sciences and Bioengineering at IIT Kanpur followed by work at Laboratory of Interdisciplinary Physics (LIPhy, CNRS) in France as a postdoctoral fellow and research engineer. Before Pursuing a PhD, he also had a brief experience as a business analyst at Global Analytics (now GAIN Credit), Chennai. He is primarily interested in understanding the role of physics, in particular mechanics, in the biological systems.

Life@IITH: In the recent past, despite my initial days at IITH coinciding with COVID-19 epidemic, my experience here has been great, especially the support from my departmental colleagues, people in the neighbouring offices, and administrative staff. I am extremely glad to be part of this wonderful place.



February 2020

Ms. Ankita Roy: Assistant Professor, Department of Design.

Ms. Ankita did her graduation from the prestigious National Institute of Design, Ahmedabad and Master of Design in Visual Communication from IDC, IIT Bombay including a brief stint as Research Assistant at Nanyang Technological University (Singapore). With a decade long professional experience as a Graphic Designer, Visualizer & UX-UI Designer, She has developed an interest in diverse research areas such as Typography & Ancient Scripts, Tessellations & Geometry, Kufic Calligraphy, Experiential & Multi-Sensory Design, Bio-mimicry, Art, Architecture, Culture & Design Pedagogy. Some of her research works that have been published include "Brahmi - Rediscovering the Lost Script" (2016) and "The Magic of Mandu" (2019).

Life@IITH: It is my privilege to be the part of the IITH fraternity with great minds and scholars around. Stepping into academia after a decade long experience in the industry is a fascinating transition with such welcoming and helpful colleagues, staffs and people around.



March 2020

Dr. Shelaka Gupta: Assistant Professor, Department of Chemical Engineering.

Dr. Shelaka did her PhD from IIT Delhi, Mtech from IIT Roorkee and BTech from DCRUST Murthal Haryana. She has worked in BITS Pilani as an Assistant Professor for six months before joining IIT Hyderabad

Life@IITH: IITH is a friendly institute which provides you with the best work environment to grow as a researcher as well as a teacher. Looking forward to a wonderful journey ahead at IITH!!

IITH's Bank of Knowledge



December 2018

Mr. Vijay Kumawat, Technical Superintendent, Department of Design.

Mr. Vijay holds a B.Des. Degree from National Institute of Fashion Technology, Himachal Pradesh. He has an 8 year experience from formula 1, Gujarat based Registered titles from Registrar of Newspapers in India, National Institute of Design (Gandhinagar and Bangalore R&D Campus) and Department of Design IIT Hyderabad. He is pursuing MA (Distance Learning) from Rajasthan University parallelly. Vijay had delivered many National and International Design solutions/designs for RNI based Titles, GMR, Formula 1 racing marshals, Dsource.in, Ekalpa-NID Bangalore, Archaeological Survey of India etc. Besides this he had documented 72 rare Indian Craft clusters from 14 different states.

Life@IITH: Wherever I go I seek learnings and experiments in interdisciplinary domains. IITH is a perfect place to connect my major future dots. This campus has different positive energy. Moreover, guidance from faculties are really impeccable.



December 2018

Mr. Vivekananda Chary, Junior Technician, Department of Design.

Mr. Vivekananda has a First Class, Diploma in Interior Design from Lakhota Institute, Hyderabad. He has a 10 year experience in innovative prototyping and designs. He had designed a wood plug making machine which is under patent process.

Life@IITH: This campus has so many supportive people and I like spending more time in Campus.



January 2019

Mr. V. S. P. Hanumantha Krishna: Assistant Registrar, Finance & Accounts. Mr. Krishna has completed CA final and also become FCA. He has done M. Com. from Osmania University. He has worked with B. Rama Rao & Co, Chartered Accountants Firm, in Hyderabad as Administrative, Accounts and Audit Manager, later he has worked in IIT Hyderabad as a Consultant (JICA).

Life @IITH: IITH gives you back what you give it to it.



January 2019

Mr. M. Venkatesh: Assistant Registrar, Academic Section. Mr. Venkatesh has Master of Computer Applications (MCA) and has worked as Section Officer as his last assignment with IIT Hyderabad.

Life @IITH: It's a great experience being part of IIT Hyderabad and I feel honoured to be associated with IIT Hyderabad.



January 2019

Mr. Laxman Srigiri: Assistant Registrar, Director's Office. Mr. Laxman has a total of 22 years of administrative experience at various levels and he is having a Master's in Personnel Management. Before joining IIT Hyderabad, he has served the Nation as 'Marine Commando' in the only elite marine Special Force of the Indian Navy for 15 years. During his tenure in Indian Navy as a Commando, he has participated in many Anti-Piracy operations such as Ops Rakshak, Swan, Vijay etc. and the most notable 'Ops Black Tornado'. He has also served as the instructor to Marine Commandos in NSWTC for 3 years and also worked as Section-in-charge of Special Ops Division of Head Quarters, Andaman and Nicobar Islands. Before joining to the recent position of Assistant Registrar, he has worked with IITH as Executive Assistant and promoted to Section Officer.

Life@IITH: I feel blessed to have an opportunity to work in this institute where transparency, integrity and fairness are valued, and hard work gets rewarded rightfully. A quiet and peaceful atmosphere of the institute and lovable nature of the IITH community makes me feel more connected to this institute. I stay on campus with my family and really enjoy it. I feel proud to be part of IIT Hyderabad.

IITH's Bank of Knowledge



January 2019

Mr. N. Srisailam: Assistant Registrar, Finance & Accounts. Mr. Srisailam holds an M. Com. from Osmania University, an MBA from IGNOU and PGDCA from APEL, He has started his career as Accounts Executive in NCL Industries Ltd (Nagarjuna Cements Limited), later joined Visaka Industries Ltd Assistant Accountant, Government Service i.e., ESIC, AP Region as LDC and got promoted as UDC. He has resigned to join IIT Hyderabad as Executive Assistant and got promoted as Section Officer in December 2017.

Life @IITH: IITH provides ample scope for Personal as well as Professional Development and I have personally experienced. Life is exciting at IITH.



January 2019

Mr. Md. Jameel: Assistant Registrar, Academic Section. Mr. Md. Jameel has completed his MA from Osmania University and Post Graduate Diploma in Personnel Management and Industrial Relations from Osmania University. Prior to Joining IITH, he worked with University of Hyderabad.

Life @IITH: It is great joining IITH and to be a member of the team.



January 2019

Mr. M. Phanindra Kumar: Assistant Registrar, Research and development.

Mr. Phanindra Kumar has done Graduation from Osmania University and Post Graduation from Pondicherry Central University. He has worked at UGC DAE CSR, Mumbai Centre for 11 years 3 months in various sections. He has overall 18 years of experience in various capacities including 7 years at years of experience at IITH before re-joining IITH as Assistant Registrar.

Life @IITH: Since, I have joined IIT Hyderabad I am and supporting all the staff and Faculty in smooth functioning of the activities of the institute. It has been an honour and valuable experience working at IIT Hyderabad. It is a dream come true to be a part of IIT Hyderabad fraternity.



January 2019

Ms. Debarpita Parira: Junior Assistant, Stores & Purchase.

Life @IITH: The best thing about being a part of IITH is the supportive and enthusiastic community. It's been a great learning opportunity to which I look forward everyday.



January 2019

Mr. A. Srinivas Rao: Executive Assistant, Department of Civil Engineering.

Life @IITH: I am very privileged to work in IIT Hyderabad as IIT Hyderabad is one among premier institutes and Institute of National importance contributing a lot to the development of Science & Technology and thereby the development in the growth of our country. In addition to my work, I am learning many things in the process of interacting with Faculty, Senior Staff etc. I am going through many innovations which are happening in our organization which is not possible to see if I work in some other organizations. I have observed mutual cooperation and simplicity in the working environment. I have also observed optimization, efficiency, planning in the Campus development

IITH's Bank of Knowledge



January 2019

Mr. T. Srinivas: Executive Assistant, Academic Section.

Life @IITH: I am proud to be an IIT Employee, working in a prestigious institute.



January 2019

Mr. Budeti Pradeep Babu: Executive Assistant, Academic Section.

Life @IITH: I feel great to work in IIT Hyderabad. IIT is my childhood dream to study but I didn't make it. Thank God now I got the chance to work in IIT



January 2019

Mr. Rajashekhar Soudhari: Executive Assistant, Academic Section.

Life @IITH: I, Rajashekhar Soudhari, am overwhelmed and excited to be part of the IITH family. I thank God for making me worthy enough to be associated with this esteemed institution of repute. For me, IIT Hyd is a temple of education. It enriched my education giving me an opportunity to exhibit my knowledge in the interest of the institute in general and the student community in particular. With the given work, I am able to learn deeper and deeper issues of students and ultimately bring them to a logical end. Let me use this platform to thank all the faculty and my colleagues who are always being supportive of me on many academic aspects. On the personal front, the whole Fraternity of IITH had stood by my side during the extreme crisis. I pray that everyone along with me unitedly strives hard to uphold the name of IIT Hyderabad and put it at the top of all IITs.



January 2019

Ms. Vijaya Lakshmi A.: Executive Assistant, Electrical Engineering.

Life @IITH: I am very blessed to be part of the world wide reputed organizations. I have worked hard for years to be part of it which is totally worth it. I am happy and really looking forward in to the future.



February 2019

Mr. K. Raguraman: Technical Superintendent, Computer Science and Engineering.

Life @IITH: This IIT Hyderabad campus life creates an engaging environment that inspires staff to realize their full potential through self-discovery, connection to community, meaningful work and a life of purpose. Away from the hustle bustle of the Hyderabad city, the IIT Hyderabad campus offers a peaceful and modern lifestyle to the faculty/staff and their families. We are enjoying summer, Monsoon and Winter at IIT Hyderabad. The sun rise and the sun set at IIT Hyderabad campus looks awesome. Actually JAPAN is known as "The land of the rising Sun", But I personally feel, "The land of the rising sun is IIT Hyderabad Campus". Totally we enjoyed the IIT Hyderabad Campus lifestyle.



February 2019

Mr. Bondla Jessy: Technical Superintendent, Computer Science and Engineering.

Life @IITH: Great place to work with. Excellent environment to learn and work on latest technologies. Lots to learn under the guidance of respective faculty-in-charges. Overall It's amazing place to learn and work with some of the brightest minds in the country.

IITH's Bank of Knowledge



February 2019

Mr. Imtiaz Ahmed: Technical Superintendent, Computer Science and Engineering.

Life @IITH: I have joined IITH as a system administrator (Project Associate), later got an opportunity of Technical Superintendent. I would like to thank faculty members of the Computer Center & CSE Dept for giving me this opportunity to work in this dynamic organization. IITH campus is a beautiful place to watch and stay. I always feel this place like my second home. In IITH, I've acquired many new skills and have grown greatly as an employee and person under Chair, Computer Center guidance. The faculty and staff team have always motivated me and pushed me to the limits so that the institute can see better days. Every single day, I learned new things from our technical experts & from extracurricular events such as sport that happens frequently in the institute. I am happy to be a part of the IITH community and wish to continue in the future.



February 2019

Mr. N. Shiva Kumar: Junior Assistant, Recruitment Section.

Life @IITH: Within the short span, I learned lot of new works related to Recruitment/ Administration etc.. It is an amazing place to learn and grow. The faculty members are very cooperative and colleagues are kind hearted and helpful.



February 2019

Ms. S. Hemalatha: Executive Assistant, Training & Placement cell.

Life @IITH: I feel privileged being a part of IITH family. IITH is a great place to learn new skills, grow in confidence and work together as a team in achieving the goals of the Institute. Co-workers are more like friends caring and supporting each other. I can say IITH is a family-like workplace always encouraging and motivating its staff.



February 2019

Mr. Ankamwar Satish: Executive Assistant, Guest House.

Life @IITH: I am continuously learning and trying to improve myself by proper planning. I am more efficient in my job now compared to when I started in IIT Hyderabad. My Supervisor (Guest House Faculty In charge) has a positive attitude and supports my efforts and has guided me in the functioning of Guest House in an effective manner.



February 2019

Mr. D. Sri Hari: Junior Assistant, Hostel office.

Life @IITH: It is my pleasure to working at IITH, one of the prestigious institution of India. Good friendly working environment and I get to learn a lot from here. I am very lucky to work here and very happy to be one of the part of prestigious institution.



February 2019

Mr. Nalla Srinivas: Executive Assistant, Administration Section.

Life @IITH: I feel very happy to share my voice about IITH, the institute with infinite opportunities. It is my second organization working with, as a staff member I would like to say, the office environment is simply superb. Working with Department faculty in academic activities is a new experience. The Head of the sections is very kind and helpful. It is a place where we have no doubt about our career growth.



February 2019

Mr. Vetrivel M.: Executive Assistant, Biomedical & Biotechnology.

Life @IITH: I am extremely proud and honoured to be a part of IIT Hyderabad.

IITH's Bank of Knowledge

**Mr. Kandhukuri Sandeep Kumar: Junior Technician,
Department of Civil Engineering.**

Life @IITH: I am glad to be a part of IIT-H fraternity. It is my pleasure to work for IIT Hyderabad and enhance my skills in a mutually beneficial way for the organization. I am having a keen interest in learning the equipment handling, Research & Development. The faculty members of the Department of Civil Engineering continuously renders their guidance & support in every aspect.

Mr. Syed Ali Sabeer: Deputy Registrar (In-Charge), Administration Section. Mr. Syed Ali Sabeer has an M.A. in Personnel Management & Industrial Relations. He had served in different capacities as an Administrative Officer in DRDO, as an Under Secretary in the Central Secretariat, as a Regional Passport Officer in the Ministry of External Affairs and as a Deputy Secretary in the Ministry of Finance before joining the IIT Hyderabad.

Life @IITH: It is a privilege to be working in an institution of national importance. Working at IITH has been very gratifying and yet challenging especially when the Institute is undergoing a transformation and striving hard to position itself on par with the first generation IITs. The dynamic leadership, the friendly faculty and the co-operative staff have, no doubt, made the IITH an amazing place to work in and enrich one's experience.

Mr. Viswanath B. J.: Junior Technician, Department of Civil Engineering.

Life @IITH: It has an environment which makes us work enthusiastically and learn new technical things. It also makes us proud to work with professors in such an elite institute which is contributing new things to society.

Mr. Kanchugantla Ramesh Yadav: Technical Superintendent, Physics.

Mr. Ramesh holds a Master's degree in Physics from Sri Venkateswara University. Before joining IITH, he has worked as Technical Assistant at Indian Institute of Science Education and Research(IISER), Tirupati(2015-2019).

Life @IITH: It has been quite pleasant. Thanks to IITH. The Department of Physics, IIT Hyderabad has equipped with the state-of-art research facilities so enabled me to get a wonderful experience. The department is very supportive and encouraging so I am confident that I can excel and contribute to the department significantly. I feel honoured to be a part of the great family of IIT Hyderabad.

**Mr. Yaseen Sherief Mohammed: Technical Superintendent,
Department of Civil Engineering.**

Mr. Yaseen has Master's in Structural Engineering & B. Tech in Civil Engineering. with 15 years of experience in the Quality Assurance/ Quality control in the Construction Industry.

Life @IITH: After joining IITH, I have been excited about learning in Research & Development in the Structural Engineering of the sophisticated lab equipment's. Faculty members of the structural engineering division continuously rendering guidance & support in every aspect. Very happy to note that I got a good opportunity to work in IITH. It is my pleasure work for IIT Hyderabad and enhances my skills in a mutually beneficial way for the organization.

IITH's Bank of Knowledge



March 2019

Mr. Naresh Kandrathi: Executive Assistant, Liberal Arts. Mr. Naresh has Masters in Business Administration along with Masters in Computer Applications from Osmania University. He has worked for six years as General Duty Assistant in IIM Indore.

Life@IITH: I have been working since one year at IIT Hyderabad and I got an opportunity to work with the Departments like Academic, Accounts, Admin and Stores and I learnt so many new things. I really love to work with people @ IITH and their friendly environment.



March 2019

Mr. Jagadeswara Rao B: Assistant Registrar, Stores & Purchase. Mr. Jagadeswara is an MBA and M. Com. He has worked as Executive Assistant (Fin & Admin) at National Fisheries Development Board, Dept of DAHD&F, Ministry of Agriculture, Hyderabad and as Assistant Director (Non-Tech) at Export Inspection Council of India, Ministry of Commerce & Industry, New Delhi before resuming his tenure at IITH.

Life@IITH: This is a wonderful place to be. I can say that there is always help at IITH for those who want it.



April 2019

Mr. Mahaboob Moonavath: Executive Assistant, Engineering Science, Physics and Mathematics. Mr. Mahaboob has worked at IIT Kharagpur as Junior Executive and Rajiv Gandhi University of Knowledge Technologies with overall eleven years of experience.

Life@IITH: With my past experience in educational institutions I am really enjoying working with IITH fraternity. I will contribute my part towards development of the Institute.



April 2019

Ms. Swapna S.: Multi Skill Assistant 1, Academic Section.

Life@IITH: I feel very proud to be working here. It is a good place to meet like minded people & learn & grow together.



April 2019

Mr. Chidruppa Thimothi: Multi Skill Assistant 1, Finance & Accounts.

Life@IITH: I am very happy to join this esteemed institute. before this, I was working in a very small private company. I hope for a bright future ahead. I'm ready to contribute my best for this institute. Currently, I am working in the accounts section since one year I learned a lot of work in this period my superiors are always encouraging and supporting me through this period. I was interested in programming and currently writing a small program for my section



April 2019

Dr. Raja Adharnath: Medical Officer I, Medical Clinic. Dr. Raja is an MBBS from Siddhart'ha Medical College, Vijayawada (Dr. NTR UHS) and AFIH from Regional Occupational Health Centre, ICMR, Bangalore (DGFASLI). His additional skills includes CCEBDM-Evidence based diabetes management, FCGP-Family medicine and Hospital management. He has experience of more than 12 years in managing OPD, Emergencies, In- Patients, Medico legal cases, Public Health project.

Life@IITH: I am passionate about my work, as I love what I do, I have a steady source of motivation that drives me to do my best. Looking for a challenging role to leverage my knowledge and experience.

IITH's Bank of Knowledge



April 2019

Mr. M. Sandeep: Multi Skill Assistant 1, Administration Section.

Life@IITH: It's my pleasure to work in one of the second generation IITs established by the government of India. All the staff members in admin have offered me great support and motivated me at all the times. Because of their support I could handle various types of tasks in the section. Thank you for giving me this opportunity.



April 2019

Mr. P. Purushotham: Security Officer, Security. Mr. Purushotham has served in Indian Coast Guard for 15 years in various capacities all over India both afloat and ashore. Specialised Logistics Management. Possess vast administrative and security related experience. Retired after the last stint of three years as Deputy Director (Administration) at Coast Guard Head Quarters, New Delhi. Commandant.

Life@IITH: I found IITH very vibrant and Dynamic in all aspects of the Institute. The work culture is highly conducive. The task of security is demanding and dynamic due to construction work and as it is a happening campus with various activities of students, visiting dignitaries of high profile. Altogether a great learning experience always. Looking forward to contributing the best possible.



May 2019

Mr. Jitendriya Raul: Technical Superintendent, Department of Civil Engineering.

Life@IITH: Being a beginner in Indian Institute of Technology Hyderabad family for one year, I use my sole potential of past experience which is packed with a decade of making various National Highways projects across the country and half a decade in other IIT. Department of Civil Engineering, IIT Hyderabad, laboratories are well equipped with highly sophisticated equipment. It enables researchers to go through the megascopic and microscopic analysis of any subject. It is always supported by well experienced technical staff and highly knowledge faculties. We are in a process to make virtual experiments to facilitate students. It will be helpful to continue their studies in this COVID-19 pandemic situation. I am happily enjoying my responsibilities which have sharpened my skills and leading towards a rewarding career.



May 2019

Ms. Doddi Chanchala Devi: Deputy Registrar, Academic Section.

Ms. Chanchala Devi, a double masters in English Literature and Sociology, she is presently pursuing her PhD in Development Studies at The Centre for Economic and Social Studies, Hyderabad. A State Service Officer before joining IITH, her recent stints include - Registrar, National Institute for Plant Health Management and Deputy Director, Department of Tribal Welfare, Governments of Telangana and Andhra Pradesh

Life@IITH: The last one year has been a breeze. Looking forward to learn and contribute in this premier institution.



June 2019

Mr. M. Srinivas: Junior Technician, Central workshop.

Life@IITH: I work at Makers Space which is central workshop and take pleasure in shaping those ideas into reality. Here, we get lot of freedom to try out many of our own ideas which results in self development. My family is very happy to reside in staff towers where we wake up everyday to beautiful scenic view.

IITH's Bank of Knowledge



June 2019

Mr. Lohakare Pramod Maroti: Junior Technician, Central workshop.

Life@IITH: Central Workshop is lively place to work, where we get lot of freedom to try out many of our own ideas which results in self development. Me and my family are happy to reside in staff towers where we wake up everyday to beautiful scenic view.



June 2019

Mr. Lingamaiah B.: Junior Technician, Central workshop.

Life@IITH: I work at Makers Space which is central workshop. Central Workshop is creators' space where many students and faculty come with amusing ideas and I take pleasure in shaping those ideas into reality. Central Workshop is lively place to work, where we get lot of freedom to try out many of our own ideas which results in self development.



June 2019

Ms. Rongala Lakshmi Prasanna: Section Officer, Chemistry. Ms. Prasanna did her Masters in Computers from JNTUK. She has worked at Dredging Corporation of India (PSU) for 6 years at Vizag.

Life@IITH: When I stepped at IITH, I felt great. It's a pleasure for me to work in this institute and to be a part of IITH family. All the faculty and the staff are very cooperative and supportive. The campus is awesome. Looking forward to contribute my best towards the growth of the institute.



August 2019

Cdr. Alex Lilly Mary: Deputy Registrar, Hostel office. Cdr Lilly Mary (Retd), Indian Navy has spent 14years as a Short service commission officer. Her skill sets are Logistics management and Recruitment.

Life@IITH: In the last 10 months at IIT Hyderabad, I have realised that there is so much potential and it is the fastest growing IIT. There is a great deal of flexibility in the work culture which is the driving factor. For students, there is a huge scope for personal development at IITH.



October 2019

Ms. Melody R. C.: Junior Technician, Chemistry.

Life@IITH: I have obtained my Masters in Organic Chemistry from Kakatyia University, Master of Arts in English Literature and Bachelor of Education from Osmania University. Incredibly privileged to be a part of esteemed organization IITH where in my career, a total move happened from Teaching field to Technical one. Faculty and staff are cooperative and guided me in this new learning environment



October 2019

Mr. Saransh Khandelwal: Technical Superintendent, Biomedical Engineering.

Mr. Saransh did his MTech in Advanced Instrumentation Engineering from CSIO, Chandigarh. His area of research interests includes Biomedical Instrumentation, Non-Invasive disease diagnosis. He has worked as a Deputy Manager (Biomedical) at HLL Infratech Services Limited (A Government of India Enterprise) for two years, and as a Trainee Scientist (Biomedical Instrumentation Division) at CSIR-Central Scientific Instruments Organisation, Chandigarh for four years.

Life@IITH: Working at IITH has been a pleasing experience as it allows me to grow and enhance my learning each and every day. The campus is lovely and best in the second generation list of IITs.

IITH's Bank of Knowledge



October 2019

Mr. Krushna Chandra Hembram: Technical Superintendent, Biomedical Engineering.

Mr. Krushna has completed his PhD (Biotechnology) in cancer biology from KIIT Bhubaneswar. He has worked in CSIR-IMTECH, Chandigarh as a Senior Research Fellow for 3 years in the area of protein chemistry and molecular biology.

Life@IITH: It is a great honour for me to be a part of IIT Hyderabad. All the faculties and staffs of the department are supportive and provides a healthy environment to work and excel. It's been a wonderful experience working here.



October 2019

Mr. P. Subbash: Technical Superintendent, Biomedical Engineering.

Mr. Subbash has done his BTech in Electronics and Instrumentation from Pondicherry Engineering College. He worked as Instrumentation Engineer for 2 years in MRF Tyres Pvt Ltd. Then he worked as Electronic Assistant in JIPMER hospital in Pondicherry for a period of 5 years.

Life@IITH: Its great experience to work in IITH. The vast research facilities, highly experienced faculties and colleagues made the IITH life. A cheerful environment for me to learn and explore new horizons in field of Biomedical Engineering.

Wall of Fame



PhD Research Scholars Mr. Veerababu and Mr. Siva Teja, #Acoustics Lab, have been selected for the prestigious student Fellowship of Committee International Research and Education (CIRE) of the Acoustical Society of America (ASA)



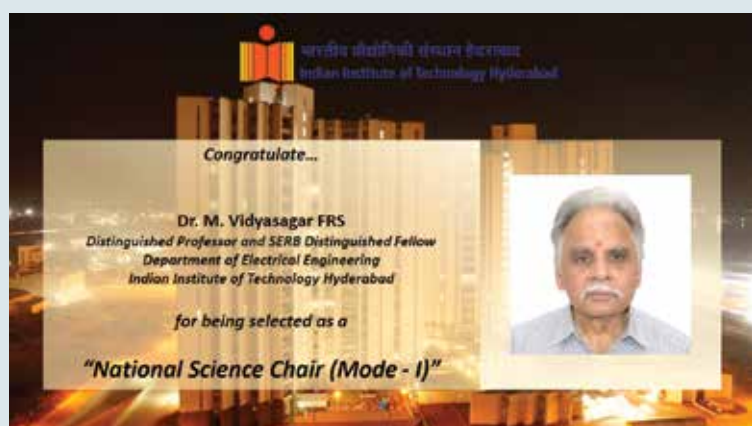
PhD Student Mr. Kaushal Kumar Maurya receives 2020 Suzuki Foundation Scholarship Grant. The grant is offered by Suzuki Foundation following a selection process. He is working under Dr. Maunendra Sankar Desarkar in the Dept of CSE



Mr. Sai Kumar Gobilla, PhD Scholar at Department of Chemistry, won 1st Prize in "Best Poster Award Category" (Awarded by ACS) in the CRSI conference at VIT - Vellore



Dr. Chandra Shekhar Sharma, Associate Professor, Dept of Chem. Engg. for being elected as Chairperson of Indian National Young Academy of Sciences (INIAS) for a period of two years.



Dr. M. Vidyasagar FRS, Distinguished Prof., Dept of Elec. Engg. & AI has been selected as an inaugural National Science Chair(NSC).



Dr Chandra Shekhar Sharma, Assoc. Prof., Dept of Chem. Engg. Has been selected for the prestigious membership of Global Young Academy, headquartered in Germany for 5 years starting from June 2020



Please send
your suggestions to:

Designed at **DOD-IITH**

Public Relations Officer

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