Inventing and Innovating in Technology for Humanity

Annual Report 2019-20

A night-view of Academic Block-B

भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

INDIAN INSTITUTE OF TECHNOLOGY
HYDERABAD

Moments of Melody at IITH

Photograph Courtesy — Department of Design (DoD)

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EDUCATION IS THE MOST POWERFUL WEAPON WHICH YOU CAN USE TO CHANGE THE WORLD."
– Nelson Mandela

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A GOOD EDUCATION IS THE FOUNDATION FOR A BETTER FUTURE."
– *Elizabeth Warren*

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> **YOU MUST DO THE THINGS YOU THINK YOU CANNOT DO."**
> *– Eleanor Roosevelt*

• IITH Vision 2024...

The secret of sustaining its position among premier institute is its thrust for applied research and focus on innovation.

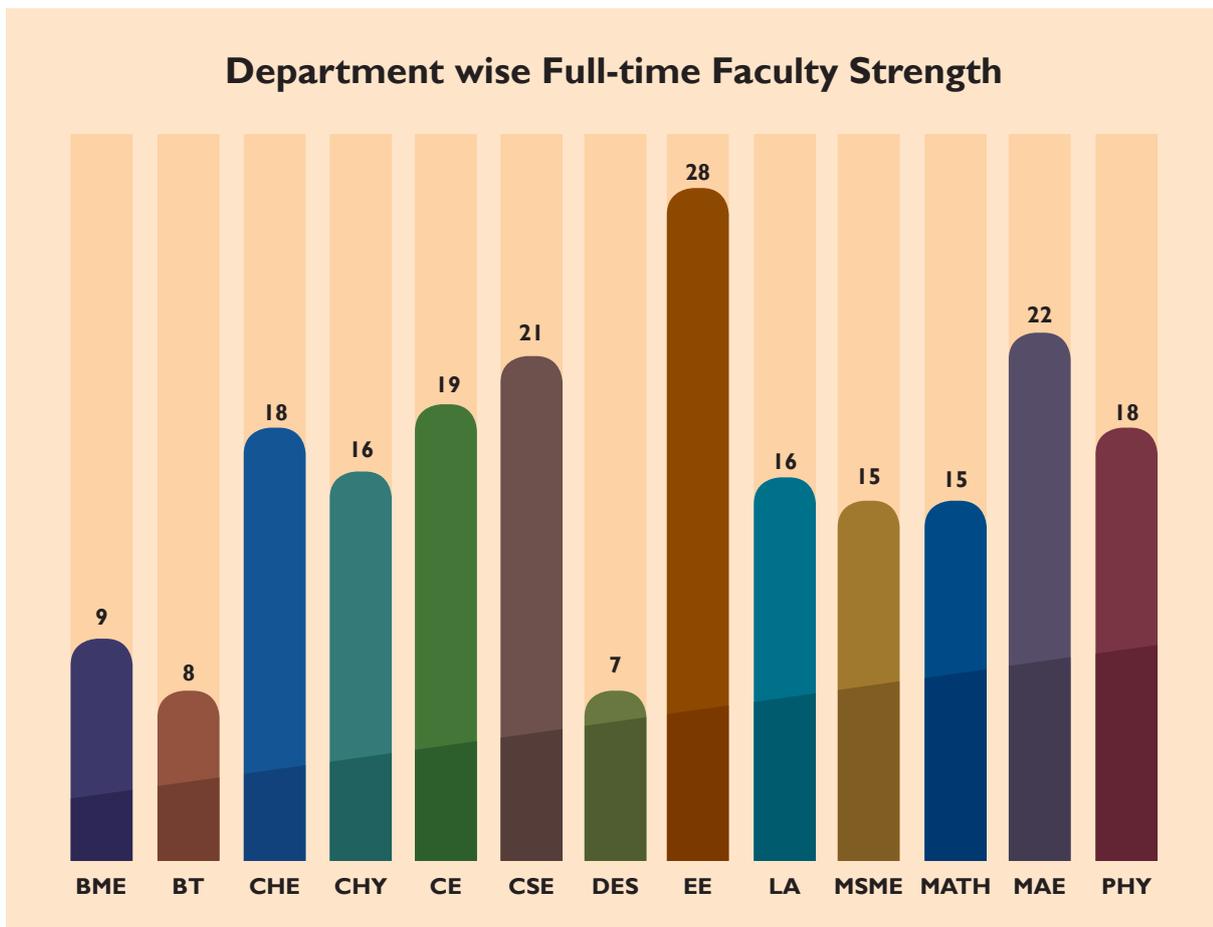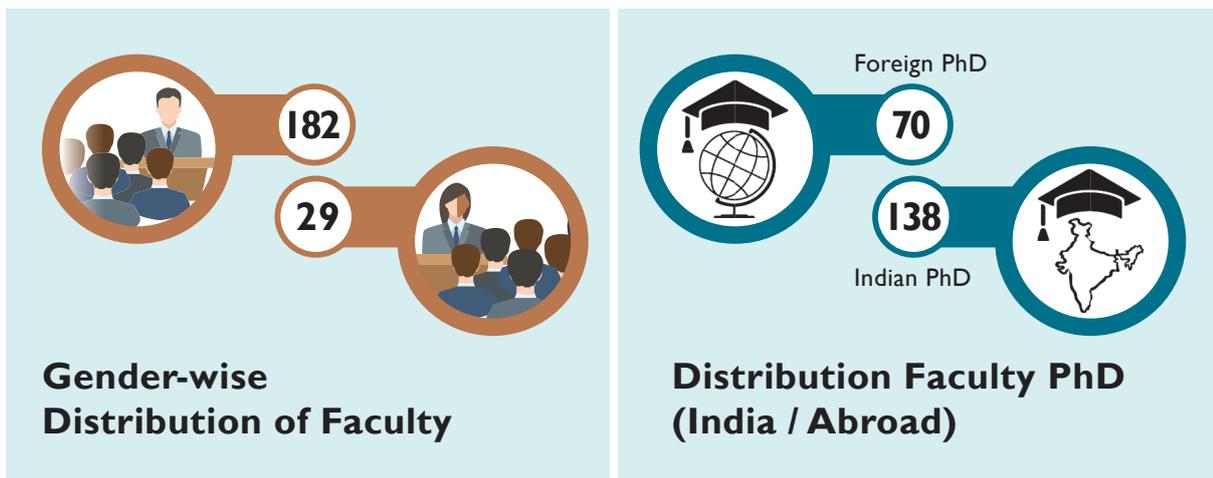IIT Hyderabad (IITH) has made its mark in 2020 as Top 10 technical institute in the country, and it is all because of the strong foundation laid a decade before. The secret of sustaining its position among premier institute is in its thrust for applied research and focus on innovation.

Now the task is to deduce a road map to move ahead to become a dream destination for intellectual faculty, best researchers and top ranked students.

IITH's Vision 2024 outlines the action plan to achieve the above mentioned goal which includes new industry-oriented masters programs, strong collaborative projects with industry, joint doctoral programs with global universities, bringing experts and students from other parts of the globe through exchange programs, industry lectures, industry defined MTech projects, semester-long internships for BTechs and programs in Entrepreneurship.

2019-2020 was a great year, IITH has strong liasoning with laboratories, industry and universities abroad with many known names like CMET, OPPO, IBM, NIED Japan, Shizuoka University, Saitama University and NIMS Japan.

The outbreak of COVID-19 at the beginning of 2020 has shaken everybody worldwide. Amid this situation too, IITH has found the opportunity to excel utilising its core strength of being an IIT with a motto of Invent and Innovate through Technology. IITHians have adapted to this new normal with on-line classes, continuous evaluation, webinars even e-farewell to the graduating batch.

I am sure we will overcome this situation and define a new way of healthy living.

Stay safe and stay connected…

Prof BS Murty

Faculty Statistics

As on 31 March 2020, IITH is having 211 faculty members on its roll. ~14% of the total faculty are women. ~35% of the faculty members obtained their PhD from universities abroad.
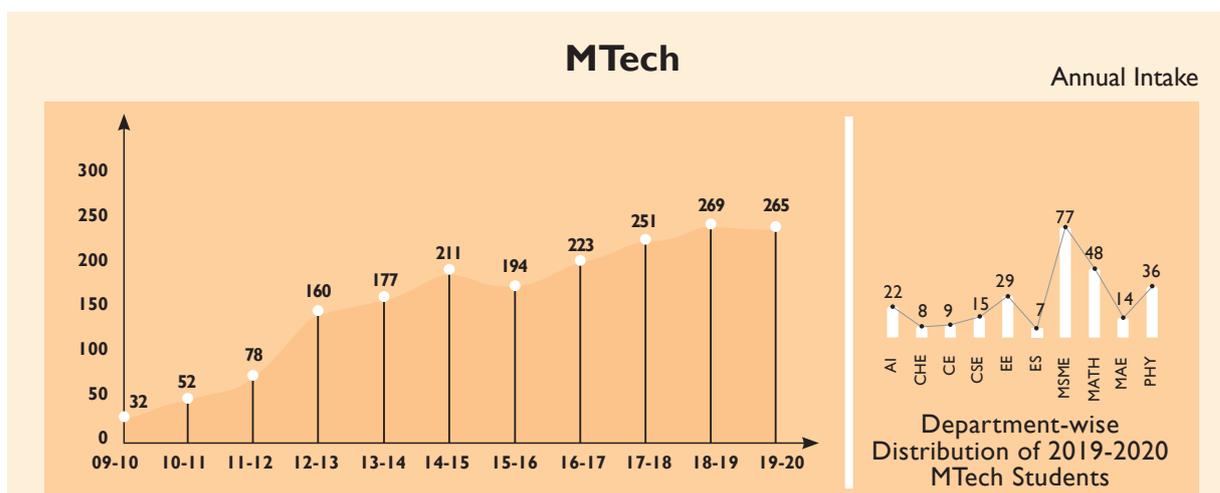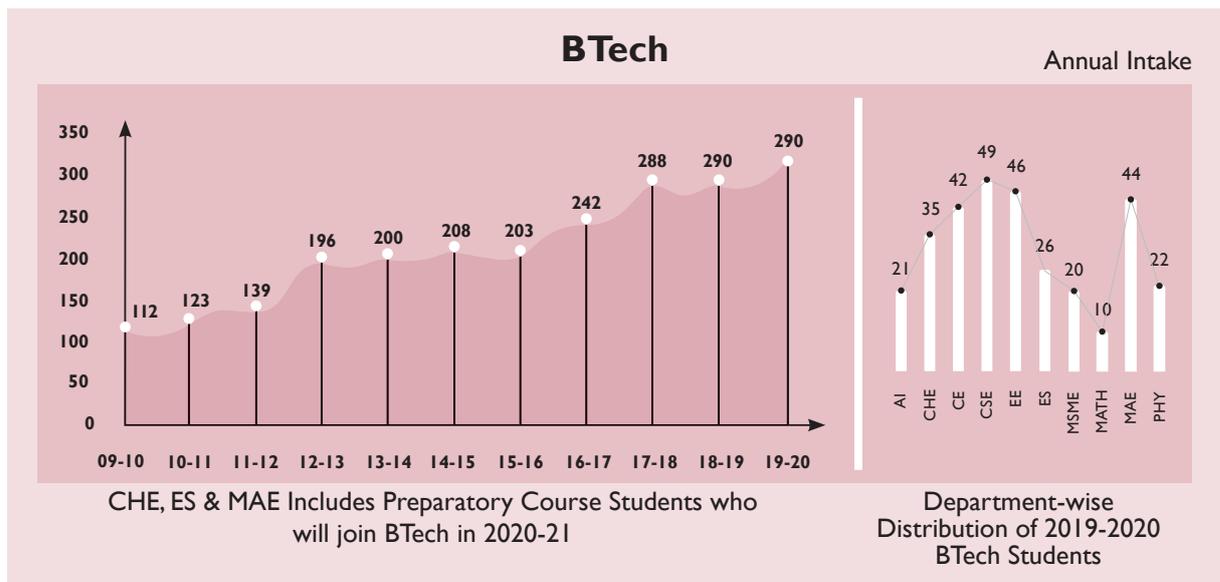
182

29

Gender-wise Distribution of Faculty

Foreign PhD

70

138

Indian PhD

Distribution Faculty PhD (India / Abroad)

Department wise Full-time Faculty Strength

BME	BT	CHE	CHY	CE	CSE	DES	EE	LA	MSME	MATH	MAE	PHY
9	8	18	16	19	21	7	28	16	15	15	22	18

Students Statistics •

IIT Hyderabad has seen a major surge in the BTech admission with an increase of ~9% in the year 2019-2020. IITH has started a new program BTech in Artificial Intelligence in year 2019-2020 which had an intake of 21 students in very first year. Similarly, BDes & MA programs newly started in 2019 had admitted 10 Students under each course.

The Annual intake for various courses has been summarized as under.

BTech

Annual Intake

BTech yearly intake: 09-10: 112; 10-11: 123; 11-12: 139; 12-13: 196; 13-14: 200; 14-15: 208; 15-16: 203; 16-17: 242; 17-18: 288; 18-19: 290; 19-20: 290

Department-wise intake: AI: 21; CHE: 35; CE: 42; CSE: 49; EE: 46; ES: 26; MSME: 20; MATH: 10; MAE: 44; PHY: 22

CHE, ES & MAE Includes Preparatory Course Students who will join BTech in 2020-21

Department-wise Distribution of 2019-2020 BTech Students

MTech

Annual Intake

MTech yearly intake: 09-10: 32; 10-11: 52; 11-12: 78; 12-13: 160; 13-14: 177; 14-15: 211; 15-16: 194; 16-17: 223; 17-18: 251; 18-19: 269; 19-20: 265

Department-wise intake: AI: 22; CHE: 8; CE: 9; CSE: 15; EE: 29; ES: 7; MSME: 77; MATH: 48; MAE: 14; PHY: 36

Department-wise Distribution of 2019-2020 MTech Students

- Artificial Intelligence (AI)
- Biomedical Engineering (BME)
- Biotechnology (BT)
- Chemical Engineering (CHE)
- Chemistry (CHY)
- Civil Engineering (CE)
- Climate Change (CC)
- Computer Science & Engineering (CSE)
- Design (DES)
- Electrical Engineering (EE)
- Engineering Science (ES)
- Liberal Arts (LA)
- Materials Science & Metallurgical Engineering (MSME)
- Mathematics (MATH)
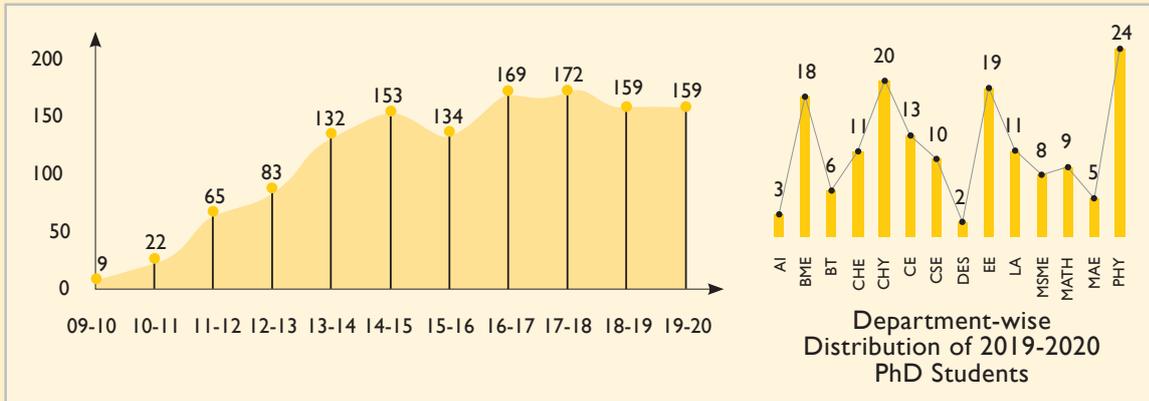- Mechanical & Aerospace Engineering (MAE)
- Physics (PHY)

EDUCATION IS THE PASSPORT TO THE FUTURE, FOR TOMORROW BELONGS TO THOSE WHO PREPARE FOR IT TODAY."
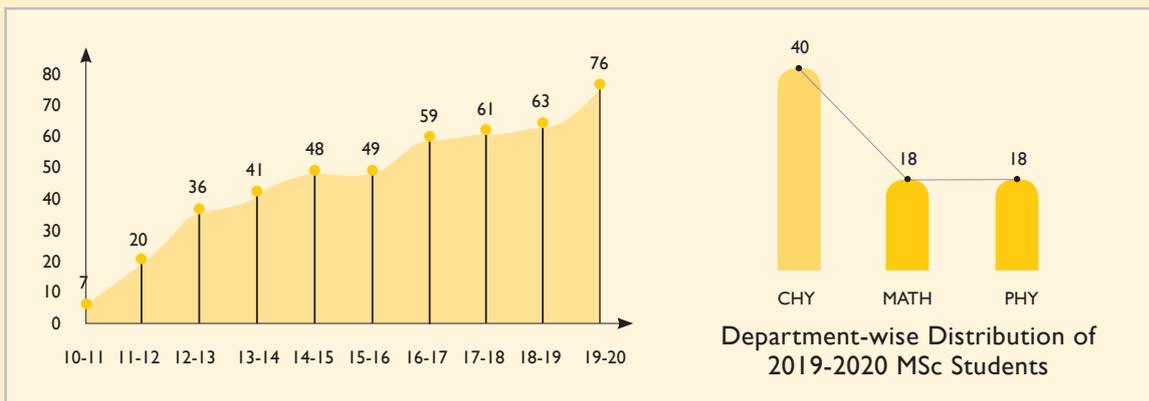*– Malcolm X*
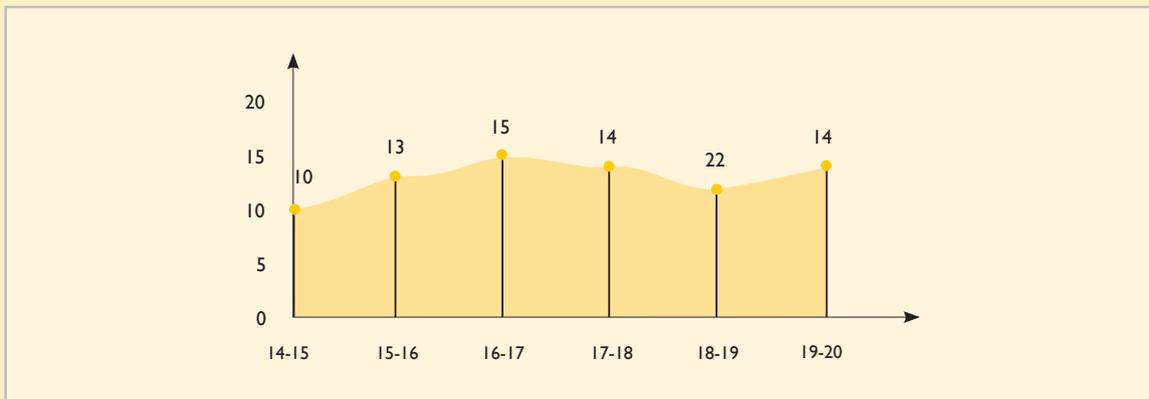
• Academics

PhD

PhD Annual Intake line graph:
- 09-10: 9
- 10-11: 22
- 11-12: 65
- 12-13: 83
- 13-14: 132
- 14-15: 153
- 15-16: 134
- 16-17: 169
- 17-18: 172
- 18-19: 159
- 19-20: 159

Department-wise Distribution of 2019-2020 PhD Students:
- AI: 3
- BME: 18
- BT: 6
- CHE: 11
- CHY: 20
- CE: 13
- CSE: 10
- DES: 2
- EE: 19
- LA: 11
- MSME: 8
- MATH: 9
- MAE: 5
- PHY: 24

MSc

Annual Intake

MSc Annual Intake line graph:
- 10-11: 7
- 11-12: 20
- 12-13: 36
- 13-14: 41
- 14-15: 48
- 15-16: 49
- 16-17: 59
- 17-18: 61
- 18-19: 63
- 19-20: 76

Department-wise Distribution of 2019-2020 MSc Students:
- CHY: 40
- MATH: 18
- PHY: 18

MDes

Annual Intake

MDes Annual Intake line graph:
- 14-15: 10
- 15-16: 13
- 16-17: 15
- 17-18: 14
- 18-19: 22
- 19-20: 14

**THE DIFFERENCE BETWEEN TRY AND TRIUMPH IS A LITTLE UMPH."**
*– Marvin Phillips*

Research & Development •

The vibrant research culture in IITH is evident from the large number of publications and the sponsored projects. In the financial year 2019-20 IITH had secured more than 100 sponsored projects from national funding agencies and private companies. The trend in the number and quantum of sponsored projects in IITH over the past is shown in the charts below.

Dynamic and enthusiastic faculty and students at IITH were involved in various projects centred on critical research 'Thrust Areas'. These 'Thrust Areas' include 5G & Next-Gen Communication Technologies, Additive Manufacturing, Artificial Intelligence, Bio-inspired Processes & Systems, Catalysis, Climate Change, Energy, Healthcare, Integrated Computational Engineering, Nano-X, and Sensors & Devices.

Research Projects
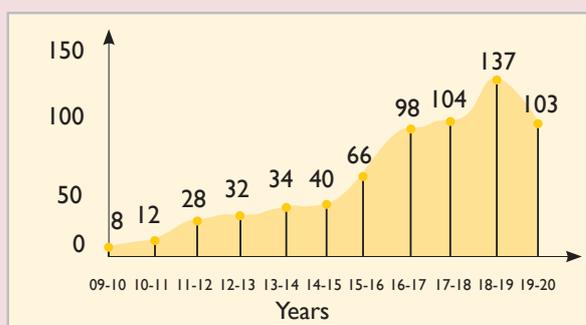
No. of Sponsored Research Projects Approved in each Financial Year
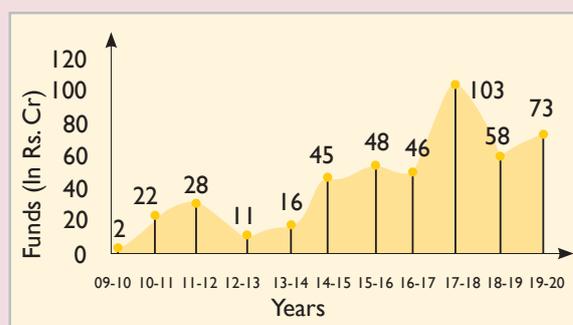
Funding from Sponsored Research Projects in each Financial Year

Consultancy Projects

No. of Consultancy Research Projects Approved in each Financial Year

Funding from Consultancy Research Projects in each Financial Year

> **ANYONE WHO HAS NEVER MADE A MISTAKE HAS NEVER TRIED ANYTHING NEW."**
> *– Albert Einstein*

Patents, Publications & PhD

Patents, Publications & PhD of any institute reflect it's research strength. A summary of these research outputs is captured here.
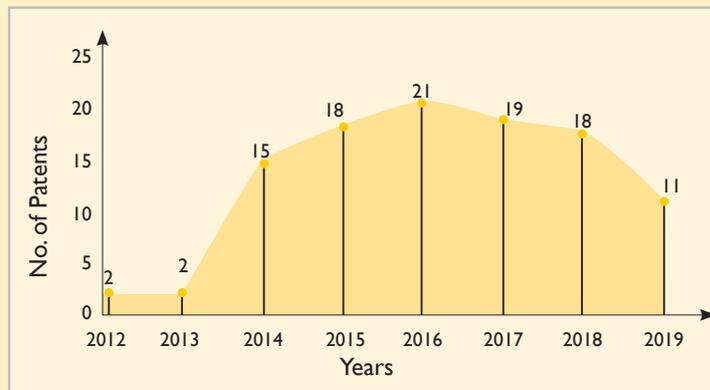
PhD (Awarded) over Years

Publications over Years

Patents over Years

Placement & Internship •

Placements

Placements at Indian Institute of Technology Hyderabad for the academic year 2019-2020 has received **293** for **479** registered students. More than 252 companies have registered for the placement process, out of which around 115 plus companies have completed the placement process till date.

The top paying companies are TSMC, Microsoft, Richtek, Denso and DE Shaw. The highest salary offered for this year is ₹**60 LPA** and the average salary is ₹**22 LPA.** There were **38** international offers.

A good number of students from UG, PG and MSc opted for higher education in India and abroad. Mentioned below are the few Universities opted by students for higher education:

- University of Tokyo
- University of Minnesota
- University of Texas, USA
- Carnegie Mellon University
- Nagoya University, Japan
- KTH, Sweden
- Tohoku University, Japan
- New York University
- Purdue University, USA

- Hokkaido University, Japan
- Yokohama National University
- University of California
- University of Massachusetts
- Columbia University
- National University of Singapore
- University of Florida
- University Della Svizzera Italiana
- University of Dallas

- George Washington University
- University of Maryland
- University of Cincinnati
- University of Illinois
- Ohio State University
- Keio University

Summary Internships

Summer Internships

At IIT Hyderabad 3rd year BTech students participated actively in the summer internship program during May to July 2019-20 to a maximum of 8 weeks, which includes both Industrial & Research oriented opportunities for students, the following are the companies registered for 2019-20 internship process. Total 50 companies has made 157 Internships offers out of which 14 are international internship offers.

- Arcesium
- Arista Networks
- Boston Scientific
- Cisco
- DE Shaw
- EA Games
- EdGE Networks
- Egnify Technologies
- Goldman Sachs

- Greatfour Systems
- InvestoSure
- Mathworks
- Mentor Graphics
- Microsoft
- Murata Electronics
- My-healthconnect
- No Broker
- Philips

- Pulse Secure
- Qualcomm
- Schlumberger
- Smarton India
- SMS DataTech Co.
- Swiggy
- TCS
- TRDCC
- XYZ Innovations

THE TRUE PURPOSE OF EDUCATION IS TO MAKE MINDS NOT CAREERS."
– William Deresiewicz

• TEQIP-KITE Centre @ IIT Hyderabad

Technical Education Quality Improvement Programme (TEQIP) was envisaged in 2003 by Government of India and The World Bank as a long-term Programme of about 10-12 years duration to be implemented in 3 phases for transformation of the Technical Education System. KITE Center (Knowledge Incubation in Technical Education) was created at IIT Hyderabad in 2013, to scale-up and support the ongoing efforts of the Government of India to improve quality of Technical Education and enhance existing capacities of the colleges and institutions (non-IITs) across India to become quality conscious, efficient and forward-looking, responsive to rapid economic and technological developments occurring at the National and International levels. On 26th May, 2016, Dr Suhash Ranjan Dey is appointed as TEQIP-KITE Coordinator, IIT Hyderabad. TEQIP-II activities mainly consist of Faculty Trainings through various Workshops / Short Courses / Conclaves which were carried out by IIT Hyderabad Faculty. TEQIP-KITE Center of IIT Hyderabad received total funding of around 2.85 crores for TEQIP-II activities. Among all the participating IITs, TEQIP-KITE Center of IIT Hyderabad is proud of attaining the maximum number of Faculty Training Days (1,296 Days through 24 Workshops) and a decent 1,638 Student Training Days under TEQIP-II Program.

Afresh, with the joint efforts between the Government of India and The World Bank, the third phase of Technical Education Programme (referred to as TEQIP-III) is started in 2017 for three years. As per MHRD-NPIU's statement, TEQIP-III is fully integrated with the twelfth five-year plan objectives for Technical Education as a key component for improving the quality of Engineering Education in existing institutions (around 200) with the Special Category Status (SCS) and support to strengthen few affiliated technical universities to improve their policy, academic and management practices. The major objectives of TEQIP-III are to increase in student participation in technical examinations, to increase enrolment of students from the traditionally disadvantaged group like SC / ST and Women, to increase in the number of Trained Faculty, to increase in the percentage of NBA accredited UG & PG programs and to gain UGC autonomous status.

Participants of a Faculty Development Program (Faculty: Dr Suhash R Dey) at IIT Hyderabad.

DREAMS COME A SIZE BIG SO THAT WE CAN GROW INTO THEM."
– Josie Bisset

TEQIP-III through IITs, commits for a combined Students, Staffs, Faculty and Institutes development in Engineering Education through a gamut of activities like Workshops, Joint Research Projects, Internships, GATE sensitization for the Engineering Students and Lab Development through staff trainings, minor civil works and purchase of equipment, furniture, books and software. Hand holding of the Institutes with dire need of support is performed by tying them with IITs for mentoring.

For this, IIT Hyderabad has made a Twinning Agreement with Atal Bihari Vajpayee Government Institute of Engineering & Technology (ABVGIET), Shimla. Under the guidance of Dr G V V Sharma, our Staff Mr R Thirumurugan and our Students have actively participated in imparting training and knowledge to ABVGIET, Shimla Students, Staffs and Faculty.

IIT Hyderabad Faculty taking Subject Domain TEQIP Workshops (a) at ABVGIET Shimla under the Twinning Agreement (Faculty: Dr G V Sharma) and (b) at IIT Hyderabad (Faculty: Dr Priyotosh Bandyopadhyay).

Additionally, under NASSCOM initiative of creating Trained Faculty in emerging technologies for TEQIP-III beneficiary institutes, IIT Hyderabad is chosen for training Block chain through Dr Sathya Peri as Coordinator. Similarly, Dr Prasad Onkar is equally Coordinating in training 3D Printing with IIT Delhi and IIT Guwahati Faculty. Till now, TEQIP-KITE Center of IIT Hyderabad has received a funding of around INR 3.39 crores for TEQIP-III. Currently, TEQIP-KITE Center of IIT Hyderabad under TEQIP-III has successfully conducted 3 Faculty Development Programs, 18 Workshops, 3 Faculty & Student Internship Programs and 1 GATE Sensitization program and performed a total of 6,737 Student Training Days and 11,306 Faculty Training Days. Almost all workshops garnered encouraging feedbacks from the participants. Now, IIT Hyderabad is looking forward to a successful culmination of TEQIP-III program by providing its maximum possible output.

IITH TEQIP Coordinator (Dr Suhash R Dey) presenting a Momento to Prof P M Khodke (NPIU-MHRD Advisor) after delivering a lecture at IIT Hyderabad.

IF THE ONLY TOOL YOU HAVE IS A HAMMER, YOU TEND TO SEE EVERY PROBLEM AS A NAIL."
– Abraham Maslow

• TEQIP (2019-2020)

Workshop

S. No.	Course / Workshop	Program held on	Course Coordinator Name
1	Faculty Training Program on Advanced Pedagogies	13 May - 14 June 2019	Dr Suhash Ranjan Dey
2	Advanced Materials Characterization Techniques	27 Aug - 01 Sep 2019	Dr Sai Rama Krishna Malladi, Dr Chandrasekhar Murapaka
3	Concepts & Applications of the FEM	02-07 Sep 2019	Dr Viswanath Chinthapenta
4	Quant OEM: Quantum Mechanics in Optical & Electron	14-19 Oct 2019	Dr Priyotosh Bandyopadhyay
5	Advanced Functional Analysis & its Applications	25-29 Nov 2019	Dr Tanmoy Paul
6	Energy Conversion & Storage	02-07 Dec 2019	Prof Vinod Janardhanan Dr Meduri Praveen
7	3D Bioprinting & Biofabrication Technologies & their Applications	09-14 Dec 2019	Dr Falguni Pati
8	Block Chain Technology	16-20 Dec 2019	Dr Sathya Peri
9	IoT through Single Board Computer @ ABVGIET, Shimla	24-28 Feb 2020	Dr GVV Sharma
10	Admin & Lab Integration Management @ ABVGIET, Shimla	25-26 Feb 2020	Mr Thirumurugan R
11	GATE Sensitization & Orientation @ ABVGIET, Shimla	24-28 Feb 2020	Dr GVV Sharma

TEQIP (2019-2020)

Internship

S. No.	Program	Program held on	No. of Participants
1	Faculty Visits	15 May - 20 July 2019	10
2	Student Internship	01-30 June 2019	73

A Subject Domain TEQIP Workshop (Faculty: Dr Tanmoy Paul) at IIT Hyderabad.

• GIAN Courses (2019-2020)

IIT Hyderabad has been participating actively in various outreach programs. Total four GIAN courses were conducted at IIT Hyderabad in the academic year 2019-20. These were a part of sixteen courses conducted at IIT Hyderabad in GIAN phase II. Total ₹27.2 lakh were allocated for GIAN courses in 2019-20 and 129 participants benefitted from these courses.

S. No.	Course Title	Course Coordinator	Expert Faculty	Course Dates
1	Clinically Applied Anthropology II: Ethnographic methods for mental health research and practice in India	Dr Shubha Ranganathan	Dr Sumeet Jain, The University of Edinburgh, United Kingdom	Dec 16-20, 2019
2	The mechanics of metal foams and lattice materials	Dr Syed Nizamuddin Khaderi	Dr Srikantha Phani, University of British Columbia, Canada	Dec 16-24, 2019
3	Design of Anchorages in Concrete Construction and their Role in Structural Strengthening	Dr S Suriya Prakash	Prof Akanshu Sharma, Institute of Construction Materials, TU Stuttgart Germany	Jul 22-01 Aug, 2019
4	Integrated Computational Materials Engineering for Metals	Dr Viswanath R Chinthapenta	Prof Mark Horstemeyer, Mississippi State University, USA	Jul 8-13, 2019

GIAN Short Course on Clinically Applied Anthropology II: Ethnographic Methods for Mental Health Theory and Practice - 16 to 20 December, 2019

DON'T DECREASE THE GOAL. INCREASE THE EFFORT."
– Tom Coleman

TLC at IITH •

Teaching Learning Centre (TLC) at IIT Hyderabad was established in 2016 under the Pandit Madan Mohan Malviya National Mission for Teaching and Training (PMMMNMTT), a scheme by MHRD. The vision of TLC at IITH has been to create an effective education ecosystem. TLC supports the IITH faculty in the content development of novel courses and effective dissemination. A repository of teaching aids is maintained at TLC which are made available to faculty as per requirements. TLC-IIT Hyderabad has a two-pronged strategy for effective teachers' training. General workshops are conducted for faculty in various schools / colleges across the country. In parallel, individual colleges are identified and department wise training is imparted. So far over 2500 teachers from other engineering colleges have been trained in various subjects. TLC has also renovated a few classrooms at IITH to create smart classrooms to facilitate virtual classrooms and other disruptive teaching practices.

One of the major workshops organised by TLC in 2019-20 was a 3-week long residential induction training programme for more than 40 faculty members across the country in May-June 2019. During the workshop, a team of experts talked about the roles and responsibilities of a faculty, curriculum design and content development, pedagogic techniques, assessment and evaluation, personal-emotional development and counselling, effective use of technology, and academic Leadership. TLC has also collaborated with TEQIP to train faculty at ABVGIET, Pragati Nagar, Himachal in Feb 2020. TLC led the effort for workshops on artificial intelligence, Aurdino, Python, machine learning for specialised as well as general audiences at colleges involving GITAM (Visakhapatnam), CMR College of Engineering (Hyderabad), Osmania University, VNR Vignana Jyothi Institute of Engineering and Technology (Hyderabad), NIT-AP, Sri Prakash Vidyaniketan (Visakhapatnam) and VR Siddhartha Engineering College (Vijayawada).

TLC is now in the process of laying out faculty development programmes and familiarisation workshops for in-house faculty. TLC is also committed to facilitate and ease the transformation for faculty as well as the student.

Participants during a 3-week long residential induction training programme organised by TLC in May-June 2019

SURPASSING MY ACHIEVEMENTS FEELS INCREDIBLE; I WANT TO REPLICATE THAT AGAIN AND AGAIN."
– Katherine Reutter-Adamek

• Incubators @ IITH

Inventions and innovations are keywords on which the foundation of Indian Institute of Technology Hyderabad (IITH) is based. The endeavour is to create an ambience where the research concepts are taken from ideation to prototype to product / commercialization stage. A strong academic and industry integration in addition to excellence in academic research forms an integral part for achieving the same. IITH was 10th in Atal Ranking of Institutes of Innovation Achievements (ARIIA).

IITH houses 3 incubation centres along with a research park and a social entrepreneurship accelerators (Nidhi Accelerator jointly with Action for India)

i-TIC Foundation IIT Hyderabad (hosted by Indian Institute of Technology Hyderabad), a Society, is an umbrella organization that has been formed with the precise idea to nurture startup culture in IIT Hyderabad. The goal is to create an 'amalgam' of research and industry by creating a very supportive and nourishing environment wherein research concepts can be taken up and integrated with industry for commercialization.

Facilities @ i-TIC

- High quality HP 3-D fusion printer – Printing brilliant & full-colour functional parts.

- Solid works 3D Designing Software
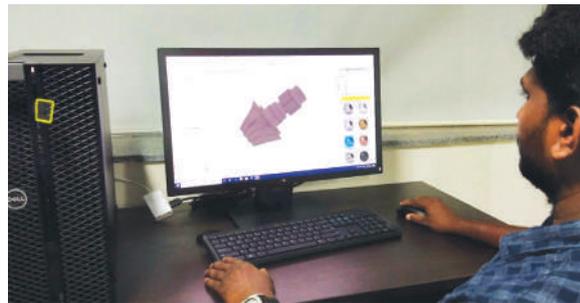
- Patent Search database called Orbit – Orbit pack consist of three modules, namely Orbit Express, Orbit Innovation and Orbit Intelligence.

- YNOS Venture Engine – YNOS is a technology platform to address the needs of the start-ups in India.
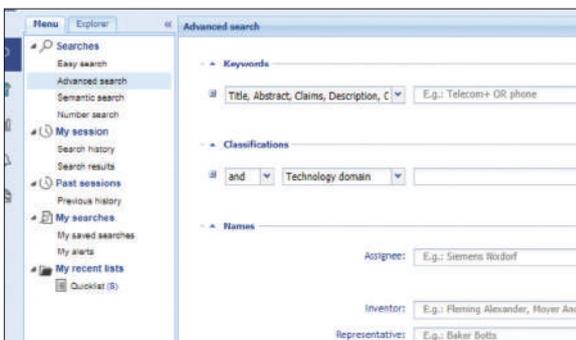
IF IT IS IMPORTANT TO YOU, YOU WILL FIND A WAY. IF NOT, YOU'LL FIND AN EXCUSE."
– Josie Bisset

Incubators @ IITH •

Startups incubated @ i-TIC in FY 19-20

S. No.	Name of the Company	Area	Status	Program if any
1	Crystal Ball / CBAI	Drone Technology (Agriculture)	Incubated	
2	Anvation Labs (iDEX)	Defence (Embedded Systems)	Incubated	iDEX SPARK Grant
3	Joseph Tsukka / Simulacra	AI (Design Based)	Incubated	
4	Tejaswini Appidi / Dr Aravind Kumar Rengan	Healthcare (Cervical Cancer)	Pre-incubated	BIRAC
5	Shivakalyani Adepu / Dr Mudrika Khandelwal	Healthcare (Candidiasis)	Pre-incubated	BIRAC
6	Uday Kiran Roopavath	Healthcare (Regenerative Bone Fillers)	Pre-incubated	BIRAC
7	Akshit Jain	Aerial Robotics	Pre-incubated	MeitY TIDE 2.0 (EiR)
8	Jayendra Kumar Sharma	Ride-hailing services	Pre-incubated	MeitY TIDE 2.0 (EiR)
9	Surbhi Guha	Food-tech	Pre-incubated	MeitY TIDE 2.0 (GRANT)
10	AI-GENIX INTERNATIONAL PVT LTD	AgriTech	Incubated	NIDHI Accelerator
11	EasyKrishi Pvt Ltd	AgriTech	Incubated	NIDHI Accelerator
12	EF POLYMER PRIVATE LIMITED	AgriTech	Incubated	NIDHI Accelerator
13	Krishitantra	AgriTech	Incubated	NIDHI Accelerator
14	Urdhvam Environmental Technologies Pvt Ltd	AgriTech	Incubated	NIDHI Accelerator
15	XMACHINES	AgriTech	Incubated	NIDHI Accelerator
16	Anavi Learning LLP	Ed Tech	Incubated	NIDHI Accelerator
17	I-Stem	Ed Tech	Incubated	NIDHI Accelerator
18	Socratease	Ed Tech	Incubated	NIDHI Accelerator
19	TagHive	Ed Tech	Incubated	NIDHI Accelerator
20	Trestle Labs	Ed Tech	Incubated	NIDHI Accelerator
21	Marut Drones	HealthTech	Incubated	NIDHI Accelerator
22	Mindcrescent Wellness Ventures Private Limited (trading as Inner Hour)	HealthTech	Incubated	NIDHI Accelerator
23	NirNal Water Filter	HealthTech	Incubated	NIDHI Accelerator
24	Onward Assist	HealthTech	Incubated	NIDHI Accelerator

YOU CAN NEVER BE OVERDRESSED OR OVEREDUCATED."
– Oscar Wilde

• Incubators @ IITH

Center for Healthcare Entrepreneurship (CfHE) The Center for Healthcare Entrepreneurship (CfHE) has been established in December 2015 at Indian Institute of Technology Hyderabad with an objective is to catalyse healthcare innovation with a focus on affordable solutions to address healthcare needs of India. This program aims at bringing together engineers, clinicians, entrepreneurs and the business community on a single platform to design and innovate in the field of healthcare, biomedical devices, and services to create a social impact. The center plays a pivotal role in identifying the clinical gaps where the Biomedical engineers can make a big difference. The program focuses on changes at grass root level in an Indian context to address the unmeet needs both in the rural and urban health care sector.

The center offers a prestigious fellowship program in Healthcare Entrepreneurship focused on Biodesign innovation through a structured and fast-paced curriculum that is completed in one year. The fellows enrolled in this program undergo a thorough immersion in clinical environment to identify the unmeet needs. This is followed by training in needs analysis, solutions, and business plan development. The Center for Healthcare Entrepreneurship houses a start-of-the-art facility for the rapid prototyping of biomedical devices, which is one of its kind in the country where the fellows can test and validate their ideas at a rapid pace to speed up the Biodesign innovation cycle.

We have graduated 3 cohorts of entrepreneurs and the fourth batch is currently running. Seven start-ups were incubated out of the program into CfHE at IITH: NemoCare, BeAble, Kvayat, Haemac, AeroBiosys, Jivika Solutions Pvt Ltd and ChemiOptic Pvt Ltd. All the start-ups have completed their product prototype and have won BIRAC start up grants for their product development. NemoCare has received the Bill & Mellinda Gates Foundation Grant and many other prestigious awards for their innovative product addressing sleep apnea and sudden infant death syndrome in neonates. BeAble, which addresses lack of engaging and science-based neurorehabilitation setup for stroke patients, has received the Indo-US Endowment grant in collaboration with Steven's University, USA.

The center has graduated 21 fellows through the fellowship program and is currently incubating 7 start ups at IIT Hyderabad as on 31-03-2020.

Nemocare Wellness has developed an easy to use, baby-friendly wearable device ("Raksha") that wraps around the foot and tracks 6 key vital signs – 24x7. In the back-end, signals are analyzed by a deep learning algorithm and the decision support system helps the caregiver with data trends and risk analysis scores. The entire system works as an intelligent platform that gives accurate notifications and alerts to healthcare workers to enable timely intervention when a distress condition is detected. The device and algorithms are patent-pending. With no technology risk, a hospital can make any of its beds into an ICU bed quickly. The simple and easy to use design allows it to be immediately deployable in a clinical setting.

YOU CAN'T USE UP CREATIVITY. THE MORE YOU USE, THE MORE YOU HAVE."
– Maya Angelou

Incubators @ IITH •

Fabless Chip Design Incubator, a flagship program being executed with the support of Ministry of Electronics and Information Technology (MEITY) precisely focuses on creating an ecosystem for incubating companies in the area of chip design.

The primary motivation for this unique incubator program is to provide a one-stop solution in the area of chip design. The vision of this incubator is to create an ecosystem wherein the incubates are not only provided with the relevant infrastructure, hardware and software but also are mentored through the path of success with the help of mentors who are pioneers in this field. The grand vision is to leverage the design expertise that exists in India to create Indian IP and to make a mark in chip design internationally.

Motivation

Electronics Industry is one of the fastest growing and largest manufacturing industries in the world, estimated to be at USD 1.75 Trillion at present and projected to reach USD 2.4 Trillion by year 2020. The demand in Indian market driven by higher consumption of electronic goods and our strategic needs for using technology across various segments and sectors is projected to reach USD 400 Billion by year 2020. The encouraging fact for India is our expertise in design and the growing emphasis on fabless chip design companies.

USP of FabCI

Location: Located at IIT Hyderabad amidst a well nurtured entrepreneurial ecosystem comprising two more incubates and Technology Research Park

EDA tools: Access to full suite of Cadence and Mentor Graphics

Characterization: Access to state-of-the-art characterization facilities

Prototyping: TSMC foundry access through MUSE semiconductors

Human Resources: Well Trained Human Resources

Networking: Access to VCs and Angel Investors

Last year FabCI incubated three companies in the virtual mode

1. Banashree Systems　　2. KFxlabs　　3. Qwikchip Pvt ltd

THE SILLY QUESTION IS THE FIRST INTIMATION OF SOME TOTALLY NEW DEVELOPMENT."
– Alfred North Whitehead

•IITH Technology Research Park

The construction of Technology Research Park which would provide space of 1.50 lakh sq.ft. had started with ground-breaking ceremony held on 28th March 2019. The same is being funded by MHRD, Govt. of India, with a sanctioned support of ₹75.00 crores. The TRP is envisaged to be operational from 2021 and would be hub for R&D centers of many companies and start-ups graduating from the IITH Incubation centers as well as other companies and organizations.

IITH Technology Research Park has progressively increased the number of occupants from 2 to 5 in the current Financial Year 2019-20. The current occupants who have set up their R&D centers are:

Plianto Technologies Pvt. Ltd., a startup graduated from i-TIC Foundation IIT Hyderabad Technology Business Incubator has taken up space of 800 sq.ft. for developing and further expanding their activities.

Redpine Signals Inc., a company with interest in development of wireless technology-based equipment has taken up 1200 sq.ft. for developing its R&D center in collaboration with IIT Hyderabad.

Qulabs Software (India) Pvt. Ltd., has set up its R&D center on Quantum Computing, Artificial Intelligence and Allied Technologies. They are allocated 800 sq.ft. for the same.

Vervesemi Microelectronics Pvt. Ltd., has set up its R&D center for developing semiconductor IC Designs to be further used in various products and applications. They have been allotted 450 sq.ft. for setting up their lab.

WiSig Networks has setup its NBIOT research space for developing 5G based technologies. They have been allocated 800 sq.ft. setting up the same.

Republic Day Celebration

On 26th January, 2020
71st Republic Day

Republic Day has been celebrated alike every year at IIT Hyderabad as the Constitution of India came into force on this day in 1956.

It is celebrated as the national festival of India. The Republic Day celebration started with the hoisting of National Flag by the Director, IIT Hyderabad Prof BS Murty followed by various cultural programmes wherein students participated with great zeal and enthusiasm. Even a blood donation camp was organized to mark this day.

EDUCATION IS THE KEY TO UNLOCK THE GOLDEN DOOR OF FREEDOM."
– George Washington Carver

• International Women's Day
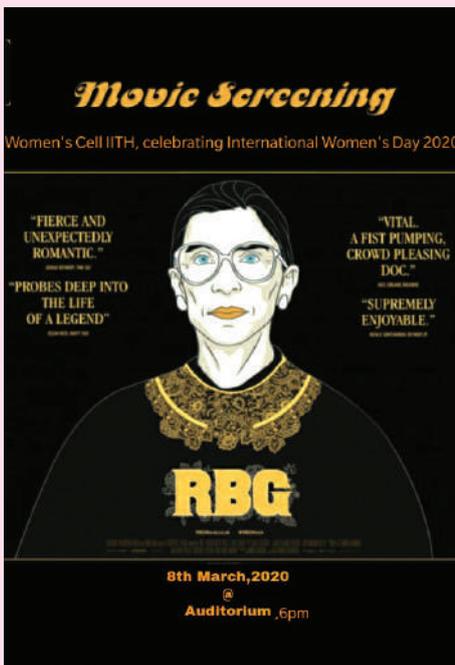
On the occasion of International Women's Day, Women's Cell & NSS Club under Fit India Movement have hosted runners of Spirit of Pinkathon (Bidar to Hyderabad-120Km), on 7th March. Runners have shared the secret of fitness with @ IIT Hyderabad Students. IIT Hyderabad's Women's Cell has also screened the film "RBG". RBG is a 2018 American documentary film directed and produced by Betsy West and Julie Cohen, focusing on the life and career of the second female (after Sandra Day O'Connor) Supreme Court of the United States Associate Justice Ruth Bader Ginsburg. It was chosen by the National Board of Review as the Best Documentary Film of 2018, and nominated for several other awards, including the BAFTA Award for Best Documentary. At the 91st Academy Awards, the film earned nominations for Best Documentary Feature and Best Original Song ("I'll Fight").


"YOU EDUCATE A MAN; YOU EDUCATE A MAN. YOU EDUCATE A WOMAN; YOU EDUCATE A GENERATION."
– Brigham Young

Biomedical Engineering

The Biomedical Engineering Department (BME) at IIT Hyderabad is the place where boundaries between engineering and science disciplines fade in order to focus on research and education targeted for ongoing and future technology. The primary mission of the department is to foster interdisciplinary work of the highest quality by bringing together a broad spectrum of faculty expertise under a single umbrella to focus on research in Biomedical Engineering. By converging the engineering expertise in analytical and experimental methods to biological and medical sciences, BME aim at unveiling the unseen in biology and innovations in technology that can be translated to clinical health care. BME has made substantial investments in strengthening the core research facilities and course curriculum. The department has realized the need for the development of an undergraduate curriculum in Biomedical Engineering and IIT Hyderabad has announced a BTech Programme in Biomedical Engineering. In addition, the Department has an MTech in Biomedical Engineering Programme and a BME minor program of 12 credits is designed for undergraduates from other disciplines to gain interdisciplinary knowledge in areas of Bioengineering. Faculty in the department of BME undertake research in a broad spectrum of areas related to Biomedical Engineering / Bioengineering such as **Bio-photonics, Novel Ultrasound Imaging, Lab on a Chip Biosensors, Biophysics, Experimental and Computational Biomechanics, Neuroscience and Neuro-technology, Tissue Engineering, 3D Bioprinting and Nano-medicine.** The department will continue to leverage its core strengths in emerging as one of the leading centres of excellence in Bioengineering in the country.
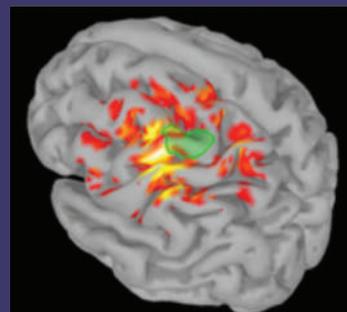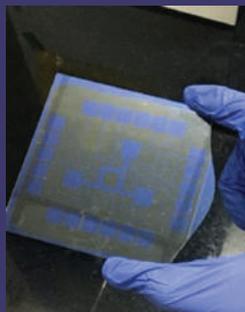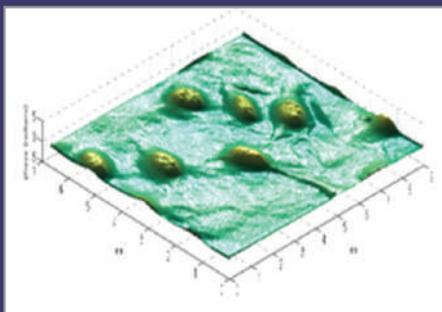
EDUCATION ISN'T SOMETHING YOU CAN FINISH."
– Isaac Asimov

Faculty

Renu John
PhD – IIT Delhi

Professor & HoD
Research Areas: Biomedical
Optical Imaging; Quantitative
Phase Microscopy; Biosensors

Harikrishnan Narayanan Unni
PhD – NTU, Singapore

Associate Professor
Research Areas: Lab on Chip Micro Fluidics and
Nanofluidics; Biophysics; Biomechanics

Subha Narayan Rath
PhD – NUS, Singapore

Associate Professor
Research Areas: Biomimicking;
3D Bioprinting; Angiogenesis; Osteogenesis;
Nature-Inspired Biomaterials; Decellularized
Tissues; Organ-On-Chip; Cell Therapy

Aravind Kumar Rengan
PhD – IIT Bombay

Assistant Professor
Research Areas: Nanomedicine;
Bio-Nanotechnology; Photothermal Therapy;
Nanotoxicology; Cancer Theranostics

Falguni Pati
PhD – IIT Kharagpur

Assistant Professor
Research Areas: Biomaterials;
Tissue Engineering; 3D Bioprinting;
In Vitro Tissue / Organ Models

Jyotsnendu Giri
PhD – IIT Bombay

Associate Professor
Research Areas: Nanomedicine;
Regenerative Medicine; Drug Delivery;
Therapeutics and Diagnostics

Kousik Sarathy Sridharan
PhD – Aarhus University

Assistant Professor
Research Areas: Neuromodulation;
Neuroimaging; Intra-operative
Neuromonitoring; Healthcare Data Analytics

Mohammed Suhail Rizvi
PhD – IIT Kanpur

Assistant Professor
Research Areas: Biomechanics;
Biophysics; Systems Biology

Mohan Raghavan
PhD – IISC Bangalore

Assistant Professor
Research Areas: Computational
Neuroscience; Motor System;
Spinal Cord; Bionics; Assistive Devices;
Rehabilitation

Sikandar Shaik
MBBS, DMRD DNB

Adjunct Faculty
Research Areas: CT; PET
Affiliation: Dept. of Radiology,
Yashoda Hospitals

Ramana Vinjamuri
PhD – Stevens Institute of Technology,
New York

Visiting Assistant Professor
Research Areas: Brain-Machine Interface

Patent Filed / Granted

- Patent Title: Sustained release biomolecules depot and process preparing the same by double emulsion method., Name of the Inventors: Jyotsnendu Giri, Patent Application No: 201941049522.

- Patent Title: Apparatus and Methods for Label-Free Morphological Evaluation of Human Sperm, Name of the Inventors: P. K. Poola and Renu John, Patent Number: applied.

- Patent title: Microfluidic Devices and Methods of Fabrication Thereof, Name of the Inventors: Sarpras Swain, Lopamudra Giri, S. Suryakumar, Falguni Pati, Application No. 201941027664, Filed on 10th July 2019.

Book / Book Chapter

- Singh S. P., Rengan A.K., (2019). Nanomaterials for Antibiofilm Activity, ACS Symposium Series(125-140), American Chemical Society.

- Yeleswarapu S., Chameettachal S., Bera A.K., Pati P. (2019), Tissue-Specific Bioink from Xenogeneic Sources for 3D Bioprinting of Tissue Constructs in Xenotransplantation Comprehensive Study, Intech Open Publisher. doi: 10.5772/intechopen.89695.

- Bojedla, R., Chameettachal S., & Pati, F. (2019). 3D Tissue Modelling of Orthopaedic Tissues. In Biofabrication and 3D Tissue Modeling (Vol. 3, pp. 216-232).

- Kundu, J., Pati F., Shim J. H., & Cho D.W. (2019). Rapid Prototyping Technology for bone regeneration. In Rapid Prototyping of Biomaterials: Techniques in Additive Manufacturing. Elsevier. https://doi.org/10.1016/B978-0-08-102663-2.00012-5.

- Panta P., Lu C.-W., Kumar P., Ho T.-S., Huang S.-L., Kumar P., Murali Krishna C., Divakar Rao K., John R. (2019). Optical coherence tomography: Emerging in vivo optical biopsy technique for oral cancers. Oral Cancer Detection: Novel Strategies and Clinical Impact, 217-237.

Publications (Journal)

1 Singh, N., Rai P., Ali, M. A., Kumar R., Sharma, A., Malhotra B. D., & John R. (2019). A hollow-nanosphere-based microfluidic biosensor for bio-monitoring of cardiac troponin i. Journal of Materials Chemistry B, 7(24), 3826–3839. https://doi.org/10.1039/c9tb00126c.

2 Thomas, T., & Unni, H. N. (2019). LED-based opto-wetting and fluidic transport for droplet mixing. Microfluidics and Nanofluidics, 23(9). https://doi.org/10.1007/s10404-019-2273-3.

3. Dhiman, N., Kingshott, P., Sumer, H., Sharma C. S., & Rath, S. N. (2019). On-chip anticancer drug screening – Recent progress in micro fluidic platforms to address challenges in chemotherapy. Biosensors and Bioelectronics, 137, 236-254. https://doi.org/10.1016/j.bios.2019.02.070.

4. Eswaramoorthy, S. D., Dhiman, N., Korra G., Oranges, C. M., Schaefer, D. J., Rath, S.N., & Madduri S. (2019). Isogenic-induced endothelial cells enhance osteogenic differentiation of mesenchymal stem cells on silk fibroin scaffold. Regenerative Medicine, 14(7), 647–661. https://doi.org/10.2217/rme-2018-0166.

5. Eswaramoorthy, S. D., Ramakrishna, S., & Rath S. N. (2019). Recent advances in three-dimensional bioprinting of stem cells. Journal of Tissue Engineering and Regenerative Medicine, 13(6), 908-924. https://doi.org/10.1002/term.2839.

6. Govindharaj, M., Roopavath, U. K., & Rath, S. N. (2019). Valorization of discarded Marine Eel fish skin for collagen extraction as a 3D printable blue biomaterial for tissue engineering. Journal of Cleaner Production, 230, 412-419. https://doi.org/10.1016/j.jclepro.2019.05.082.

7. Roopavath, U. K., Malferrari, S., Van Haver, A., Verstreken, F., Rath, S. N., & Kalaskar, D. M. (2019). Optimization of extrusion based ceramic 3D printing process for complex bony designs. Materials and Design, 162, 263-270. https://doi.org/10.1016/j.matdes.2018.11.054.

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11. Sankar Sharanya; Sharma Chandra, S., Rath, Subha, N. (2019) Enhanced osteodifferentiation of MSC spheroids on patterned electrospun fiber mats – An advanced 3D double strategy for bone tissue regeneration Materials Science & Engineering C-Materials for Biological Applications 94, 703-712. https://doi.org/10.1016/j.msec.2018.10.025.

12. Kandasamy, G., Khan, S., Giri, J., Bose, S., Veerapu, N. S., & Maity, D. (2019). One-pot synthesis of hydrophilic flower-shaped iron oxide nanoclusters (IONCs) based ferrofluids for magnetic fluid hyperthermia applications. Journal of Molecular Liquids, 275, 699-712. https://doi.org/10.1016/j.molliq.2018.11.108.

13. Singh, R., Khan S., Basu, S. M., Chauhan M., Sarviya, N., & Giri J. (2019). Fabrication, Characterization, and Biological Evaluation of Airbrushed Gelatin Nanofibers. ACS Applied Bio Materials, 2(12), 5340-5348. https://doi.org/10.1021/acsabm.9b00636.

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15. Singh R. Khan, S. Basu, S. M. Chauhan, M. Sarviya, N. & Giri, J. (2019). Fabrication, Characterization, and Biological Evaluation of Airbrushed Gelatin Nanofibers. ACS Applied Bio Materials, 2(12), 5340-5348. https://doi.org/10.1021/acsabm.9b00636.

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19. Darabdhara, G. Das, M. R. Singh, S. P. Rengan, A. K. Szunerits, S. & Boukherroub, R. (2019). Ag and Au nanoparticles/reduced graphene oxide composite materials: Synthesis and application in diagnostics and therapeutics. Advances in Colloid and Interface Science, 271, 101991. https://doi.org/10.1016/j.cis.2019.101991.

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22. Sasikumar, S. Chameettachal, S. Cromer, B. Pati, F. & Kingshott, P. (2019). Decellularized extracellular matrix hydrogels – Cell behavior as a function of matrix stiffness. Current Opinion in Biomedical Engineering, 10, 123-133. https://doi.org/10.1016/j.cobme. 2019.05. 002

23. Chameettachal, S., Sasikumar, S., Sethi, S., Sriya, Y., & Pati, F. (2019). Tissue/organ-derived bioink formulation for 3D bioprinting. In Journal of 3D printing in medicine (Vol. 3, Issue 1, pp. 39–54).

Publications (Conference)

1. S. B. Alvi, S. Paradkar, A. Pradhan, R. Srivastava and A. K. Rengan, "Timing The Therapeutic Trigger of Au Lipos Cur NPs for Effective Photothermal Therapy," 2019 IEEE 13th International Conference on Nano/Molecular Medicine & Engineering (NANOMED), Gwangju, Korea (South), 2019, pp. 35-40, doi: 10.1109/NANOMED49242.2019.9130624.

2. Yerrapragada, M. R., & Unni, H. N. (2019). Paper-based microfluidic platforms for osteoporosis diagnosis. 21st International Conference on Miniaturized Systems for Chemistry and Life Sciences, MicroTAS 2017, 1451-1452 (2017 article published in 2019).

Funded Research Projects

- Dr. Aravind Kumar Rengan, Project Type: Grant-in-Aid, Project Code: DST/BME/F163/2019-20/G240, Project Title: Proof of concept towards scale up production of nano gold coating on liposomes for the manufacture liposome gold nanoparticles (commercial grade) used in photothermal therapy, Sponsoring Agency: DST-AMT, 45.6L.

- Dr. Renu John, Project Type: Grant-in-Aid, Project Code: ICMR/BME/F055/2019-20/G245, Project Title: Application of optical coherence tomography and adjunct fluorescence imaging for early detection of oral cancers, Sponsoring Agency: DST IDP, 5.9L.

- Dr. Subha Narayan Rath, Project Type: Grant-in-Aid, Project Code: MHFW/BME/F110/2019-20/G248, Project Title: Development of Bio Inspired Marine Eel Fish Mucus Derived 3D bio printed hydrogel Scaffolds or cartilage repair through promotion of chondrogenics differentiation of human umbilical card derived, Sponsoring Agency: ICMR, 51.6L.

- Dr. Kousik Sarathy Sridharan, Project Type: Grant-in-Aid, Project Code: SERB/BME/F202/2019-20/G256, Project Title: Development of corticospinal integrity assessment framework for stroke patients in low resource settings, Sponsoring Agency: DST-SERB, 29.5L.

- Dr. Subha Narayan Rath, Project Type: Grant-in-Aid, Project Code: ICMR/BME/F110/2019-20/G270, Project Title: Lipo Polymeric Nanodrug Delivery System in a defect Specific 3D printed cartilage: An in Vivo analysis in osteoarthritis rat model, Sponsoring Agency: ICMR, 15.7L.

- Dr. Aravind Kumar Rengan, Project Type: Grant-in-Aid, Project Code: BIRAC/BME/F163/2019-20/G271, Project Title: Cervico-vaginal fluid retriever device for the screening of cervical cancer/CIN Vaginal Infections by colorimetric technique, Sponsoring Agency: DBT-BIRAC, 50L.

- Dr. Jyotsnendu Giri, Project Type: Grant-in-Aid, Project Code: G280, Project Title: Affordable, Effective Personalized Point-of-use Wound Care Patches at Patient Bedside For Large Asymmetric Burn Wound, Sponsoring Agency: IMPRINT II SERB, 120L.

- Dr. Mohan Raghavan, Project Type: Grant-in-Aid, Project Code: G281, Project Title: Reconstructing Spinal Cord neural dynamics during exercise and Yoga, Sponsoring Agency: DST, 48.1L.

Workshops Conducted

- Dr. Falguni Pati, Organised TEQIP workshop on 3D Bioprinting and Biofabrication Technologies and their Applications from 9th to 14th December 2019 at IIT Hyderabad, where 40 faculty and students from different Institutes and Collages participated.

Awards & Recognitions

- Dr. Aravind Kumar Rengan, Assistant Professor has been inducted as Member in Indian Young Academy of Sciences (INYAS).

- Dr. Aravind Kumar Rengan, Assistant Professor received BIRAC BIG grant to initiate a start up at IIT Hyderabad i-TIC.

- Dr. Aravind Kumar Rengan, Assistant Professor received Newton - Bhabha Award.

- Dr. Jyotsnendu Giri, Associate Professor, selected as Editorial Board Member in Scientific Report, Nature.

Highlights

Dr Subha Narayan Rath, Regenerative medicine and stem cell (RMS) lab has recently done some ground breaking research on bench-to-bedside application-oriented research. We have developed ceramic-polymer based 3D printed scaffolds which was patented and now attempted for animal testing. We have synthesized nano magnetic hydroxyapatite (nMHAp), ßß-tricalcium phosphate (ß-TCP), PCL-Bioactive Glass Composite Scaffolds for mandibular defect or dental filling application. We have targeted nature inspired bio-mimicking and synthesis of the biomaterials before using them for 3D bioprinting recently, especially from marine sources. In addition, another group of our lab is testing anti-cancer drugs using 3D spheroid cancer cell models compared to 2D cell line models used previously. We have got a project to develop the 3D testing fluidics and hence our interest in developing the micro fluidic devices for anti-cancer drug testing along with our collaborators. All the works are tested with proper in vitro culture using patient-derived Mesenchymal stem cells (MSCs) or cancer derived cells.

Dr Harikrishnan Narayanan Unni Biomicrofluidics lab at IITH is focused on the design and development of chip scale devices of bioanalytical applications. Tau protein aggregation is identified as one of key phenomena associated with the onset and progression of Alzheimer's disease. We performed on-chip confocal imaging of Tau protein aggregation and Tau-drug interaction using a spiral-shaped passive micro mixing platform. Tau aggregation from ATP conjugation and regaining of native Tau via drug interaction was realized using an immunofluorescence antibody assay. The dose-response behaviour of an Alzheimer's drug, Methylthioninium chloride (MTC) was monitored on-chip for defining the optimum concentration of the drug. The amount of Tau protein sample used in our experiments was significantly lesser than the usage from conventional techniques, and the whole protein-drug assay was realized in less than two hour time. We identified that intensity-based Tau imaging could be used to study Alzheimer's drug response. In addition, it was demonstrated that cell-free, micro fluidic Tau protein assays could be used as potential on-chip drug evaluation tools for Alzheimer's disease.
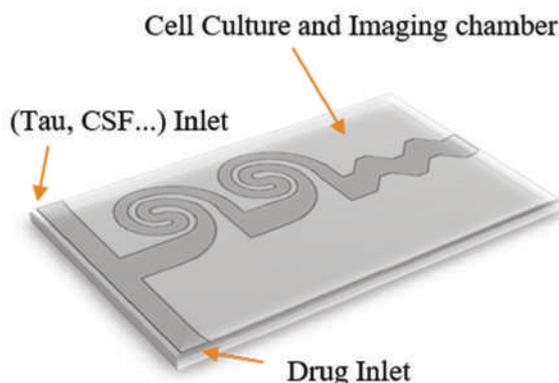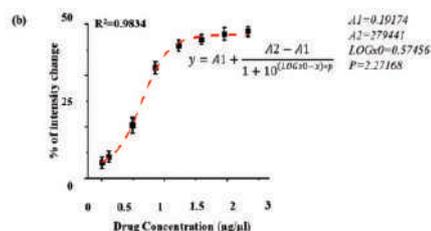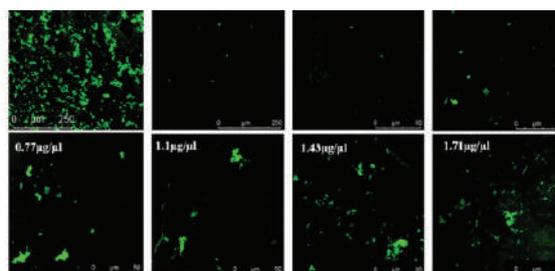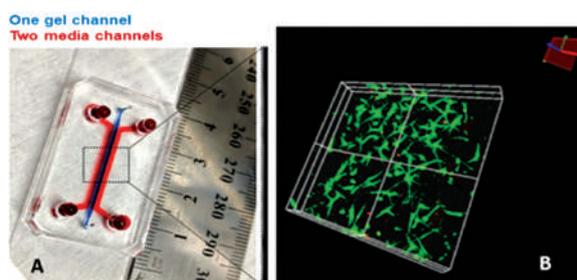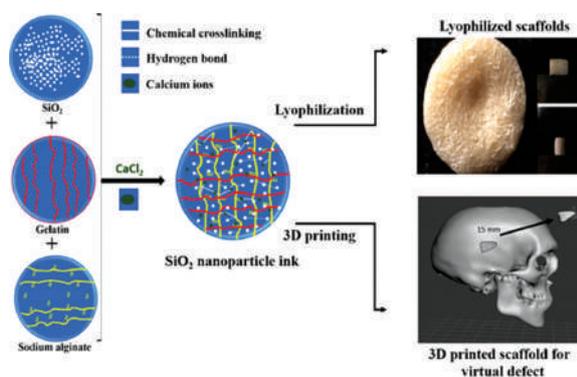
Biotechnology

In the new era of precision medicine, the **Department of Biotechnology at IITH** focuses on various cutting-edge medical biotechnology research areas with the expertise of 8 faculty members who had versatile research training in **US** and Europe. The department offers **MTech (Medical Biotechnology)** and **PhD (Biotechnology)** programs to train students to meet the international standards.

A CELL IS REGARDED AS THE TRUE BIOLOGICAL ATOM."
– Gorge Henry Lewes

Faculty

Thenmalarchelvi Rathinavelan
PhD – University of Madras
Associate Professor & HoD
Research Areas: Computational Biology; Biophysics; Biomolecular NMR

Anindya Roy
PhD – IISC Bangalore
Associate Professor
Research Areas: DNA Repair

Basant Kumar Patel
PhD – Banaras Hindu University
Associate Professor
Research Areas: Protein Misfolding in Neurodegenerative Diseases

N K Raghavendra
PhD – IISC Bangalore
Associate Professor
Research Areas: HIV-1 Biology

Rajakumara Eerappa
PhD – CCMB, Hyderabad
Associate Professor
Research Areas: Epigenetic; Enzyme Engineering for Asymmetric Synthesis and for Catalytic Efficiency; Structure Based Drug Design and DNA Repair; and Structural Biology; X-Ray Crystallography; Biophysics and Biochemistry and Computational Biology

Anamika Bhargava
PhD – Innsbruck Medical University, Austria
Associate Professor
Research Areas: Voltage-Gated Calcium Channels; Electrophysiology; Channelopathies; Imaging of Ion Channels; Zebra fish Animal Model

Sandeep K Singh
PhD – Virginia Commonwealth University, USA
Assistant Professor
Research Areas: Cell and Molecular Neuroscience; Neuron-Glia Interactions; Cell Biology of Glioma

Ashish Misra
PhD – IISc, Bangalore
Assistant Professor
Research Areas: Genomics; Epitranscriptomics; Cancer; RNA Biology; Alternative Splicing

Publications (Journals)

1. Prasad, Archana; Bharathi, Vidhya; Sivalingam, Vishwanath; Girdhar, Amandeep; Patel, Basant K. (2019) Molecular Mechanisms of TDP-43 Misfolding and Pathology in Amyotrophic Lateral Sclerosis Frontiers in Molecular Neuroscience 12, 25 https://doi.org/10.3389/fnmol.2019.00025.

2. Mohan, M. Akula, D. Dhillon, A. Goyal, A., & Anindya, R. (2019). Human RAD51 paralogue RAD51C fosters repair of alkylated DNA by interacting with the ALKBH3 demethylase. Nucleic Acids Research, 47(22), 11729–11745. https://doi.org/10.1093/nar/gkz938.

3. Tufegdzic Vidakovic, A. Harreman, M. Dirac-Svejstrup, A. B., Boeing, S. Roy, A. Encheva, V. Neumann, M., Wilson, M. Snijders, A. P., & Svejstrup, J. Q. (2019). Analysis of RNA polymerase II ubiquitylation and proteasomal degradation. Methods, 159–160, 146–156. https://doi.org/10.1016/j.ymeth.2019.02.005.

4. Sharma, Mukul; Akula, Deepa; Mohan, Monisha; Nigam, Richa; Das, Madhusmita; Anindya, Roy Heteroexpression of Mycobacterium leprae hypothetical protein ML0190 provides protection against DNA-alkylating agent methyl methanesulfonate Biochemical And Biophysical Research Communications 509(3) 779-783 https://doi.org/10.1016/j.bbrc. 2018. 12.184.

5. Patro, L. P. P., & Rathinavelan, T. (2019). Targeting the Sugary Armor of Klebsiella Species. Frontiers in Cellular and Infection Microbiology, 9. https://doi.org/10.3389/fcimb. 2019.00367 (Invited).

6. Abhishek, S., Sivadas, S., Satish, M., Deeksha, W., & Rajakumara, E. (2019). Dynamic Basis for Auranofin Drug Recognition by Thiol-Reductases of Human Pathogens and Intermediate Coordinated Adduct Formation with Catalytic Cysteine Residues. ACS Omega, 4(5), 9593–9602. https://doi.org/10.1021/acsomega.9b00529.

7. Gaur, H., & Bhargava, A. (2019). Glyphosate induces toxicity and modulates calcium and NO signaling in zebrafish embryos. Biochemical and Biophysical Research Communications, 513(4), 1070–1075. https://doi.org/10.1016/j.bbrc.2019.04.074.

8. Bhargava A, Saha S (2019). T-Type voltage gated calcium channels: a target in breast cancer?. Breast Cancer Res Treat. Jan;173(1):11-21. DOI: 10.1007/s10549-018-4970-0.

Seminars Conducted

*   Motivational Lecture by Prof. S Kundu, IIT BHU, April 2019.

*   Saket Choudhary, Computational Biology and Bioinformatics, University of Southern California. Title: Comparative Genomics of Translational Regulation. 19th August, 2019.

*   Dr. Rashna Bhandari, Head, Laboratory of Cell Signaling, CDFD, Hyderabad delivered a lecture as a part of the National Science Day event celebrated on 28th February, 2020.

*   Dr. Kiranam Chatti, Head, Center for Advancement of Research Skills, Dr. Reddy's Institute of Life Sciences delivered a lecture as a part of the National Science Day event celebrated on 28th February, 2020.

*   Dr. Debanjan Dasgupta, Francis Crick Institute and University College London, London, UK. Title: Perception and Encoding Odour Temporal Dynamics in the Mouse Olfactory Bulb, March 2020.

Awards & Recognitions

*   Dr. Raghavendra Nidhanapati Karanam, Associate Professor, Biotechnology called Chief Guest and illustrious alumni at Silver Jubilee Celebrations of St. Joseph's Degree College, Kurnool. AP, held on 9th Feb, 2020.

*   Thenmalarchelvi Rathinavelan, Vice Chancellor Nominee, Board of Studies, JNTU-Hyderabad (2019).

*   Dr. Rajakumara Eerappa: Received DAAD Scholarship, Research Stays for University Academics and Scientists in Germany.

*   Dr. Rajakumara Eerappa: Guest Professor in Prof. Dr. Ulrich Schwaneberg Group, Chair of Biotechnology, ABBt Institute of Biotechnology, RWTH Aachen University, Germany.

Highlights

IIT Hyderabad Researchers Develop Combination Therapy for Cancer.

"In photothermal therapy, a material that converts light to heat is specifically sent to the tumor location,

and when irradiated, causes ablation or destruction of the host cancer cells. IR780 is one such dye that absorbs near-infrared light and generates reactive oxygen species that kills the host cell. This dye is loaded onto a suitable carrier material and targeted at the cancer tissues."

The development of effective therapies that are specific to the cancer tissues and nontoxic to healthy tissues, remains the ultimate challenge in the war against cancer. Current gold-standard cancer treatment approaches such as surgery, chemotherapy and radiotherapy, continue to have limitations of adverse side effects to the healthy tissues / organs surrounding the tumor. The combined photothermal and CfAC therapy holds significant promise for enhanced therapeutic benefits with minimal / no side effects when translated into human application.

The research team used liposomes – lipid nanoparticles a hundred thousand times smaller than the width of a single human hair – as the carriers for IR780 because of their low toxicity, flexibility, biocompatibility, biodegradablity and non-immunogenicity.

The team loaded liposomes not only with IR780 but also with an anticancer agent called CfAC that is extracted from the plant Anthocephalous Cadamba.

These liposomes were tested against human breast cancer cells that were introduced into mice groups.

The team has also elucidated the mechanism of action of CfAC that causes cell death. They showed through in vitro studies that CfAC produces considerable amounts of reactive oxygen species, which can bring about cell death. Interestingly, CfAC did not produce reactive oxygen species inside healthy cells and can therefore be free of side-effects.
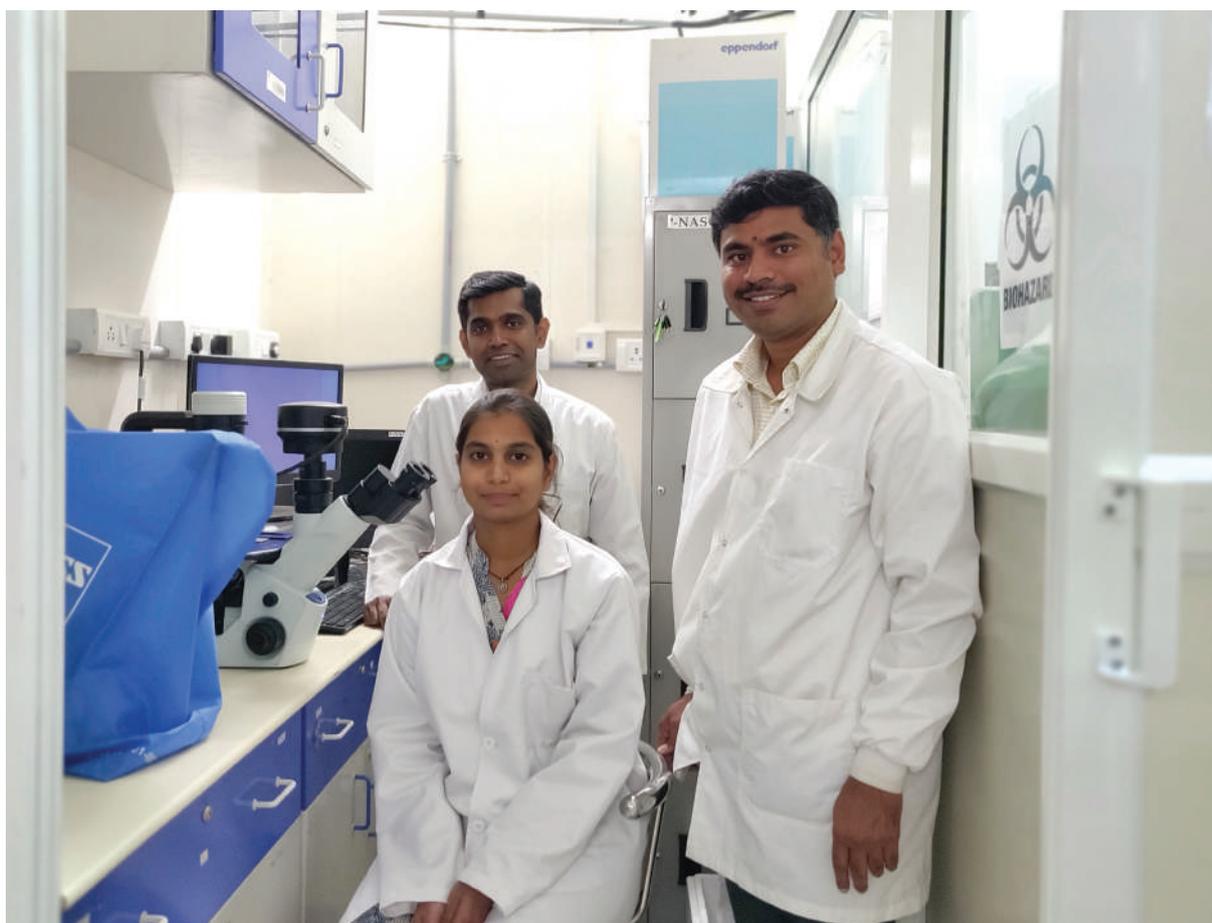
SCIENCE IS ORGANIZED KNOWLEDGE. WISDOM IS ORGANIZED LIFE"
– Immanuel Kant

UHRF1 protein, involved in cancer and neural stem cell maintenance, engaged in reading modified **DNA barcode**

Complex structure was solved by X-ray diffraction (spots in lens background) from single crystal obtained using in-house robot
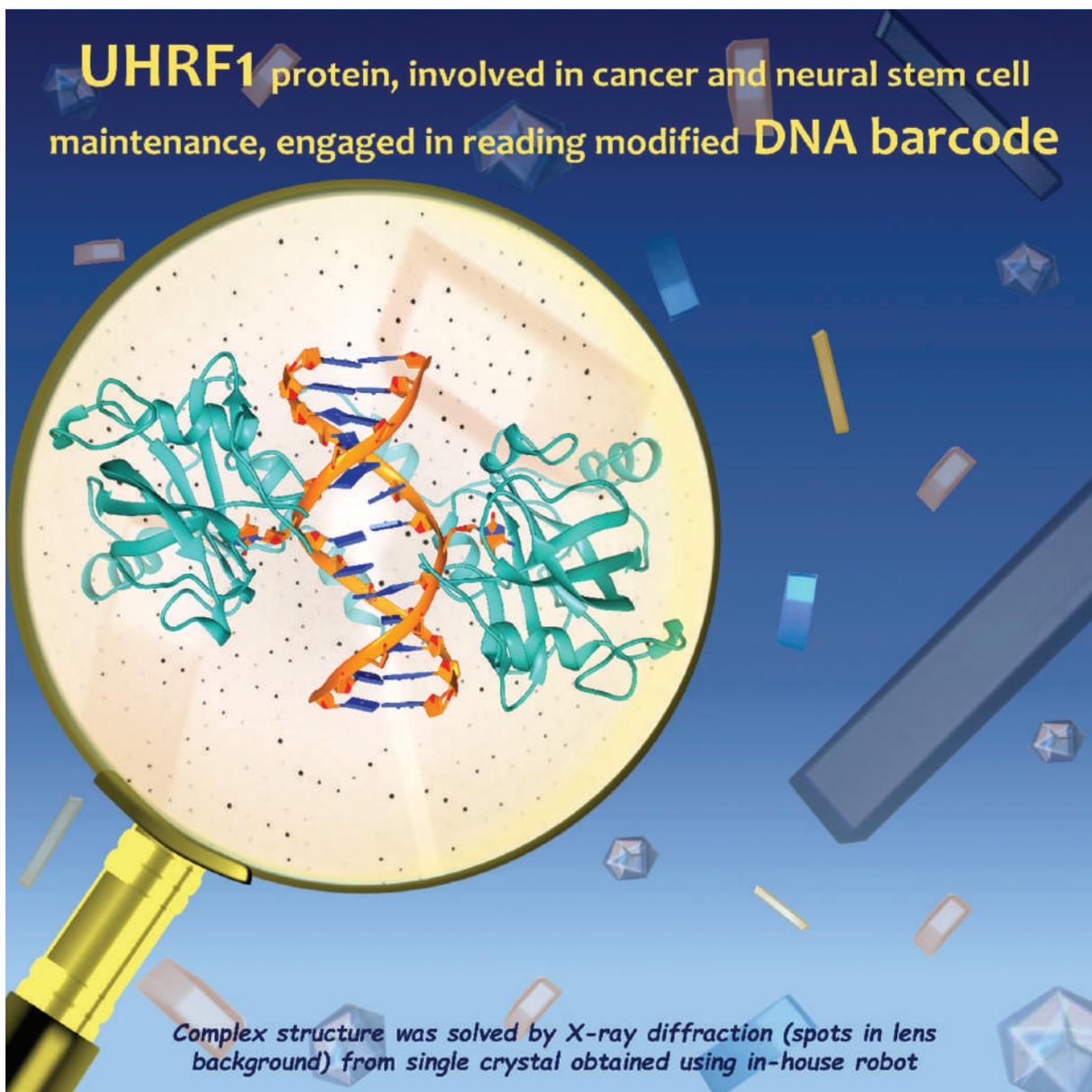
Mechanistic insights into recognition of symmetric methylated cytosines in CpG and non-CpG DNA by UHRF1

Non-CpG DNA methylation (non-mCpG) is enriched in the genome of brain neurons and germ line cells in mammals. Accumulation of non-mCpG during postnatal brain development correlates with gene regulation and inactivation of distal regulatory elements. Rajakumara Eerappa group has solved the structure of UHRF1 complexed with methylated non-CpG DNA, by X-ray crystallography method, to understand the mechanistic insights into cytosine methylation barcode readout by the UHRF1. The study substantiates the role of UHRF1 in genomicnon-CpG methylation maintenance.

Rational engineering of PDE inhibitor for assisted reproductive technologies
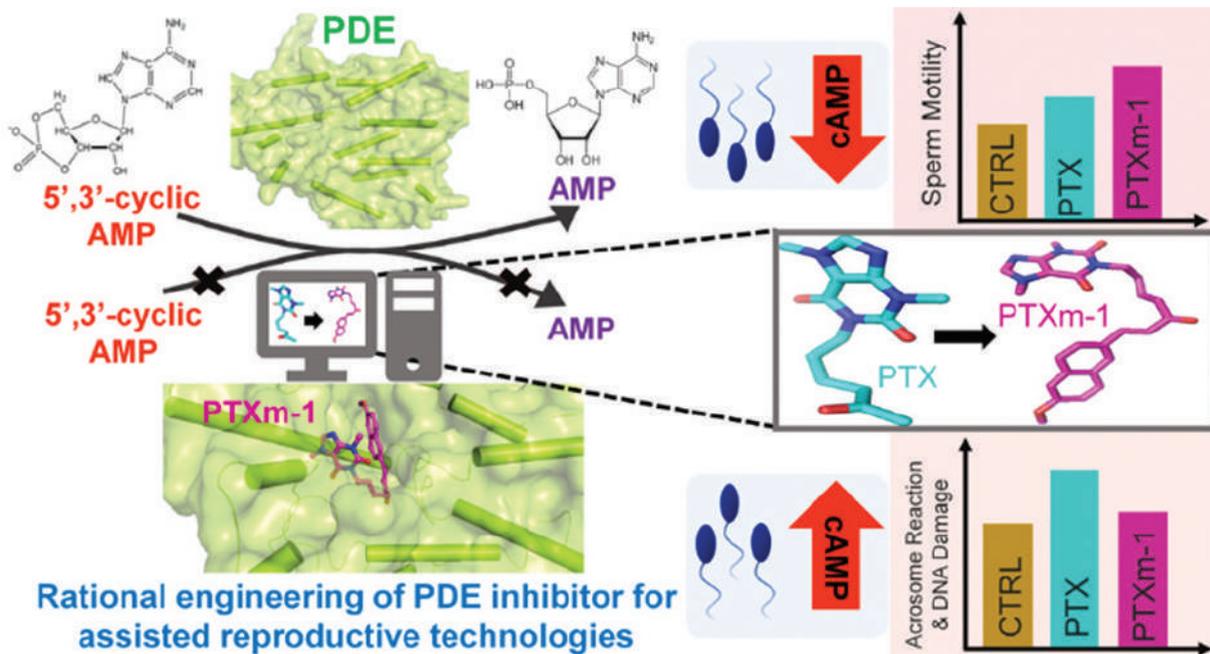
Rajakumara Eerappa group (collaboration with Prof Guruprasad Kalthur, Department of Clinical Embryology, Kasturba Medical College, Manipal University) has redesigned pentoxifylline (PTX) against selective phosphodiesterases (PDE) to modulate sperm functional competence for assisted reproductive technologies (ART). Based on experimental studies on human sperms and mice embryo development, we conclude that PTXm-1 (modified PTX) molecule may be a better pharmacological agent for assisted reproductive technologies such as in-vitro fertilization (IVF) than PTX for aiding viable sperm motility and function enhancement.

Chemical Engineering

The main objective of the department is to prepare the next generation of chemical engineers to address a broad spectrum of problems that are central to sustainability and economic growth of the country. With more and more inter and multidisciplinary research that is required to solve today's socio-economic problems, collaborations that cut across conventional research paradigm is indispensable. With 18 young and dynamic faculty, engaged in cutting edge research, we provide quality programmes in chemical engineering education, research and development and expert consulting support to process industries. Broadly, teaching covers various aspects of chemical, biochemical, materials and minerals engineering. Our electives expose our students to the state-of-the-art developments in the field of energy, new materials, Nano-science, and Biochemical Engineering. Chemical Engineering Department at IITH encompasses both BTech and MTech programmes that feature a curriculum that is both comprehensive and flexible. Department also hosts 55 PhD and nearly 25 MTech students. The department's strong commitment to research is evidenced by INR 30 crores extramural funding that faculties have obtained. Faculty from the department are actively involved in hosting conferences and outreach workshops benefitting the students and faculty across several institutes in India. The department also houses state-of-the-art research teaching laboratories. The faculty members in the department conduct research in a wide variety of exciting areas such as fluid flow, mineral processing, catalysis, materials for energy and biological applications, nanotechnology, bioengineering, process control and optimization.

Faculty

Narasimha Mangadoddy
PhD – University of Queensland - Australia
Associate Professor & HoD
Research Areas: Mineral Processing; CFD; Multi Phase Flows; Fluidization; Particulate Technology

Kirti Chandra Sahu
PhD – JNCASR, Bangalore
Professor
Research Areas: Raindrops; Bubbles and Drops; Multi Phase Flows; Flow Instability

Vinod Janardhanan
PhD – KIT, Germany
Professor
Research Areas: Heterogeneous Catalysis; Fuel Cells

Saptarshi Majumdar
PhD – IIT Kharagpur
Professor
Research Areas: Multi-Scale Modeling; Bio-Materials Design; Industrial Process Analysis

Sunil K Maity
PhD – IIT Kharagpur
Professor
Research Areas: Hydrodeoxygenation of Vegetable Oils and Oxygenated Compounds; Steam Reforming and Oxidative Steam Reforming of Bio-butanol; Process Design using Aspen Plus and Techno-Economic Analysis; Hydroxyalkylation-Alkylation Reaction (HAR) followed by HDO of HAR Product; Oligomerization of Butylene; Production of Butyl Levulinate by Butanolysis of Furfuryl Alcohol

Kishalay Mitra
PhD – IIT Bombay
Associate Professor
Research Areas: Machine Learning; Artificial Intelligence; Optimal Control; System Identification; Uncertainty Modeling; Supply Chain; Systems Biology; Wind and Solar Farm Design

Anand Mohan
PhD – Texas A&M, USA
Associate Professor
Research Areas: Cardiovascular Mechanics; Complex Fluid Rheology

Chandra Shekhar Sharma
PhD – IIT Kanpur
Associate Professor
Research Areas: Polymer and Carbon Nanomaterials; Carbon-MEMS; Electrospun Nanofibers; Nature inspired Functional Surfaces; Drug Delivery; Waste Management; Li-ion Batteries and Supercapacitors

Debaprasad Shee
PhD – IIT Kanpur
Associate Professor
Research Areas: Catalysis Over Supported Metals and Metal Oxides; Structure Property Correlations; Fuels and Chemicals from Renewable Sources; Reaction Kinetics

Devarai Santhosh Kumar
PhD – IIT Madras
Associate Professor
Research Areas: Solid State Fermentation; Submerged Fermentation; Lipase; Biodiesel; Edible Mushroom; Statistical Design of Experiments; Microbial Enzyme Production; Hybrid Biosensor

Lopamudra Giri
PhD – University of Iowa, USA
Associate Professor
Research Areas: Bioimaging; Systems Biology; Confocal Microscopy; Live Cell Imaging; Neuroscience; Neurodegeneration; Statistical Modeling; Data Analysis

Parag D. Pawar
PhD – Johns Hopkins, USA
Associate Professor
Research Areas: Bacterial Infections; Biofilms; Cellular Automata; Antibiotic Resistance

Faculty

Phanindra Varma Jampana
PhD – University of Alberta, Canada
Associate Professor
Research Areas: System Identification;
Compressed Sensing

Balaji Iyer Vaidyanathan Shantha
PhD – IIT Bombay
Associate Professor
Research Areas: Biomimetics;
Polymer Brushes; Structure-Property Relations;
Biological Soft Matter; Multi Scale Simulations

Praveen Meduri
PhD – University of Louisville, USA
Assistant Professor
Research Areas: Photo electrochemical Water
Splitting; Photocatalysis; Lithium Sulfur Batteries

Satyavrata Samavedi
PhD – Virginia Polytechnic Institute and
State University, USA
Assistant Professor
Research Areas: Biomaterials;
Polymer Physics / Characterization;
Drug Delivery; Stem Cell Differentiation;
Inflammation

Suahanya Duraiswamy
PhD – NUS, Singapore
Assistant Professor
Research Areas: Micro Fluidics; Micro Reaction
Engineering; Biodiagnostics / Biosensors;
Micro Scale Particle Synthesis and Manipulations

Shelaka Gupta
PhD – IIT Delhi
Assistant Professor
Research Areas: Density Functional Theory;
Heterogeneous Catalysis; Biomass Conversion;
Biorenewable Fuels and Chemicals;
Green Chemistry

Patent Filed & Granted

- Patent Title: Cellulose Acetate based Non-woven Nano-fiber Matrix with High Absorbency Properties for Female Hygiene, Name of the Inventors: Chandra Shekhar Sharma, Shital Yadav, Tulika Rastogi, Illa Mani Pujitha, Patent Application Number: CN107075173B.

- Patent Title: Development of Rotary Drum Bioreactor for The Production of Enzymes Using Solid State Fermentation, Name of the Inventors: Devarai Santhosh Kumar, Kruthi Doriya, Anup Ashok, Devulapally Ram Mohan Rao, Patent Application Number: 201841031208.

- Patent Title: A system for optimum product design of hot rolled steels using cyclic evolutionary and classical approach, Name of the Inventors: Itishree Mohanty, Kishalay Mitra, Affan Malik, Pratik Mital, A. N. Bhagat, Patent Application Number: 201731011793.

- Patent Title: Micro Fluidic Devices and methods of fabrication thereof, Name of the Inventors: Sarpras Swain, Lopamudra Giri, S. Surya Kumar, Falguni Pati, Patent Application No.: 201941027664.

- Patent Title: Dense Medium Cyclone for Near Gravity Coal Fraction Separation, Name of the Inventors: Narasimha Mangadoddy, Teja Reddy Vakamalla, Mayank Kumar, Asha Kumari Aketi Veera, Narendra Kumar Nanda, Rajan Kumar, Sivakumar Raparla, Sreedhar Gaekwad Eswarappa, Patent Application Number: PCT/IB2019/055279.

Book / Book Chapter

- K. Gayen, T. K. Bhowmick, S. K. Maity, Sustainable downstream processing of microalgae for industrial application. CRC Press, Taylor & Francis Group 2020, 1-364. https://doi.org/10.1201/9780429027970.

- Recent Advances in Free Surface Flows (2020), G. Biswas and K. C. Sahu In: Dixit U., Dwivedy S. (eds) Mechanical Sciences, Springer, Singapore (https://doi.org/10.1007/978-981-15-5712-5_6).

- Role of Biofilms in Bioprocesses: A Framework for Multidimensional IBM Modeling of Heterogeneous Biofilms.

- P. Kumar, M. Varkolu, S. Mailaram, A. Kunamalla, S. K. Maity, Chapter 12 – Biorefinery Polyutilization Systems: Production of green transportation fuels from biomass, In: Polygeneration with polystorage for chemical and energy hubs. Editor: Kaveh Rajab Khalilpour, Ac, 2019, 373-407.

- S. Sarkar, M. S. Manna, S. K. Maity, T. K. Bhowmik, K. Gayen, Chapter 08 – Integrated approach for the sustainable extraction of carbohydrates and proteins from microalgae, In: Sustainable downstream processing of microalgae for industrial application, Editors: K. Gayen, T. K. Bhowmik, S. K. Maity, 2020, 201-227.

Publications (Journal)

1. Padhi, M. Mangadoddy, N. Sreenivas, T. Vakamalla, T. R., & Mainza, A. N. (2019). Study on multi-component particle behaviour in a hydrocyclone classifier using experimental and computational fluid dynamics techniques. Separation and Purification Technology, 229, 115698. https://doi.org/10.1016/j.seppur.2019.115698.

2. Teja Reddy Vakamalla, Narasimha M., The dynamic behaviour of large-scale 250 mm hydro cyclone: A CFD study, Asia-Pacific Journal of Chemical Engineering, Volume 14, Issue 2, March/April 2019, Article Number e2287. https://doi.org/10.1002/apj.2287.

3. Damodar D., Kunamalla A., Varkolu M., Maity S. K., & Deshpande A. S. (2019). Near-Room-Temperature Synthesis of Sulfonated Carbon Nanoplates and Their Catalytic Application. ACS Sustainable Chemistry and Engineering, 7(15), 12707–12717. https://doi.org/10.1021/acssuschemeng.8b06280.

4. Yenumala, S. R., Kumar P., Maity, S. K., & Shee, D. (2019). Production of Green Diesel from Karanja Oil (Pongamia Pinnata) using mesoporous NiMo-alumina composite catalysts. Bioresource Technology Reports, 7. 7, 100288. https://doi.org/10.1016/j.biteb.2019.100288.

5. Mailaram, S., & Maity, S. K. (2019). Techno-economic evaluation of two alternative processes for production of Green Diesel from Karanja Oil: A pinch analysis approach. Journal of Renewable and Sustainable Energy, 11(2), 025906.

6. Kumar, Pankaj; Maity, Sunil K.; Shee, Debaprasad (2019) Role of NiMo Alloy and Ni Species in the Performance of NiMo / Alumina Catalysts for Hydrodeoxygenation of Stearic Acid: A Kinetic Study ACS OMEGA 4(2) 2833-2843. https://doi.org/10.1021/acsomega.8b03592.

7. Dynamics of Coalescence of a Compound Droplet on a Liquid Pool (2019), H. Deka, G. Biswas, K. C. Sahu, Y. Kulkarni and A Dalal, Journal of Fluid Mechanics, 866, R2 1 -11.

8. Non-isothermal bubble rise dynamics in a self-rewetting fluid: three-dimensional effects (2019), M. Balla, M. T. Tripathi, K. C. Sahu, G. Karapetsas and O. K. Matar, Journal of Fluid Mechanics, 858, 689-713.

9. Linear instability in a miscible core-annular flow of a Newtonian and a Bingham (2019), K. C. Sahu, Journal of Non-Newtonian Fluid Mechanics, 264, 159-169.

10. Evaporation of ethanol-water sessile droplet of different compositions at an elevated substrate temperature (2019), P. Gurrala, P. Katre, S. Balusamy, S. Banerjee and K.C. Sahu, International Journal of Heat and Mass Transfer, 145, 118770.

11. Motion of a droplet on an anisotropic micro-grooved surface (2019), M. Kumar, R. Bhardwaj and K. C. Sahu, Langmuir, 35, 2957-2965.

12. Interfacial instability in pressure-driven core-annular pipe flow of a Newtonian and a Herschel-Bulkley fluid (2019), R. Usha and K. C. Sahu, Journal of Non-Newtonian Fluid Mechanics, 271, 104144.

13. Shape oscillations of a nonspherical water droplet (2019), M. Balla, M. T. Tripathi and K.C. Sahu, Physical Review E., 99, 023107.

14. Spatio-temporal instability of two superposed fluids in a channel with boundary slip (2019), G. Chattopadhyay, K.C. Sahu and R. Usha, International Journal of Multiphase Flow, 113, 264-278.

15. Dynamics of an arched liquid jet under the influence of gravity (2019), M.P. Borthakur, G. Biswas, D. Bandyopadhyay and K.C. Sahu, European Journal of Mechanics - B/Fluids, 74, 1-9.

16. Methanol-based fuel cell on paper support with N-doped graphene oxide/nickel cobaltite composite catalyst (2019), S. Lal, M. Deepa, K.C. Sahu and V.M. Janardhanan, Journal of Electrochemical Society, 166, F190-F197.

17. Lal, Sweta; Deepa, Melepurath; Sahu, Kirti Chandra; Janardhanan, Vinod M. (FEB 20 2019) Methanol-Based Fuel Cell on Paper Support with N-Doped Graphene Oxide/Nickel Cobaltite Composite Catalyst Journal of The Electrochemical Society 166(4)F190-F197 https://doi.org/10.1149/2.0301904jes.

18. Unnikrishnan, Anusree; Rajalakshmi, N.; Janardhanan, Vinod, M. 2019 Kinetics of electrochemical charge transfer in HT-PEM fuel cells Electrochimica Acta 293, 128-140 10.1016/j.electacta.2018.09.171.

19. Gaydhane, M., Choubey, P., Sharma, C. S., & Majumdar, S. (2020). Gelatin nanofiber assisted zero order release of Amphotericin-B: A study with realistic drug loading for oral formulation. Materials Today Communications, 24. https://doi.org/10.1016/j.mtcomm.2020.100953.

20. Laha, A., Gaydhane, M. K., Sharma, C. S., & Majumdar, S. (2019). Compressed nanofibrous oral tablets: An ingenious way for controlled release kinetics of Amphotericin-B loaded gelatin nanofibers. Nano-Structures and Nano-Objects, 19. https://doi.org/10.1016/j.nanoso.2019. Article No. 100367.

21. Raikwar, D., Majumdar, S., & Shee, D. (2019). Thermocatalytic depolymerization of kraft lignin to guaiacols using HZSM-5 in alkaline water-THF co-solvent: A realistic approach. Green Chemistry, 21(14), 3864–3881. https://doi.org/10.1039/c9gc00593e.

22. Yadav, S., Mattaparthi, S., Sreenivasulu, K., Khandelwal, M., Majumdar, S., & Sharma, C. S. (2019). Recycling of thermoplastic polystyrene waste using citrus peel extract for oil spill remediation. Journal of Applied Polymer Science, 136(33). https://doi.org/10.1002/app.47886.

23. Raikwar, D., Munagala, M., Majumdar, S., & Shee, D. (2019). Hydrodeoxygenation of guaiacol over Mo, W and Ta modified supported nickel catalysts. Catalysis Today, 325, 117-130.

24. Swain, Pinaki; Ronghe, Anshaj; Bhutani, Utkarsh; Majumdar, Saptarshi(FEB 7 2019) Physicochemical Response of Gelatin in a Coulombic Soup of Monovalent Salt: A Molecular Simulation and Experimental Study Journal Of Physical Chemistry B 123(5)

1186-1194 https://doi.org/10.1021/acs.jpcb.8b11379.

25. Gumte, K. M., & Mitra, K. (2019). Bio-Supply Chain Network Design to tackle ethanol deficiency in India: A mathematical framework. Journal of Cleaner Production, 234, 208–224. https://doi.org/10.1016/j.jclepro.2019.06.160.

26. Lee, S. B., Mitra, K., Pratt, I., H. D., Anderson, T. M., Ramadesigan, V., Chalamala, B. R., & Subramanian, V. R. (2019). Open data, models, and codes for vanadium redox batch cell systems: A systems approach using zero-dimensional models. Journal of Electrochemical Energy Conversion and Storage, 17(1). https://doi.org/10.1115/1.4044156. Article No. 011008.

27. Pantula, P. D., & Mitra, K. (2019). A data-driven approach towards finding closer estimates of optimal solutions under uncertainty for an energy efficient steel casting process. Energy, 189. https://doi.org/10.1016/j.energy.2019.116253.

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29. Ameenuddin, M., Anand, M., & Massoudi, M. (2019). Effects of shear-dependent viscosity and hematocrit on blood flow. Applied Mathematics and Computation, 356, 299–311. https://doi.org/10.1016/j.amc.2019.03.028

30. M. Ameenuddin, M. Anand, CFD Analysis of hemodynamics in idealized abdominal aorta-renal artery junction: Preliminary study to locate atherosclerotic plaque, Computer Research And Modeling, 11(4): 695-706, (2019). https://doi.org/10.20537/2076-7633-2019-11-4-695-706

31. Machineni, L., & Pawar, P. D. (2019). Role of biofilms in bioprocesses: A framework for multidimensional IBM modelling of heterogeneous biofilms. In Horizons in Bioprocess Engineering. Springer International Publishing, 12 October 2019, 93-112. https://doi.org/10.1007/978-3-030-29069-6_6

32. Adil, K. R., Nathani, A., Sharma, C. S., Lenka, N., & Gupta, P. (2019). Investigation of poly(vinyl) alcohol-gellan gum based nanofiber as scaffolds for tissue engineering applications. Journal of Drug Delivery Science and Technology, 54, December 2019, 101276. https://doi.org/10.1016/j.jddst.2019.101276.

33. Araga, R., Kali, S., & Sharma, C. S. (2019). Coconut-Shell - Derived Carbon/Carbon Nanotube Composite for Fluoride Adsorption from Aqueous Solution. Clean - Soil, Air, Water, 47(5). https://doi.org/10.1002/clen.201800286. Article No. 1800286.

34. Araga, R., & Sharma, C. S. (2019). Amine Functionalized Electrospun Cellulose Nanofibers for Fluoride Adsorption from Drinking Water. Journal of Polymers and the Environment, 27(4), 816–826. https://doi.org/10.1007/s10924-019-01394-2.

35. Dhiman, N., Kingshott, P., Sumer, H., Sharma, C. S., & Rath, S. N. (2019). On-chip anticancer drug screening – Recent progress in microfluidic platforms to address challenges in chemotherapy. Biosensors and Bioelectronics, 137, 236–254. https://doi.org/10.1016/j.bios.2019.02.070.

36. Gaikwad, M. M., Kakunuri, M., & Sharma, C. S. (2019). Enhanced catalytic graphitization of resorcinol formaldehyde derived carbon xerogel to improve its anodic performance for lithium ion battery. Materials Today Communications, 20, September 2019, 100569. https://doi.org/10.1016/j.mtcomm.2019.100569.

37. Gupta, A., Pal, P., & Sharma, C. S. (2019). Surface texturing of silicon 100 in an extremely low concentration TMAH for minimized reflectivity. ECS Journal of Solid State Science and Technology, 8(10), P622–P628. https://doi.org/10.1149/2.0301910jss.

38. Illa, M. P., Khandelwal, M., & Sharma, C. S. (2019). Modulated Dehydration for Enhanced Anodic Performance of Bacterial Cellulose derived Carbon Nanofibers. Chemistry Select, 4(21), 6642–6650. https://doi.org/10.1002/slct.201901359.

39. Illa, M. P., Sharma, C. S., & Khandelwal, M. (2019). Tuning the physiochemical properties of bacterial cellulose: Effect of drying conditions. Journal of Materials Science, 54(18), 12024–12035. https://doi.org/10.1007/s10853-019-03737-9.

40. Mamidi, S., Gangadharan, A., & Sharma, C. S. (2019). Graphite coated pyrolyzed filter paper

as a low-cost binder-free and freestanding anode for practical lithium-ion battery application. Electrochimica Acta, 310, 222–229. https://doi.org/10.1016/j.electacta.2019.04.131.

41. Mattaparthi, S., & Sharma, C. S. (2019a). Fabrication of Self-cleaning Anti reflective Polymer Surfaces by Mimicking Underside Leaf Hierarchical Surface Structures. Journal of Bionic Engineering, 16(3), 400–409. https://doi.org/10.1007/s42235-019-0032-5.

42. Mattaparthi, S., & Sharma, C.S.(2019). Mimicking flower petals to fabricate self-cleaning and antireflective polymer surfaces. Bioinspired, Biomimetic and Nanobiomaterials, 9(1), 45–52. https://doi.org/10.1680/jbibn.19.00017.

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44. Singh Bhati, V., Nathani, A., Nigam, A., Sharma, C.S., & Kumar, M. (2019). PAN/(PAN-b-PMMA) derived nanoporous carbon nanofibers loaded on ZnO nanostructures for hydrogen detection. Sensors and Actuators, B: Chemical, 299, 15th Nov. 2019. https://doi.org/10.1016/j.snb.2019. Article No. 26980.

45. Gangele, A., Ashok, A., Sharma, C.S., Pal, P., & Pandey, A.K. (2019). Frequency analysis of hexagonal microbeam with 2D nanofiber mat. Materials Research Express, 6(8). https://doi.org/10.1088/2053-1591/ab27fe. Article No. 085631.

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Publications (Conference)

1. Gumte, K., Pantula, P. D., Soumitri, M. S., Mitra, K., Data Driven Robust Optimization for Supply Chain Planning Models, 2019 Sixth Indian Control Conference, Hyderabad, India, 2019, pp. 218-223, doi: 10.1109/ICC47138.2019.9123191.

2. Ravi kiran, I., Soumitri, M. S., Mitra, K., Recurrent Neural Network Based Modelling of Industrial Grinding Time Series Data, 2019 Sixth Indian Control Conference, Hyderabad, India, 2019, pp. 1-6, doi: 10.1109/ICC47138.2019.9123235.

3. Singh, R., Sharma, S., Giri, L., and K. Mitra, Dynamic optimization for Optimal production of Indole in a mixed culture, 2019 Sixth Indian Control Conference, Hyderabad, India, 2019, pp. 256-261, doi: 10.1109/ICC47138.2019.9123170.

4. Mittal, P., Mitra, K., Robust Wind Farm Layout Optimization under Uncertainty, 2019 Sixth Indian Control Conference, Hyderabad, India, 2019, pp. 164-169, doi: 10.1109/ICC47138.2019.9123240.

5. Soumitri, M. S., Nagalla, S. H., Mitra, K., Comparative Study of Optimal Long Short Term Memory Networks for One Day Ahead Solar Irradiance Hourly Forecast, 2019 Sixth Indian Control Conference, Hyderabad, India, 2019, pp. 238-243, doi: 10.1109/ICC47138.2019.9123157.

6. Pantula, P. D., Soumitri, M. S., Swain, S., Giri, L., Mitra, K., Automation of Synchronicity Identification in Hippocampal Neurons through Intelligent Data Clustering Approach, 2019 Sixth Indian Control Conference, Hyderabad, India, 2019, pp. 268-273, doi: 10.1109/ICC47138.2019.9123194.

7. Pantula, P. D., Mitra, K., An Evolutionary Machine Learning Approach Towards Less Conservative Robust Optimization, IEEE Congress on Evolutionary Computation, Wellington, New Zealand, June 10-13, 2019, 2990-2997.

8. Mittal, P., Mitra, K., Variable Grid Resolution based Evolutionary Multi-objective optimization towards Micro-siting, IEEE Congress on Evolutionary Computation, Wellington, New Zealand, June 10-13, 2019, 2787-2793.

9. Upadhyay, V., Ravutla, S. R., Dhyani, V., George, K., Swain, S., Mitra, K., Giri, L., A model screening framework for the generation of Ca2+ oscillations in hippocampal neurons using differential evolution, 9th International IEEE EMBS Neural Engineering Conference, San Francisco, CA, USA, March 20-23, 2019. Volume-2019, Article No. 8716993, 961-964.

10. Mittal, P., Malik, A., Mohanty, I., Mitra, K., A hybrid constrained many-objective optimization approach towards production of hot rolled micro alloyed steels, XXVI Conference on Computer Methods in Materials Technology, KomPlasTech 2019, Zakopane, Poland, Jan 13 - 16, 2019, 67-72.

11. Mittal, P., Mitra, K., Determination of optimal layout of wind turbines inside a wind farm in

presence of practical constraints, IEEE Indian Control Conference, IIT Delhi, January 9 - 11, 2019. 14 May, 2019, Article No. 8715616 353-358

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13. Pantula, P. D., Soumitri M. S., Mitra, K., A Novel ANN-Fuzzy Formulation Towards Evolution of Efficient Clustering Algorithm, IEEE Indian Control Conference, IIT Delhi, January 9-11, 2019. 14 May, 2019, Article No. 8715610, 254-259

14. Upadhyay, V., Teja R. S., Dhyani V., George K., Swain, S., Mitra K., Giri, L. A model screening framework for the generation of Ca2+ oscillations in hippocampal neurons using differential evolution; International IEEE/EMBS Conference on Neural Engineering, NER; 20 to 23 March 2019; 16 May 2019, Article number 8716993, Pages 961-964.

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18. Spoorthy D., Manne S. R., Dhyani V., Swain S., Shahulhameed S., Mishra S., Kaur I., Giri L., Jana S.. Automatic Identification of Mixed Retinal Cells in Time-Lapse Fluorescent Microscopy Images using High-Dimensional DBSCAN; Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS; 23 to 27 July, 2019; 8857375, pp. 4783-4786.

19. Kant, K. and Kumar, M. and Banerjee, Raja and Mangadody, Narasimha and et al,. (2019) Numerical study of primary jet breakup in a simplex swirl atomizer using dual grid coupled level set Vof method. In: ASME 2019 Gas Turbine India Conference, GTINDIA, 5-6 December 2019; Code 157040. Volume 2, 2019, V002T04A005.

20. Polisetty, V. G., Varanasi, S. K., & Jampana, P. (2019). Error bounds for identification of a class of continuous LTI systems, IFAC – Papers on Line Vol. 52, Issue 1, pp. 418-423.

21. Varanasi, S. K., Manchikatla, C., Polisetty, V. G., & Jampana, P. (2019). Sparse optimization for image reconstruction in Electrical Impedance Tomography, IFAC – Papers on Line Vol. 52, Issue 1, pp. 34-39.

22. Varanasi, S. K., Swain, S., Giri, L., & Jampana, P. (2019). Identification of neuronal networks from calcium oscillation data. In N. R. J. E. Chachuat B. Bernard O. (Ed.), IFAC-PapersOnLine (Vol. 52, Issue 1, pp. 544-549).

23. Varanasi, S. K., Tirumalaraju, S. V., & Jampana, P. (2019). Comparative Study of Parsimonious NARX Models for Three Phase Separator. 2019 5th Indian Control Conference, ICC 2019 - Proceedings, pp. 430-435.

24. Mandakini Padhi, Mangadoddy, N., Reddy, T., Understanding the interaction of multicomponent particles in hydrocyclone classifier using CFD model, 2019, IMPC2018-29th International Mineral Processing Congress, Moscow; Russian Federation; 17 to 21 September 2018; pp.583-593.

25. Richter, M. C., Mainza, A. N., Govender, I., Mangadoddy, N., Positron emission particle tracking of near gravitational material inside a dense media cyclone, , 2019, IMPC2018-29th International Mineral Processing Congress, Moscow; Russian Federation; 17 to 21 September 2018; pp.573-582.

26. Vadlakonda, B., Kopparthi, P., Mukhurjee, A. K., Mangadoddy, N. Investigation of column flotation hydrodynamics using electrical resistance tomography coupled with pressure transducers, 2019, , IMPC2018-29th International Mineral Processing Congress, Moscow; Russian Federation; 17 to 21 September 2018, Pages 2061-2070.

27. Asha Kumari, A. V., Narasimha, M., Raja Banerjee, R., Sreedhar, G. E., Shivakumar, R., Kumar, R., Numerical simulation of the effect of near gravity density particles on the performance of DMC treating coal, 2019, IMPC2018-29th International Mineral Processing Congress, Moscow; Russian Federation; 17 to 21 September 2018, Pages 3489-3500.

28. Aketi, V.A.K., Suresh, K., Narasimha, M., Jodan, P.S., Sreedhar, G.E., Shiva Kumar, R., Kumar, R., Experimental analysis of NGM coal particles behaviour in DMC, 2019, IMPC2018-29th International Mineral Processing Congress, Moscow; Russian Federation; 17 to 21 September 2018, Pages 939-948.

Funded Research Projects

- Dr. Debaprasad Shee, Project Code: SERB/CHE/F069/2018-19/PDF34, Project Title: Design of Novel Catalysts for the Production of 2,5-Furandicarboxylic Acid (FDCA) from Biomass, Sponsoring Agency: DST-SERB, 22.4L (Project start date: 15/04/2020).

- Dr. Kishalay Mitra, Project Type: Grant-in-Aid, Project Code: MHRD/CHE/F089/2019-20/G226, Project Title: Wind farm layout optimization under uncertainty using wind speed forecasting through probabilistic models and comparison with machine learning algorithms., Sponsoring Agency: SPARC, 47.5L.

- Dr. Vinod M Janardhanan, Project Type: Grant-in-Aid, Project Code: SERB/CHE/F031/2019-20/G239, Project Title: Development and Demonstration of Solid Oxide Electrolysis cell technology for Co-electrolysis of CO_2 and H_2O for the production of Syngas, Sponsoring Agency: DST-IMPRINT (The amount shown is share for IITH), 17.2L.

- Dr. Saptarshi Majumdar, Project Type: Grant-in-Aid, Project Code: DBT/CHE/F040/2019-20/G244, Project Title: Multiple Drug Nano Formulation and Quantatative Imaging of Cellular Response for Glaucoma Treatment Protocol, Sponsoring Agency: DBT, 55.1L.

- Dr. Kishalay Mitra, Project Type: Grant-in-Aid, Project Code: DBT/CHE/F089/2019-20/G282, Project Title: Application of Artificial Intelligence and Optimal Control in Optimizing Protein/Vaccine Production in Bioreactor System: A step towards affordable Bio-molecule Production, Sponsoring Agency: DBT, 54.3L.

- Dr. Narasimha Mangadoddy, Project Code: Tata/CHE/F046/2019-20/S100, Project Title: Design Modifications of TATA-JK Dense Medicum Cyclone for the efficient separation of Middling coal using CFD, Sponsoring Agency: TATA Steel, 9.9L.

- Dr. Saptarshi Majumdar, Project Code: Tata/CHE/F040/2019-20/S101, Project Title: Feasibility study for the production of Hierarchical carbon Nano Materials from Tailing Coal and Coal Tar, Sponsoring Agency: TATA Steel, 27L.

- Dr. Meduri Praveen, Project Code: HBL/CHE/F148/2019-20/S111, Project Title: Micron Sized Silicon Materials and Lithium Titanate as Anodes for Lithium Ion Batteries (LIBs), 25.7L.

Seminar Conducted

- Dr. Kishalay Mitra organized 6th IEEE Indian Control Conference at IIT Hyderabad as Finance chair and local organization co-chair during December 18 - 20, 2019.

- Dr. Kishalay Mitra organized 4th workshop on Neural Networks and Its Application to Optimization Based Control at College of Engineering Pune, Dec 2 - 6, 2019.

- Co-convenor & Speaker: 3-day workshop on Applied Statistical Analysis at TATA Steels, Jamshedpur, Dr. Satyavrata Samavedi and Dr. Lopamudra Giri (June 2019).

- Organizer / Speaker at a one-day workshop organized under the Aegis of Indian National Young Academy of Sciences (INYAS) at the University of Hyderabad, Dr. Chandra S. Sharma and Dr. Satyavrata Samavedi along with others (Feb 2020).

Awards & Recognitions

- Dr. Chandrasekhar Sharma, Associate Professor, has been selected as a Member, National Academy of Sciences, India (NASI) (2019).

- Dr. Chandrasekhar Sharma, Associate Professor, has been selected as an Associate Editor, Special Issue on Carbon-MEMS in Nature's Microsystems and Nanoengineering Journal (October 2019).

- Dr. Chandrasekhar Sharma, Associate Professor, selected as an Expert Advisory Committee Member on Waste Management, DST, Govt. of India.

- Dr. Chandra Shekhar Sharma, Associate Professor, has been invited to join SERB-SUPRA Screening Committee as a member for Engineering Sciences (Jan. 2020).

- Dr. Chandra Shekhar Sharma, Associate Professor, has been included as a Special Invitee of Project Advisory Committee (PAC) – 'Materials & Engineering Sciences' of International Bilateral Cooperation Division (IBCD), Department of Science & Technology, GoI, Feb. 2020.

- Dr. Chandra Shekhar Sharma, Associate Professor, has been elected as Chairperson, Indian National Young Academy of Sciences (INYAS) for a period of two years (Feb. 2020-Feb.2022). (Feb. 2020).

- Dr. Chandra Shekhar Sharma, students has received
    - Mr. Mamidi Suresh wins the Best Poster Award in 2nd KPIT Shodh Awards at IISER-Pune (Jan. 2020).
    - Vikram Kishore Bharti wins INAE Best MTech Thesis Award (2019).
    - Mamidi Suresh wins First Prize in Nano Artography International Competition (Sept. 2019).
    - Poonam Rani wins Best Poster Presentation Award in National Conference on Carbon Materials (Nov. 2019).
    - Poonam Rani wins Best Poster Presentation Award in National conference on Solid State Ionics (Dec. 2019).

- Dr. Debaprasad Shee, Associate Professor, elected as an Associate Fellow of the Telangana Academy of Sciences (TAS), 2019.

- Dr. Kishalay Mitra, Associate Professor, has been selected as an academic partner by IBM Research, India under Open Science Collaboration Program.

- Dr. Kishalay Mitra, Associate Professor, has been selected as Associate Editor, Journal of The Institution of Engineers (India): Series E, Springer.

- Dr. Kishalay Mitra, Associate Professor, has been selected as Member, Board of Studies, Department of Instrumentation and Control, College of Engineering Pune, Pune.

- Dr. Kishalay Mitra, Associate Professor, has been selected as Member, International Program Committee, IEEE Indian Control Conference.

- Dr. Kishalay Mitra, Associate Professor, has been selected as Member, International Advisory Committee, International Conference on Power, Control and Communication Infrastructure (ICPCCI 2019).

- Dr. Kishalay Mitra, Associate Professor, has been selected as Member of Executive Council of Asian Society for Research in Engineering Sciences (ASRES).

- Dr. Narasimha Mangadoddy, Associate Professor, has received Best poster award won by Ms. Mandakini Padhi (PhD scholar) at international Conference on the Advances in Process Metallurgy, 4-5 July 2019, Bengaluru, India.

- Dr. Narasimha Mangadoddy, Associate Professor, has received Best Paper Award (regional chapter) won by Ms. Mandakini Padhi (PhD Scholar) at XVIII Mineral Processing Technology Conference (MPT)-2019,16-18 Dec, Hyderabad.

- Dr. Narasimha Mangadoddy, Associate Professor, has received Best Poster Award won by Mr. Aman Mittal (PhD Scholar) at XVIII Mineral Processing Technology Conference (MPT)-2019,16-18 Dec, Hyderabad.

- Dr. Narasimha Mangadoddy, Associate Professor, became International Advisory Committee Member for IMPC (International Mineral Processing Congress) from India representing Academic Research since 2019 onward.

- Dr. Satyavrata Samavedi, Assistant Professor Grade-I, selected as an Editorial board member: Scientific Reports (June 2019- present).

- Dr. Satyavrata Samavedi, Assistant Professor Grade-I, has been Inducted member, Indian National Young Academy of Sciences, INYAS (2019-2023).
- Dr. Sunil Kumar Maity, Professor, following paper was selected as the best paper award. S. Mailaram, N. Dobhal and Sunil K. Maity, Techno-economic Analysis for Production of Biodiesel and Green Diesel from Microalgal Oil. Conference: 7th International Conference on Advances in Energy Res.
- Dr. Sunil Kumar Maity, Professor, following paper was selected as the Featured Article: S. Mailaram, S. K. Maity, Techno-economic

Evaluation of Two Alternative Processes for Production of Green Diesel from Karanja Oil: A pinch analysis approach. Journal of Renewable and Sustainable Energy.
- Prof. Kirti Chandra Sahu, Professor, has been selected as Member of External Affairs Committee – American Physical Society's Division of Fluid Dynamics (DFD) (2019-2021).
- Dr. Saptarshi Majumdar, Professor, Inducted as 'Advisory Committee Member' for Indian Institute of Petroleum & Energy, Vizag (Ministry of Petroleum, GoI).

Highlights
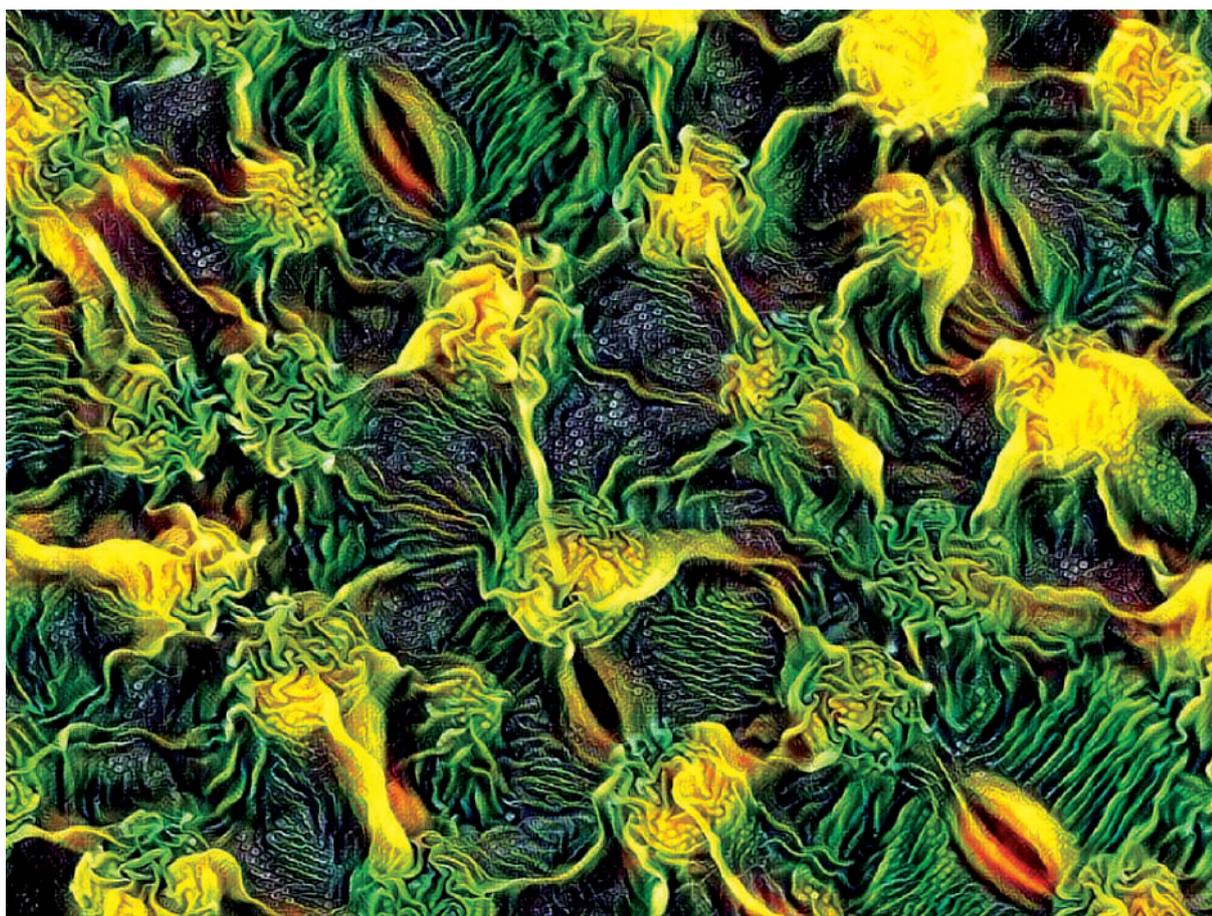
Image 1: Hierarchy in Nature: Epidermal Cells of Leaf

Self-organized micron-size epidermal cells holding each other with nano sized grooves on Cryptolepisbuchanani leaf Image credit: Srinadh Mattaparthi, Chandra Shekhar Sharma

Reference: Mattaparthi, S., Sharma, C. S., Fabrication of self-cleaning anti-reflective polymer surfaces by mimicking underside leaf hierarchical surface structures, J. Bionic Engg., 2019, 16(3), 400-09.

Image 2: Nano Petals Scanning Electron Microscopy (SEM) image of Cobalt Oxide Nano Petals

This image depicts cobalt oxide Nano Petals derived from Metal-Organic Frameworks (MOFs). This unique morphology of Nano Petals based anode provided an ultra-high capacity at large current densities in Li-Ion batteries.

This image was judged as Best Image in an International Science Image Competition, Nano-Artography, organized by Drexel University, USA.

Image credit: Mamidi Suresh, Chandra Shekhar Sharma
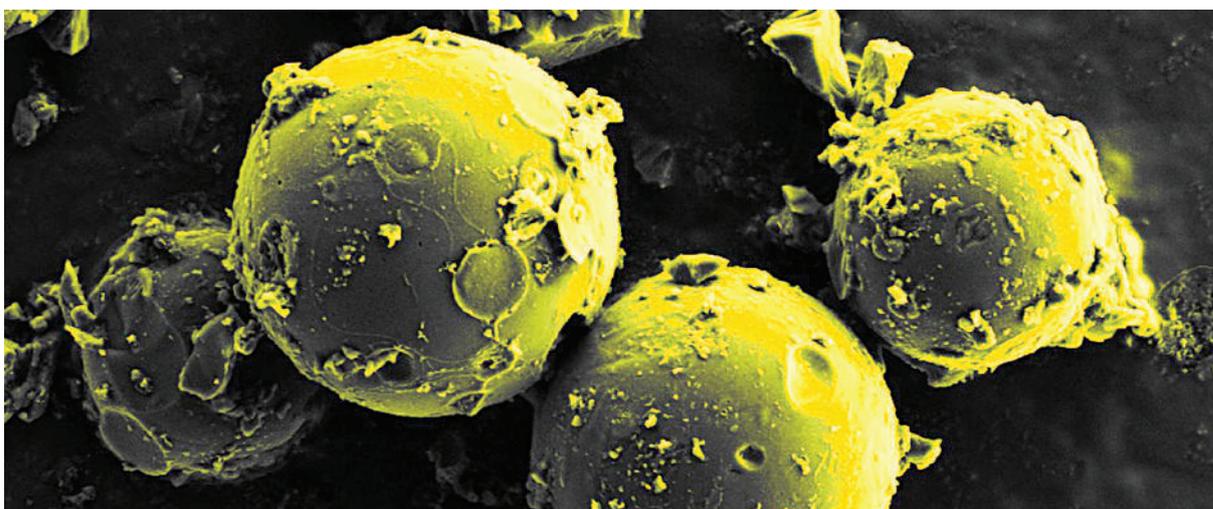
Image 3: The Carbon Galaxy

This is a colored scanning electron microscopy of carbon micro-particles as derived after catalytically graphitizing resorcinol formaldehyde xerogel at 1100 °C. Image credit: Mamidi Suresh, Chandra Shekhar Sharma

Reference: Mayur M. Gaikwad, Manohar M. Kakunuri, Chandra S. Sharma, Enhanced catalytic graphitization of resorcinol formaldehyde derived carbon xerogel to improve its anodic performance for lithium ion battery, Materials Today Communications, 2019, 20, 100569.

Chemistry

The Department started functioning from the very inception of IITH. Both Theory and Laboratory Teaching Programs for UG have started from the very first day of IITH. The Department has the distinction of starting the first PG program in science at IITH. This two year MSc Chemistry degree program was started in 2010. Besides, the state-of-the-art PG and research laboratories were established. The Department is committed to excellence in chemistry by establishing research programs for meeting scientific and technological challenges faced by the ever changing, science centered world of the 21st century. Our aim is to produce highly sought after and knowledgeable graduates for pursuing careers with Academia, Industry and Government. The department has been conducting cutting edge research in contemporary topics in Physical, Organic and Inorganic Chemistry. Various state-of-the-art research facilities such as 400 Mhz NMR, esR, hRMs, Single Crystal – and Powder – XRD, CD, Fluorescence / Lifetime and Raman Spectrometers, Atomic Force Microscopy (with conductive, electrostatic force, magnetic force, surface potential, nanolithography modes), Gas Chromatography-Mass Spectrometer, hPIC, High Resolution Lasers etc., are available in the department.

Faculty

G Satyanarayana

PhD – IISC Bangalore

Professor & HoD

Research Areas: Transition-Metal Catalysis; Development of New Methodology and Total Synthesis and Drug Diversity Oriented Synthesis

Faiz Ahmed Khan

PhD – University of Hyderabad

Professor

Research Areas: Transition Metal-Mediated Reactions in Organic Synthesis; Discovery of New Methodologies and Control of Stereochemistry in Organic Synthesis; Chemical Synthesis in Ionic Liquids; and Supported Catalysts; Synthesis of Natural and Aesthetically Pleasing

Ch Subrahmanyam

PhD – IIT Madras

Professor

Research Areas: Catalysis; Nanomaterials and Energy Systems

G Prabusankar

PhD – IIT Bombay

Professor

Research Areas: Organometallic Synthesis; Late Transition Metal Chemistry; Heavier Main Group P-Block Chemistry; Molecular Activation; Molecules to Materials; Molecules for Medicines

Melepurath Deepa

PhD – Delhi University

Professor

Research Areas: Applied Electrochemistry

Tarun K Panda

PhD – Free University - Berlin, Germany

Professor

Research Areas: Main Group Chemistry; Coordination Chemistry; Lanthanide Chemistry; Homogeneous Catalysis; X-Ray Crystallography and Structure Analysis

Bhabani S Mallik

PhD – IIT Kanpur

Associate Professor

Research Areas: Computational Chemistry; Molecular Dynamics; Statistical Mechanics

D S Sharada

PhD – University of Hyderabad

Associate Professor

Research Areas: Organo / Bio / Photoredox Catalysis; Asymmetric Synthesis and Chemical Biology

Surendra K Martha

PhD – IISC Bangalore

Assistant Professor

Research Areas: Materials Electrochemistry with Special Emphasis on Lead-acid; Li-ion; Sodium ion Batteries and Supercapacitors

Somnath Maji

PhD – IIT Bombay

Assistant Professor

Research Areas: Synthetic Coordination / Bio-Inorganic / Organometallic Chemistry; Metal Catalyzed Water Splitting / Carbon Dioxide Reduction / Hydrogen Generation; Applications of Molecular Catalysts in Functional Devices for Production of Solar Fuels

Surajit Maity

PhD – IIT Bombay

Assistant Professor

Research Areas: Physical Chemistry; Spectroscopy and Dynamics of Molecules Ions and Radicals

Jai Prakash

PhD – IIT Delhi

Assistant Professor

Research Areas: Inorganic Chemistry; Crystallography; Metal Chalcogenides and Intermetallics

Ashutosh Kumar Mishra
PhD – IIT Kanpur
Assistant Professor
Research Areas: Bioorganic Chemistry

Venkata Rao Kotagiri
PhD – JNCASR, Bangalore
Assistant Professor
Research Areas: Functional Organic Materials;
Supramolecular Chemistry;
Organic Semiconductors

Krishna Gavvala
PhD – IISER Pune
Assistant Professor
Research Areas: Biophysical Chemistry;
Time-Resolved Spectroscopy and
Single-Molecule Characterisation

Saurabh Kumar Singh
PhD – IIT Bombay
Assistant Professor
Research Areas: Computational Inorganic
Chemistry; Molecular Magnetism;
Electronic Structure Theory; Heavy Element

Patent Filed / Granted

• Patent Title: High energy density secondary lithium batteries, Name of the Inventors: Surendra Martha, S. Krishna Kumar, Sourav Ghosh, Patent Number: 201841024810

• Patent Title: Formation of positive electrode used for forming battery, involves providing carbon fibers, binder composition comprising conductive carbon and lithium – rich composition, creating homogeneous slurry, and thermally treating slurry, Name of the Inventors: Nanda J.; Dudney N. J., Narula C. K., Pannala S., Unocic R. R., Martha S. K., Patent Number: US2019157712-A1 (US Pat.)

Book / Book Chapter

• Nanostructured Anode Materials for Batteries (Chapter 3: Lithium Ion, Ni-MH and Lead-acid and Thermal Batteries), Surendra Kumar Martha, Liju Elias, (Editors Poulomi Roy, S. K. Srivastava), Publisher: John Wiley & Sons, 2019, 147-230.

Publications (Journals)

1. Das, A., Kolay, A., Shivaprasad, S. M., & Deepa, M. (2019). Poly (3,4-ethylenedioxypyrrole) coating and poly (4-styrenesulfonate) polyanions enhance solar cell performance. Chemical Engineering Journal, 374, 292-303. https://doi.org/10.1016/j.cej.2019.05.156

2. Kokal, R. K., Bredar, A. R. C., Farnum, B. H., & Deepa, M. (2019). Solid-State Succinonitrile/Sulfide Hole Transport Layer and Carbon Fabric Counter Electrode for a Quantum Dot Solar Cell. ACS Applied Nano Materials, 2(12), 7880-7887. https://doi.org/10.1021/acsanm.9b01873

3. Kokal, R. K., Raavi, S. S. K., & Deepa, M. (2019). Quantum Dot Donor-Polymer Acceptor Architecture for a FRET-Enabled Solar Cell. ACS Applied Materials and Interfaces, 11(20), 18395-18403. https://doi.org/10.1021/acsami.9b01792

4. Kolay, A., Maity, D., Ghosal, P., & Deepa, M. (2019a). Carbon@Tellurium Nanostructures Anchored to a Si Nanowire Scaffold with an Unprecedented Liquid-Junction Solar Cell Performance. ACS Applied Materials and

Interfaces, 11(51), 47972–47983. https://doi.org/10.1021/acsami.9b17573.

5. Kolay, A., Maity, D., Ghosal, P., & Deepa, M. (2019b). Selenium nanoparticle-decorated silicon nanowires with enhanced liquid-junction photo electrochemical solar cell performance. Journal of Physical Chemistry C, 123(14), 8614-8622. https://doi.org/10.1021/acs.jpcc.9b00062.

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Publications (Conference)

- Damaraju M., Bhattacharyya D., Panda T., Kurilla K.K. E3S Web of Conferences; 27 to 29 August 2018; EDP Sciences; 2019. Volume : 93, 17 April, 2019, Article no: 02005 Application of a continuous bipolar mode electrocoagulation(CBME) system for polishing distillery waste water.

Seminar Conducted

- Organized: IIT-H & Its EV International Workshop on Dawn of A New Era for Indian Automotive Industry by Creating New Lithium ion Battery Fits for High Temperature and Promoting Pollution-Free EV World in India, Saturday, November 30, 2019 10:00 AM, 'A'-Block Auditorium, Indian Institute of Technology Hyderabad (IIT-H) Kandi, Sangareddy-502285, Telangana.

- A seminar by Prof. Osamu Tsutsumi, Department of Applied Chemistry, Ritsumeikan University, Japan. Title: Tunable Luminescence of Gold(I) Complexes with High AIE Character. Date: 24/02/2020 (Monday). Time: 2:30PM - 3:30PM Title: Mechano-Optical Behavior of Chiral Liquid-Crystalline Elastomers: Visualiza-

tion of Force toward Sensor Applications by Prof. Osamu Tsutsumi, Department of Applied Chemistry, College of Life Sciences, Ritsumeikan University, Japan Time: 11:00 AM-12:00 PM. Date: 1st Aug 2019 Title: Helical Axis.

- Orientation in Micro Particles of Cholesteric Liquid Crystal Polymers for Omni-Directional Reflection Behavior by Dr. Kyohei Hisano, Department of Applied Chemistry, College of Life Sciences, Ritsumeikan University, Japan Time: 12:00 PM - 01:00 PM. Date: 1st Aug 2019.

- Prof. Vincent Gandon, Institut de Chimie Moléculaire et des Matériaux d'Orsay (IC-MMO), Université Paris-Sud, France. TITLE: "Calcium in Organic Synthesis" Time: 3.30 PM on 27th August 2019.

- Prof. A. T. Biju, Editor-in-Chief, J. Heterocyclic Chem. The Department of Organic Chemistry, Indian Institute of Science, Bangalore. TITLE: "Organocatalysis Using N-Heterocyclic Carbenes (NHCs)" Time: 3.00 PM on 2nd August.

- Prof. G. Sekar, Department of Chemistry, Indian Institute of Technology Madras. TITLE: "The Halogen–Bonding Catalysis: An Efficient Tool for Functional Group Activation" Time: 9.30 AM on 25th July.

- Prof. Anil Kumar Saikia, Department of Chemistry, Indian Institute of Technology Guwahati. TITLE: "Stereoselective Synthesis of Heterocyclic Compounds" Time: 2.00 AM on 25th July.

- Prof. Irishi N. N. Namboothri, Department of Chemistry, Indian Institute of Technology Bombay. TITLE: "Synthesis of Heterocycles and Carbocycles via Hauser-Kraus Annulation of Phthalides with Nitroalkenes and Other Electron Deficient Alkenes" 10.00 AM on 24th July.

- Prof. K. R. Prabhu, Department of Chemistry, Indian Institute of Science, Bangalore. TITLE: "Directed C-H Bond Reactions for C-H Functionalization of Organic Molecules" Time: 2:30 PM on 24th July.

- Prof. Sambasivarao Kotha, Department of Chemistry, Indian Institute of Technology Bombay. Title: Development of New Synthetic Strategies and Tactics: Their impact, implications and applications. Date & Time: 28th March 2019, 10:30 AM.

- Prof. S. Baskaran, Department of Chemistry, Indian Institute of Technology Madras. Title: Reversal of Polarity by SET Oxidation: Novel Synthesis of Heterocyclic Ring Systems, Date & Time: 28th March 2019 4:00 PM.

Funded Research Projects

- Prof. Subrahmanyam Challapalli, Project Type: Grant-in-Aid, Project Code: MHRD/CHY/F019/2019-20/G229, Project Title: Hot and Multi Electron Mediated Photo Electrochemical Methods High Efficiency Water Splitting, 53.4L.
- Dr. Surendra Kumar Martha, Project Type: Grant-in-Aid, Project Code: DST/CHY/F112/2019-20/G253, Project Title: Recycling Lithium Ion Batteries for a Sustainable Technological and Economic Development Relisted, Sponsoring Agency: DST-UKIERI, 43L.
- Dr. Surendra Kumar Martha, Project Type: Grant-in-Aid, Project Code: DST/CHY/F112/2019-20/G260, Project Title: DST-IISC Energy Storage Platform on Supercapacitores, Sponsoring Agency: DST, 553.6L.
- Dr. Surajit Maity, Project Type: Grant-in-Aid, Project Code: SERB/CHY/2019-20/G269, Project Title: Excited State Hydrogen Transfer in Micro Solvated N-H Bearing Molecules: Determination of the Hydrogen Bonded Structures Properties and Tautomerization Reaction Products, Sponsoring Agency: DST-SERB, 53.9L.

Awards & Recognitions

- Dr. Deepa M, Professor, PhD Student: Ms. Ankita Kolay, won the 3rd place at the 'IIT Bombay Metrohm Young Chemist Award 2019' contest, with a cash prize of Rs. 1 Lakh.
- Dr. G Prabu Sankar, Professor, Chemistry, has received DUO-ASEM Professor Fellowship-2020.
- Dr. Sharada D. S, Associate Professor, has been selected as an Associate Fellow, Telangana Academy of Sciences.
- Dr. Subrahmanyam Challapalli, Professor, has been selected as a Fellow of Telangana Academy of Sciences.

- Dr. Sharada, Associate Professor, PhD Student: Mr. Narender Reddy Katta won Young Achiever Award, 2019 from INSC Bangalore.

Highlights

Aluminium catalysed chemo-selective reduction of tert-amides with pinacolborane (HBpin) to furnish corresponding tert-amines using earth abundant Al complex under solvent free, base free and mild conditions is reported.

The work on a steric controlled oxidation of mesoionic selone using copper(II) salt to yield a rare tetraselenide from dimerized diselenides through chalcogen bonding (ChB) has been invited for the Cover Page of European Journal of Inorganic Chemistry, Wiley-VCH, Germany. More information can be found in the paper by G. Prabusankar et al., Eur. J. Inorg. Chem. 2020, 2403-2407.

The work on a rare intramolecular Au···H-C(sp3) hydrogen bonding interaction and blue light-emitting properties of gold(I)-N-heterocyclic carbene complex has been invited for the Cover Page of American Chemical Society, USA. More information can be found in the paper by G. Prabusankar et al., Organometallics 2020, 39, 2202–2206.
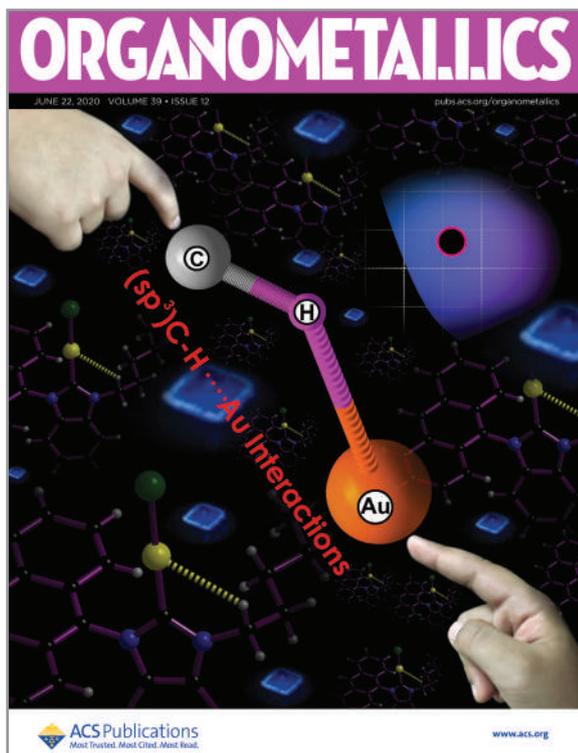
The work on homoleptic and heteroleptic Zn(II) selone catalysts for thioetherification of aryl halides without scrubbing oxygen has been invited for the Cover Page of New Journal of Chemistry, Royal Society of Chemistry, United Kingdom. More information can be found in the paper by G. Prabusankar et al., New J. Chem., 2020, 44, 3574-3583.
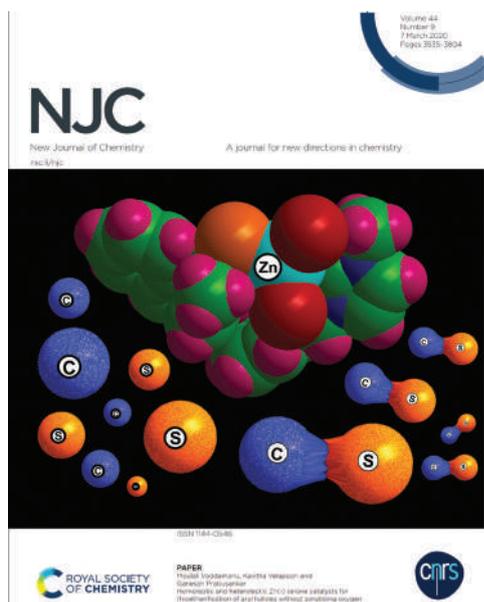
Honorable Minister of Human Resource Development, Government of India, Dr. Ramesh Pokhriyal Nishank has tweeted the Amyotrophic lateral sclerosis (ALS) work of Dr. Basant Patel & Dr. Ganesan Prabu Sankar from his official Twitter handle with MHRD impression. More information can be found in the paper International Journal of Biological Macromolecules, 2020, 147, 117-130

A strategic approach: The formation of three rings and three contiguous stereogenic centers has been accomplished with high regio- and diastereo selectivity for the assembly of structurally complex molecular architectures via a novel multicomponent quadruple domino reaction (MCQDR) leading two N–C, two C–C and one O–C bonds. Solvents, catalysts and work-up free features are the interesting aspects making the protocol efficient, green and atom economical.
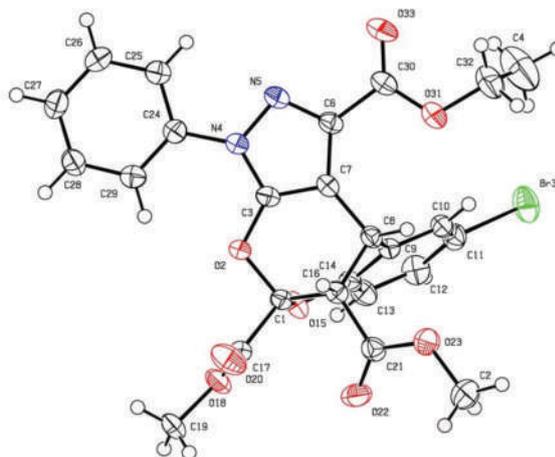
Civil Engineering

Department of Civil Engineering is focused on both basic and applied research to provide solutions that help drive the future evolution of Civil Engineering (CE). Industry interaction and academic exchanges are an integral characteristic of our department. The Department offers a Bachelor of Technology (BTech) program in Civil Engineering, and two year and three year Master of Technology with thesis (MTech with thesis) and all-course work MTech programs in three specializations: Environmental and Water Resource Engineering, Geotechnical Engineering, and Structural Engineering. The department also offers a Doctor of Philosophy (PhD) program in five specializations: Environmental Engineering, Geotechnical Engineering, Structural Engineering, Transportation Engineering and Water Resources Engineering. CE faculty are committed to deliver knowledge and expertise in wide spectrum of Civil Engineering and are actively involved with research that caters to the societal needs in general. We are proud to share that CE faculty and grad students are involved with sponsored projects from various funding agencies that include Ministry of New and Renewable Energy, National Highway Authority of India, Ministry of Environment & Forests, Ministry of Human Resources & Development, Defence Research and Development Organization, Department of Science & Technology, Ministry of Housing & Urban Affairs, etc., along with other industries.

EARTH PROVIDES ENOUGH TO SATISFY EVERY MAN'S NEED BUT NOT EVERY MAN'S GREED."
– *Mahatma Gandhi*

Faculty

Shashidhar
PhD – IIT Madras
Associate Professor & HoD
Research Areas: Bio-remediation; Contaminant Hydrology; Hydraulic Transients; Hydro Climate; Hazardous Waste Management; Wastewater Treatment; Remote Sensing and GIS Applications

K V L Subramaniam
PhD – Northwestern University, USA
Professor
Research Areas: Concrete Material and Structures; Structural Health Monitoring; Material Characterization

S Sireesh
PhD – IISC Bangalore
Professor
Research Areas: Pavement Geotechnics; Geosynthetics; Recycled Materials; Ground Improvement

Amirtham Rajagopal
PhD – IIT Madras
Associate Professor
Research Areas: Damage Mechanics; Fracture Mechanics; Finite Element and Mesh Free Methods

B Umashankar
PhD – Purdue University, USA
Associate Professor
Research Areas: Foundation Engineering; Reinforced Soil; Soil-Structure Interaction; Recyclable Materials in Geotechnics

S Suriya Prakash
PhD – Missori University of Science & Technology – Rolla, USA
Associate Professor
Research Areas: Precast Systems; Prestressed Concrete; Structural Concrete Behavior; Structural Strengthening

Mahendrakumar Madhavan
PhD – University of Alabama – Birmingham, USA
Associate Professor
Research Areas: Affordable Housing; Sustainable Materials; Cold-Formed Steel; Structural Steel Design; Cold-Formed Steel Wall Panels; CFRP Retrofitting of Steel Structures; Cold-Formed Steel (CFS) Connections; Composite (Steel-Concrete) Construction

Asif Qureshi
PhD – Swiss Federal Institute of Technology, Switzerland
Associate Professor
Research Areas: Environmental Science and Public Health

K B V N Phanindra
PhD – New Mexico State University, USA
Associate Professor
Research Areas: Groundwater Modeling; Soil-Water-Plant Interactions; Remote Sensing & GIS; Eco-Hydrological Processes

Debraj Bhattacharyya
PhD – University of New Brunswick, Canada
Associate Professor
Research Areas: Water & Wastewater Treatment; Solid Waste Management; Renewable Energy (Biofuel)

B Munwar Basha
PhD – IISC Bangalore
Associate Professor
Research Areas: Unsaturated Soil Mechanics; Reliability Based Design; Geotechnical & Geoenvironmental Engineering; Computational Geomechanics; Municipal Solid Waste Landfills; Soil Dynamics and Earthquake Resistant Design; Retaining Structures; Reliability Analysis of Pavement Geotechnics; Rock Mechanics

Anil Agarwal
PhD – Purdue University, USA
Assistant Professor
Research Areas: Structural Fire Engineering; High-Temperature Testing; Large-Scale Testing; Collapse Prevention; Structural Design for Extreme Conditions; Steel Structures; Composite Structures; Earthquake Resistant Design; Structural Strengthening

Faculty

Surendra Nadh Somala
PhD – California Institute of Technology, USA
Assistant Professor
Research Areas: Earthquake Resistant Design of Structures; Active and Passive Structural Vibration Control; Seismic Resilience; Imaging and Inversion of Seismic Source & Structure; Engineering Seismology; Computational Fracture Mechanics

Digvijay S Pawar
PhD – IIT Bombay
Assistant Professor
Research Areas: Driver and Pedestrian Behavioral Modeling; Traffic Safety and Accident Analysis; Traffic Operation and Simulation; Intelligent Transportation Systems; Statistical Modelling and Classification Technique; Naturalistic Driving Study And Human Factors

Satish Regonda
PhD – University of Colorado at Boulder, USA
Assistant Professor
Research Areas: Urban and Rural Flood Modeling; Climate Sciences; Data Sciences; Statistical Modeling Techniques; Ensemble Forecasting; Tools and Products Development; GIS; R; Shiny

Seetha N
PhD – IISC Bangalore
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Research Areas: Porous Media; Colloids; Flow; Transport; Multi-Scale Modeling; Up scaling

Pritha Chatterjee
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Assistant Professor
Research Areas: Waste Treatment; Resource Recovery from Waste; Bioenergy; Bioelectro Chemical Systems; Anaerobic Digestion

Sk Zeeshan Ali
PhD – IIT Kharagpur
Assistant Professor
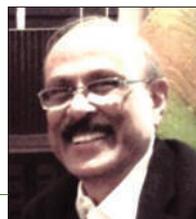*Research Areas:* Water Resources Engineering

Ambika S
PhD – IIT Madras
Assistant Professor
Research Areas: Environmental Engineering

D Chandrasekharam
PhD – IIT Bombay
Visiting Professor
Research Areas: Groundwater Pollution; Geothermal Energy

Civil Engineering

Book / Book Chapter

- Sireesh, S., Umashankar, B., and Deepti, A. (Eds.) (2019). Advances in Geotechnical and Transportation Engineering. Proceedings from International Conference on Futuristic Approaches in Civil Engineering (FACE), Springer Publisher.

- Arif Ali Baig Moghal, B. Munwar Basha, Mohammed Ashfaq. (2019). Probabilistic Study on the Geotechnical Behavior of Fiber Reinforced Soil. In: Latha G. M. (eds) Frontiers in Geotechnical Engineering. Developments in Geotechnical Engineering, Springer.

- Peddinti P. R. T., Munwar Basha B., Saride S. (2019). Evaluation of Flexible Pavement Distress Using Nonlinear Regression Analysis. Lecture Notes in Civil Engineering (167-176), Springer.

- Rayabharapu V. K., Saride S. (2019). Contact Pressure Distribution in Geocell Reinforced Rural Roads. Lecture Notes in Civil Engineering (393-408), Springer.

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- Sireesh Saride and Deepti A (2019) Chapter: Development of Fly Ash Stabilized Recycled Base Material (FRB) for Indian Highways, In book: Geotechnical Design and Practice, Ilamparuthi K., Robinson R. (eds) Springer, pp.137-147, DOI: 10.1007/978-981-13-050.

- Sireesh Saride and Vinay K.V (2019) Chapter 8: Reflection Crack Assessment Using Digital Image Analysis, In book: Frontiers in Geotechnical Engineering, Madhavi Latha G. (eds) Springer, pp. 139-156, https://doi.org/10.1007/978-981-13-5871-5.

- Vinay Kumar V., Saride S. (2019). Influence of Crack Depth on Performance of Geosynthetic-reinforced Asphalt Overlays. Lecture Notes in Civil Engineering (181-193), Springer.

- Hariprasad C., Umashankar B., Garala T. K. (2019). Lightweight deflectometer for compaction quality control. Lecture Notes in Civil Engineering(35-42), Springer.

- Shiva Bhushan J. Y. V., Parhi P.S., Umashankar B.. (2019). Geotechnical Characterization of Construction and Demolished (C&D) Waste. Lecture Notes in Civil Engineering (27-34), Springer.

- Sravanam S. M., Balunaini U., Madhav M. R. (2019). Reinforcement Tensile Forces in back-to-back Retaining Walls. Lecture Notes in Civil Engineering (173-181), Springer.

- Umaharathi N., Bhargav Kumar K. P., Umashankar B..(2019). Effect of Plastic Fines on Shear Strength of Sands. Lecture Notes in Civil Engineering (51-58), Springer.

- Garg R., Vemuri J. P., Subramaniam K. V. L. (2019). Correlating Peak Ground A/V Ratio with Ground Motion Frequency Content. Lecture Notes in Civil Engineering (69-80), Springer.

- S. S. Prakash and Bambhole, A. (2019). Chapter 5 - Structural Condition Assessment. ASTR GL-01: Guidelines for Structural Rehabilitation and Retrofitting, Allied Publishers, Pages 167-192, ISBN-978-93-87997-80-6.

- Bambhole, A and S. S, Prakash (2019). Chapter 6- Health Assessment of Structures, ASTR GL-01: Guidelines for Structural Rehabilitation and Retrofitting, Allied Publishers, Pages 194-223, ISBN-978-93-87997-80-6.

- S. S. Prakash. (2019). Chapter 7-Estimation of New Demands Before Repair and Strengthening, ASTR GL-01: Guidelines for Structural Rehabilitation and Retrofitting, Allied Publishers, Pages 224-270, ISBN-978-93-87997-80-6.

- Banoth, I., & Agarwal, A. (2020). Effect of Heating Rate on Bond Behavior Between Steel and Concrete at Elevated Temperatures. Lecture Notes in Civil Engineering, 74, 89–98. https://doi.org/10.1007/978-981-15-4079-0_8.

- Hemanth Kumar, C., Subash, B., & Agarwal, A. (2020). Response of RC Short Column Under Combined Fire and Axial Loading. Lecture Notes in Civil Engineering, 74, 121–131. https://doi.org/10.1007/978-981-15-4079-0_11.

- Natesh, P. S., & Agarwal, A. (2020). Numerical Modelling of Continuous Composite Beam Under Fire Loading. Lecture Notes in Civil Engineering, 74, 73-88. https://doi.org/10.1007/978-981-15-4079-0_7.

- Singh, S., & Agarwal, A. (2020). Numerical Analysis of Post-earthquake Fire Resistance of Concrete-Filled Tubular Steel Columns. Lecture Notes in Civil Engineering, 74, 133–143. https://doi.org/10.1007/978-981-15-4079-0_12.

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2. Karnam Prabhakara, B. K., Guda, P. V., & Balunaini, U. (2019). Optimum mixing ratio and shear strength of granulated rubber-fly ash mixtures. Journal of Materials in Civil Engineering, 31(4). https://doi.org/10.1061/(ASCE)MT.1943-5533.0002639.

3. Pando M. A. (Ed.), Geotechnical Special Publication (Vols. 2019-March, Issue GSP 312, pp. 304-313). American Society of Civil Engineers (ASCE). https://doi.org/10.1061/9780784482148.031.

4. Parhi, P. S., Sravanam, S. M., & Balunaini, U. (2019). Dynamic characterization of coal ash lagoons using multichannel analysis of surface waves (Masw) technique. In M. N. Silvestri F. (Ed.), Earthquake Geotechnical Engineering for Protection and Development of Environment and Constructions – Proceedings of the 7th International Conference on Earthquake Geotechnical Engineering, 2019 (pp. 4351-4358). CRC Press/Balkema.

5. Shiva Bhushan, J. Y. V., Parhi, P. S., & Umashankar, B. (2019). Geotechnical Characterization of Construction and Demolished (C&D) Waste. Lecture Notes in Civil Engineering, 16, 27–34. https://doi.org/10.1007/978-981-13-0899-4_4.

6. Sravanam, S. M., Balunaini, U., & Madhav, M. R. (2019a). Behavior and Design of Back-to-Back Walls Considering Compaction and Surcharge Loads. International Journal of Geosynthetics and Ground Engineering, 5(4). https://doi.org/10.1007/s40891-019-0180-z.

7. Umaharathi, N., Bhargav Kumar, K. P., & Umashankar, B. (2019). Effect of plastic fines on shear strength of sands. Lecture Notes in Civil Engineering, 16, 51-58. https://doi.org/10.1007/978-981-13-0899-4_7.

8. Bhushan, J., Parhi, P., & Umashankar, B. (2019). Geotechnical Characterization of Construction and Demolished (C&D) Waste. Geotechnical Characterisation and Geoenvironmental Engineering, 27-34.

9. Kumar, K., Krishna, G., & Umashankar, B. (2019). Evaluation of Waste Foundry Sand and Blast Furnace Steel Slag as Geomaterials. Geo-Congress 2019: Geoenvironmental Engineering and Sustainability, 304-313.

10. Parhi, P. S. S., Sravanam, S., & Balunaini, U. (2019). Multi-Channel Analysis of Surface Waves for Sub-Surface Characterization of Coal Ash Pond in India. AGUFM 2019, NS43D, 862.

11. Bhagath Singh, G. V. P., & Subramaniam, K. V. L. (2019b). Production and characterization of low-energy Portland composite cement from post-industrial waste. Journal of Cleaner Production, 239. https://doi.org/10.1016/j.jclepro.2019.118024.

12. Gadkar, A., & Subramaniam, K. V. L. (2019). An evaluation of yield and Maxwell fluid behaviors of fly ash suspensions in alkali-silicate solutions. Materials and Structures/Materiaux et Constructions, 52(6). https://doi.org/10.1617/s11527-019-1429-7.

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19. Ravula, M. B., & Subramaniam, K. V. L. (2019b). Experimental Investigation and Interface Material Model for the Cohesive-Frictional Shear Response of Soft-Brick Masonry under Applied Compression. Journal of Materials in Civil Engineering, 31(12). https://doi.org/10.1061/(ASCE)MT.1943-5533.0002961

20. Singh, G. V. P. B., & Subramaniam, K. V. L. (2019). Influence of processing temperature on the reaction product and strength gain in alkali-activated fly ash. Cement and Concrete Composites, 95, 10-18. https://doi.org/10.1016/j.cemconcomp.2018.10.010.

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24. Peddinti, P. R. T., Munwar Basha, B., & Saride, S. (2019). Evaluation of Flexible Pavement Distress Using Nonlinear Regression Analysis. Lecture Notes in Civil Engineering, 28, 167-176. https://doi.org/10.1007/978-981-13-6701-4_10.

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26. Rayabharapu, V. K., & Saride, S. (2019b). Geocell reinforced dense sand bases overlying weak sand sub-grades under repeated loading. Lecture Notes in Civil Engineering, 14, 285-294. https://doi.org/10.1007/978-981-13-0559-7_32.

27. Saride, S., & Kumar, V. V. (2019). Estimation of Service Life of Geosynthetic-Reinforced Asphalt Overlays from Beam and Large-Scale Fatigue Tests. Journal of Testing and Evaluation, 47(4), 2693-2716. https://doi.org/10.1520/JTE20170605.

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34. Varma, K., & Saride, S. (2019). Fatigue Behaviour of Jute fiber reinforced asphalt concrete. Indian Institute of Technology Hyderabad.

35. Aurojyoti, P., Raghu, P., Rajagopal, A., & Reddy, J. N. (2019). An n-sided polygonal finite element for nonlocal nonlinear analysis of plates and laminates. International Journal for Numerical Methods in Engineering, 120(9), 1071-1107. https://doi.org/10.1002/nme.6171.

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imperfect interfaces by using finite element technique. In K.Y. -H. Parinov I.A. Chang S. H. (Ed.), Springer Proceedings in Physics (Vol. 224, pp. 399-411). Springer Science and Business Media, LLC. https://doi.org/10.1007/978-3-030-19894-7_30.

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2. Rajagopal A., Vedamanickam N. Proceedings of 2019 3rd IEEE International Conference on Electrical, Computer and Communication Technologies, ICECCT 2019; 20 to 22 February 2019; Institute of Electrical and Electronics Engineers Inc.; 2019.

3. Banoth, I., Agarwal, A., "Bond behaviour between steel and concrete at elevated temperatures," 6th Conference on Applications of Structural Fire Engineering, June 13-14, 2019, NTU, Singapore.

4. Chinthapalli, H.K., Agarwal, A., "Effect of Confinement on Fire Behavior of Reinforced Concrete Columns: Experimental Study," 6th Conference on Applications of Structural Fire Engineering, June 13-14, 2019, NTU, Singapore.

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10. Flux partitioning in heterogeneous, fragmented croplands – An experimental validation - AGU Fall Meet 2019

11. Seetha N., Hassanizadeh, S.M., Colloid transport in partially saturated porous media: A pore-scale perspective, International Ground Water Conference, IIT Roorkee, India, 22-24 October 2019.

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13. Mishra, P. and S. N. Somala, Earthquake Early Warning Feasibility Study for India using Deep Learning, 4th International Conference on Earthquake Early Warning, Seoul, South Korea, September 2019

14. Chanda, S. and S. N. Somala, A Propagating Dislocation based Simulation of 2005 Kashmir Earthquake, 7th International Congress on Computational Mechanics and Simulation (ICCMS), IIT Mandi, December 2019

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16. Karthik Reddy, K. S. K., S. N. Somala and H.-H. Tsang, Seismic Hazard Assessment of Gangtok Region: A Direct Amplitude-based Approach, Federation of Indian Geosciences Associations (FIGA), CSRI-NGRI, Hyderabad, October 2019.

17. Mandal, P., S. N. Somala, Mitra, S., Mukund, N., Nayak, R. and Harms, J., Newtonian Noise Cancellations Using Pile Structure, Newton-Bhabha and the Open Data Workshop, IUCAA Pune, December 2019.

18. Kumar, K. P. B., Krishna, G., and Umashankar, B. (2019). Evaluation of Waste Foundry Sand and Blast Furnace Steel Slag as Geomaterials. Geo-Congress 2019 Geotechnical Special Publication GSP 312, 304-313, https://doi.org/10.1061/9780784482148.031.

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Funded Research Projects

- Dr. Suriya Prakash S, Project Type: Grant-in-Aid, Project Code: MHRD/CE/F092/2019-20/G223, Project Title: Smart Hybrid Fiber Reinforced Composite Strengthening System for Civil Infrastructure, Sponsoring Agency: MHRD, 70.2L.

- Dr. Amirtham Rajagopal, Project Type: Grant-in-Aid, Project Code: CSIR/CE/F050/2019-20/G246, Project Title: Nonlocal and Nonlinear Analysis of Plates and Laminates Via A Novel Goal Oriented Adaptive Sided Polygonal Finite Element Approach, Sponsoring Agency: CSIR, 15.4L.

- Dr. Pritha Chatterjee, Project Type: Grant-in-Aid, Project Code: SERB/CE/F212/2019-20/G268, Project Title: Electricity Assisted Synthesis of Long Chain Fatty Acids in a Novel Hybrid DF-MES Reactor from Organic Waste, Sponsoring Agency: SERB, 25.5L.

- Dr. Phanindra K BV N, Project Type: Sponsored, Project Code: CGWB/CE/F070/2019-20/S90, Project Title: Hyderabad for Automation of Estimation of Dynamic Groundwater Resources using GEC-2015 Methodology and Related Research Work, Sponsoring Agency: Central Ground Water Board, Ministry of Jal Shakthi, GoI, 559.2L.

- Dr. Digvijay S Pawar, Project Type: Sponsored, Project Code: S99, Project Title: Proof of Concept Trial on Traffic Accident Record Software in India, Sponsoring Agency: Toyota Motor Corporation, 13L.

Seminars Conducted

- A one-day seminar on "Strategies for Enhancing Fire Resistance and Resilience of Modern Concrete Structures" on May 17, 2019. Guest Speaker: Prof. Venkatesh Kodur, Michigan State University, USA.

- "1. International Workshop on Strengthening of Civil Infrastructure Using Advanced Technologies – Challenges and Opportunities, 16-17, August 2019, IIT Hyderabad, India2. 10 Day GIAN Course on Design of Anchorages in Concrete Construction and their Role in structural strengthening, July 22- July 31, 2019. Organized at IIT Hyderabad, India"

- Organized One Day Workshop on "Automation of Estimation of Dynamic Groundwater Resources and related Research", IIT Hyderabad, 17 Sep 2019

- Workshop on Retrofitting of Steel Structures, September 27-28, 2019

- Organized a two-day focus group discussion and workshop titled "Understanding Space-

Time Variability of Climate Extremes for Societal Resiliency in Krishna River Basin", IIT Hyderabad, Jan 7 - 8, 2020.

Awards & Recognitions

- Dr. Anil Agarwal, Assistant Professor has received Young Turk of Composites Award 2019-20, awarded by the FRP Institute, Chennai and TAACMA.

- Dr. Mahendra Kumar Madhavan, Associate Professor, has been selected as an Editorial Board Member of Journal of Structures - Research Journal of the Institution of Structural Engineers, UK.

- Dr. Mahendra Kumar Madhavan, Associate Professor, has been selected as a Voting member of the "ASCE Structural Engineering Institute (SEI) Technical Administrative Committee on Metals" for a Six Year Term (2019-2025).

- Dr. Munwar Basha B, Associate Professor, has been selected as an Associate Editor, ASCE Journal of Hazardous, Toxic, and Radioactive Waste (from Sep 10, 2019, onwards).

- Dr. Munwar Basha B, Associate Professor, has been nominated to represent Indian Geotechnical Society (IGS) on the International Technical Committee TC-302 on "Forensic Geotechnical Engineering" of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) for the term 2018-2021.

- Dr. Sireesh Saride, Professor, has been elected as an Editorial Board Member of Indian Geotechnical Journal, Springer.

- Dr. Suriya Prakash S, Associate Professor, Civil Engineering has received DUO-India Fellowship to work at TU Stuttgart 2020.

- Dr. Umashankar Balunaini, Associate Professor, has empanelled in the list of experts / specialist in rendering technical advise on ash dykes for NTPC.

- Dr. Umashankar Balunaini, Associate Professor, delivered Er Matur Gopal Rao Twenty Second Endowment Lecture for the year 2019. Talk titled 'Design and Construction Aspects of Foundations for Important Barrage Structures'. Organized by The Institution of Engineers (India), Telangana State Centre.

- Dr. Umashankar Balunaini, Associate Professor, has been nominated to represent Indian Geotechnical Society (IGS) on the International Technical Committee TC-211 on "Ground Improvement" of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) for the term 2018-2021.

- Dr. Subramaniam K. V. L., Professor, has been selected as an Editorial Board Member, Journal of Cement and Concrete Composites (Elsevier).

- Dr. Subramaniam K. V. L., Professor, has given Inaugural Prof. Dinesh Mohan Memorial Lecture, Central Building Research Institute, Roorkee (Feb. 10, 2020).

Highlights

1. **Development of Landslide Susceptibility Mapping through Geographic Information System (GIS) and Artificial Intelligence (AI) Model (Prof Sireesh S.)**

The aim and objective of the project are to generate the landslide susceptibility map (LSM) using Artificial Intelligence and GIS tools for the Mandi district, Himachal Pradesh. To propose a refined model that will decrease the over fitting caused by the pseudo examples.

Using the GIS tool, data was collected for all the triggering factors such as Curvature, Slope Degree / Slope Percent, Slope Aspect / Aspect, Land Use Land Cover, road, Topographic wetness index, Digital elevation model, stream power index, sediment transportation index. Then using the Machine Learning algorithm which includes Decision tree, Naïve Bayes, SVM and Ensemble model, the data were analyzed. The model showing better performance was selected for preparation on LSM. In which AUC obtained for SVM is 0.80, Naïve Bayes is 0.77, Decision Tree is 0.76, Ensemble 1.0 is 0.85. So using ensemble model the LSM was prepared.

For the refinement purpose, a new method to decrease the bias due to pseudo examples was proposed. The model observed improvement. The AUC was increased from 0.85 to 0.96. This refinement was achieved by an iterative procedure. In which the training examples selected for iteration were selected from the map which was generated by the Ensemble model 1.0 in the particular case. Figure 1 shows the LSM developed using frequency ratio method by Geological Survey of India and the proposed GIS-AI based model.
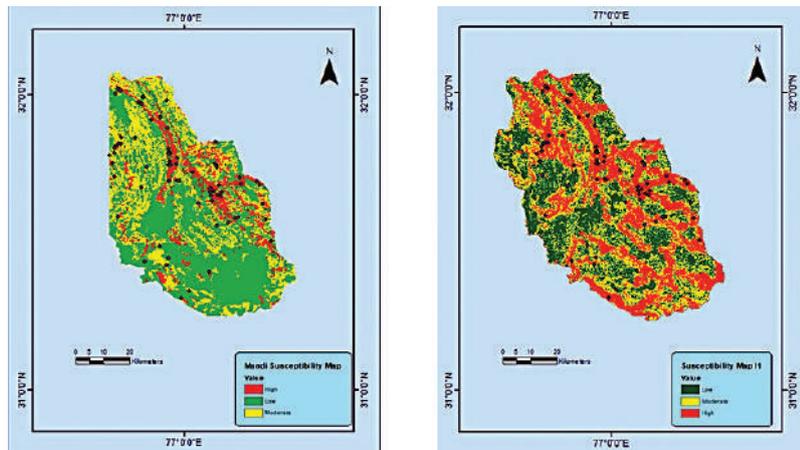
Fig. 1 Landslide Susceptibility Map of Mandi, Himachal Pradesh: a) Existing map b) Proposed map based on GIS-AI (modified Ensemble) model

2. System Reliability-Based Design of Flexible Pavements (Prof. Sireesh S.)

The present research work demonstrates a comprehensive system reliability procedure for the design of flexible pavements by considering the individual variability in each of the thicknesses and resilient moduli of the pavement layers. The appropriate probability density functions for thicknesses and resilient moduli are determined based on the statistical analysis of experimental data from different sources. Further, the surface response method based accurate regression models for calculating fatigue and rutting modes are developed to reduce the computational time taken for reliability analysis. Based on the extensive parametric studies, the influence of variability in each mechanistic parameter on the reliability-based performance of flexible pavements is established. A 95 percent target reliability level was proposed for flexible pavements by considering both performance and the cost of construction and design charts are proposed (Fig. 2). Overall, the present framework addresses the drawbacks of existing reliability-based design methods. The proposed framework is expected to increase the applicability of reliability methods for flexible pavement design.

Fig. 2 A typical design chart to obtain the thickness of the base layer for a given resilient modulus of subgrade and resilient modulus of the base layer for at least 95% reliability

3. Resilient Modulus of Geocell Reinforced Bases (Prof. Sireesh S.)

Using the loading sequence established and optimum damping properties and discretization levels, the resilient modulus test on unreinforced and geocell reinforced GSB is numerically simulated in FLAC 3D. The conclusions observed from the study are presented as follows:

- It is observed that the difference between displacements induced due to the last stress combination in both Reinforced and Unreinforced cases in the z-direction is very less.
- The Average Resilient Modulus (M_r) values for Unreinforced and Reinforced models are 251.5 MPa and 252.5 MPa, respectively.
- Since only a single geocell is used, no advantage of reinforcement is observed due to a lack of membrane effect.
- The influence of geocell reinforcement on Resilient Modulus is in line with the experimental study of Mengelt et al., (2006).

- The influence of geocells under stress conditions exerted in resilient modulus test facility can't be visualized. The reason could be that the single geocell could not mobilize the reinforcement and confining effect due to the lack of connected adjoining cells. The stress contours observed in the geocell-reinforced model specimen can be seen in Fig. 3 at the end of the resilient modulus test.

- Hence, it is recommended that the influence of geocell reinforcement can only be evaluated through large-scale studies and to obtain the modulus improvement offered by the geocell mattress.
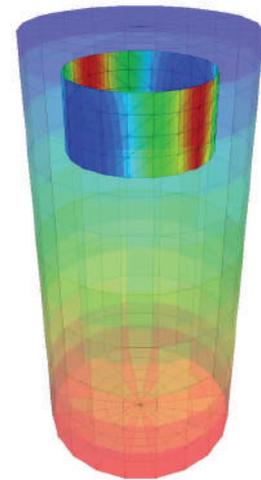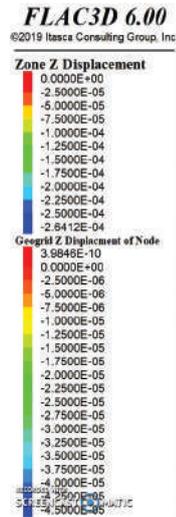
Fig. 3 Stress Contours in a geocell-reinforced GSB specimen subjected to repetitive loading.

4. Cold formed steel connections between Beam-Beam & Beam-Column with clip angles under cyclic loading – Research Motivation (Dr. Mahendrakumar Madhavan)

- Cold formed steel become a black-horse in construction industry due to its enormous application & advantages over conventional hot-rolled steel
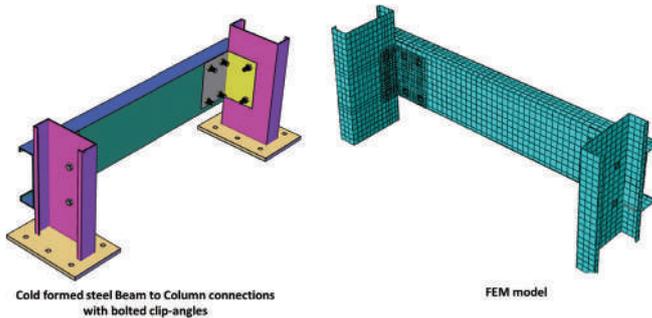
Fig.4 Cold formed steel connections between Beam- Beam & Beam-Column with clip angles under cyclic loading

- The major challenges in the construction work like transportation & handling of materials, high installation cost, corrosion & desired shape etc., got solved with cold formed steel usage.

- Our research motive is to study cold formed steel connections between Beam-Beam & Beam-Column with clip angles under cyclic loading to raise the standards of cold-formed steel on the global platform in terms of design.

5. Optimum Design of Municipal Solid Waste (MSW) Landfills: A Reliability-Based Approach (Dr. B. Munwar Basha)

The stability of the landfill slope becomes vulnerable when the dumping process goes on beyond the design height of the landfill. Particularly in the developing countries, these landfills are uncontrolled waste dumps, which pose severe stability problems once they reach a critical height. The safety, stability and reliability of an MSW landfill slope as shown in Fig. 5 is governed by the shear strength parameters of the solid waste. The MSW is a highly heterogeneous and complex material, as it comprises of different materials collected from various sources which exhibit different inherent properties. The design without considering uncertainties associated with the shear parameters of the MSW and the soil-liner interface friction angle may yield potentially misleading conclusions in terms of slope safety levels.
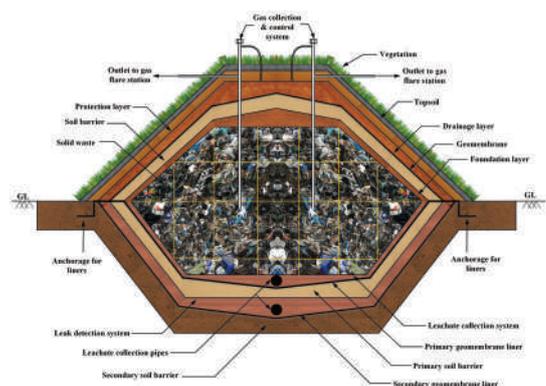
Fig. 5a Schematic representation of MSW landfill

The properties of MSW are strongly correlated in horizontal direction compared to vertical direction. Therefore, the present study addresses the anisotropic spatial variability associated with the shear strength parameters of MSW. Inverse Gaussian and Gaussian random fields for stability number and friction angle of MSW respectively are developed for the design parameters by employing a square root exponential decaying Gauss-Markov correlation function and Cholesky decomposition technique. For an illustration, a Gaussian random field created for the internal friction angle (φ) as shown in Fig.
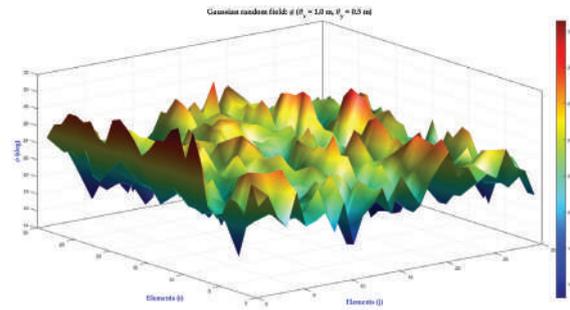
Fig. 5b Gaussian random field representing spatial distribution of internal friction angle of MSW

The consideration of isotropic correlation length ($\theta_x = \theta_y$) in the reliability analysis overestimates the reliability index (β_{MP}) with reference to anisotropic correlation lengths, $\theta_x = 5\theta_y$, $10\theta_y$ and $20\theta_y$. The vertical correlation length (θ_y) $\geq$ 1.5 times the height of MSW slope (H) and the horizontal correlation length (θ_x) $\geq$ 5 times vertical correlation length (θ_y) marginally influences the reliability indices (β_{MP}) of MSW landfill slopes for all values of horizontal correlation lengths, when anisotropy in the MSW properties is accounted. The proposed reliability based design methodology exhibits promising features, wide applicability for the design and analysis of MSW landfill slopes. The proposed methodology can be adopted in the Geoenvironmental design and practice for the development of sustainable design of MSW landfill slopes.
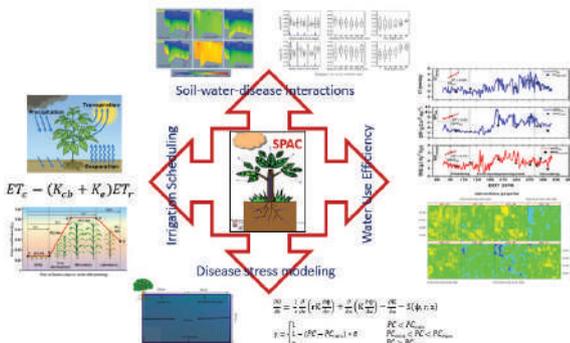
6. Process understanding within the soil-plant-atmosphere continuum (Dr K. B. V. N. Phanindra)

- Understand soil-water-crop-atmosphere inter actions for a wide range of crops using experimental and numerical studies
- Develop region specific crop coefficients and yield response factors
- Evaluate the role of sustainable irrigation and agricultural strategies on crop water and yield dynamics.

7. Micro-meteorology and flux footprints in agriculture (Dr. K. B. V. N. Phanindra)

- Evaluate the performance of analytical flux footprint models under deviated assumptions
- Monitor micro-meteorological fluxes (of H_2O and CO_2) at high temporal frequency using eddy covariance flux towers
- Derive the methodologies to estimate footprints in complex and heterogeneous mixed fetch conditions

8. Hydraulics of fractured aquifers (Dr. K. B. V. N. Phanindra)

- Delineate the fracture patterns and preferential flow paths in fractured aquifers
- Perform geophysical and pumping experiments on fracture enabled rock blocks under control laboratory conditions
- Evaluate various fracture characterization methods and deduce their applicability ranges using experimental studies
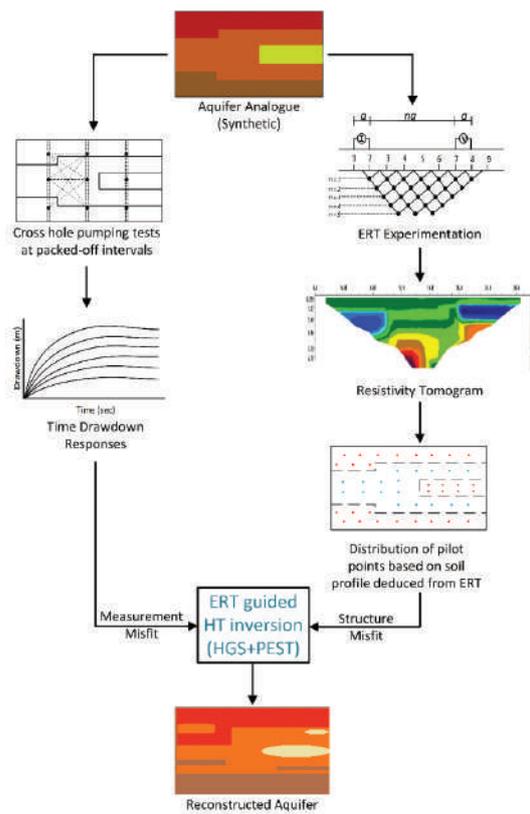
9 Remote sensing and GIS in groundwater (Dr. K. B. V. N. Phanindra)

- Use open-source satellite imagery and GIS algorithms in crop classification, groundwater mapping and monitoring
- Perform statistical down scaling on coarse resolution satellite imagery using novel algorithms
- Evaluate various drought indices using spectral indices and establish their temporal dependencies
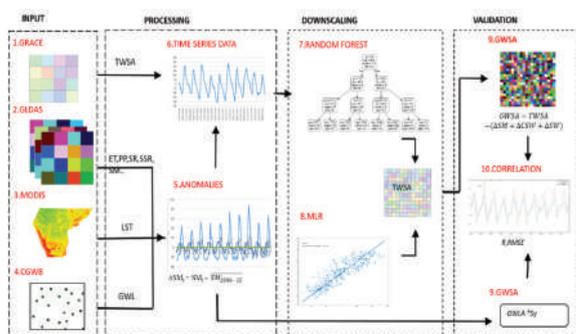
10. Lightweight Portable Bridge (Dr. Anil Agarwal)

A lightweight portable bridge was co-developed by Dr. Anil Agarwal (Dept. of Civil Engineering, IIT Hyderabad) and Mr. Srinivas Aluri (M/s. Modulus Composites Pvt. Ltd., Hyderabad) for GRSE (a defense PSU). The bridge was inaugurated by Sri Rajnath Singh (Hon. Defense Minister) on Aug 13, 2020. This 9-meter long bridge can support 3.5 times its self-weight. The composite materials technology used in this bridge has great potential both for civilian and defence applications.

Fig. 10 Lightweight Portable Bridge

11. Techno-Economic Assessment of Bio-Crude Oil From Kitchen Wastewater

The techno-economic assessment of nutrient recovery from wastewater using microalgae was done for the microalgae species Chlorella and Scenedesmus. A dynamic model of algae growth was developed using experimental data in Indian conditions taken from literature. The model was developed, calibrated and validated to estimate biomass production and nutrient removal in algal cultures grown in a photo bioreactor. The cost of production of 1L bio-crude from microalgae grown in kitchen wastewater in IITH was calculated to be

Rs. 80 which is comparable with crude oil cost. The model developed can be used by practising engineers for predicting biomass growth and nutrient removal and thereby achieving a break-even point for cost efficiency.

TECHNO-ECONOMIC ASSESSMENT OF BIO-CRUDE OIL FROM KITCHEN WASTE

Chlorella and *Scenedesmus* sp.

$$\frac{dX}{dt} = \mu_X * X * \left(1 - \frac{X}{X_{max}}\right) - d_{th} * X$$

$$\mu_X = \mu_{max} \left(\prod_i^N \left[\frac{N_i}{K_i + N_i}\right]\right) \left[\frac{q_{w}S}{K_s + S + S^2/K_{ih}}\right] \left[\frac{I_{av}^n}{I_s^n + I_{av}^n}\right] [T_T]$$

$$\frac{dC}{dt} = \frac{-Mc}{V*\frac{dX}{dt}}$$

$$M_c = \frac{\frac{dX}{dt}}{W_{nco_3} Y_c}$$

$$\frac{dC_{N,P}}{dt} = -1000 * Y_{N,P} * \mu_x * X$$

$$[N, P] = [N_{init}, P_{init}] \text{ at } t = 0$$

$$T_T = 0.06T - 20.035$$

$$I_0(t) = \frac{\pi}{2} * \frac{I_d}{f_p} \sin\left(\frac{\pi t}{f_p}\right)$$

$$\frac{d(S)}{d(t)} = X * \frac{q_m * S}{K_s + S + \frac{S^2}{K_{ih}}}$$

$$I_{av} = \frac{1}{z} \int_0^z I_0 \exp(-K_L z) dz$$

Microalgae grown in Kitchen wastewater of IITH

Calibration

Validation

Cost estimation- For 1L Biocrude

TOTAL COST: Rs 80/L BIOCRUDE
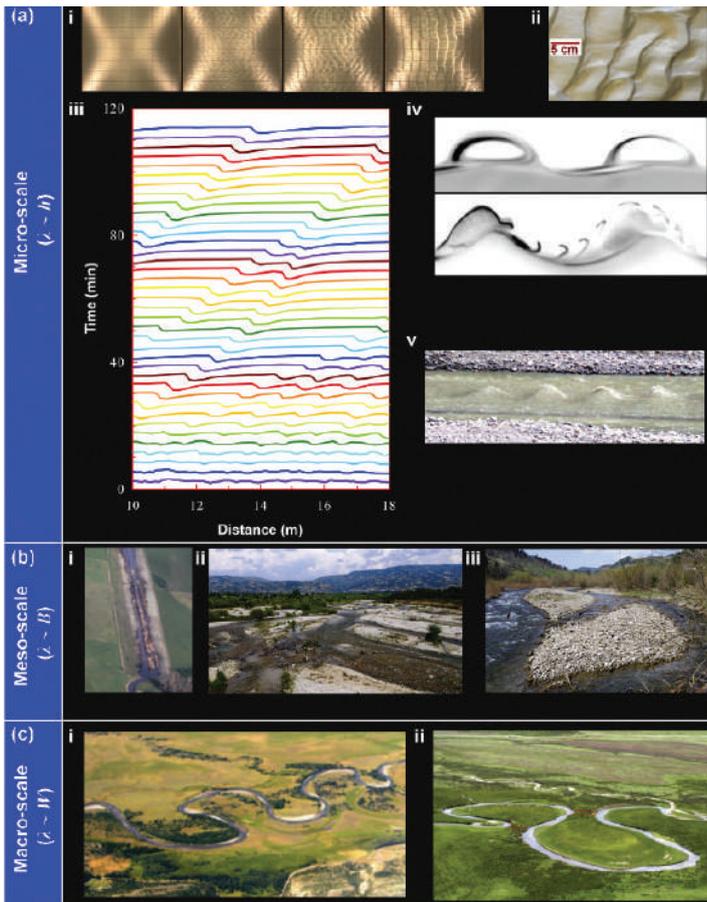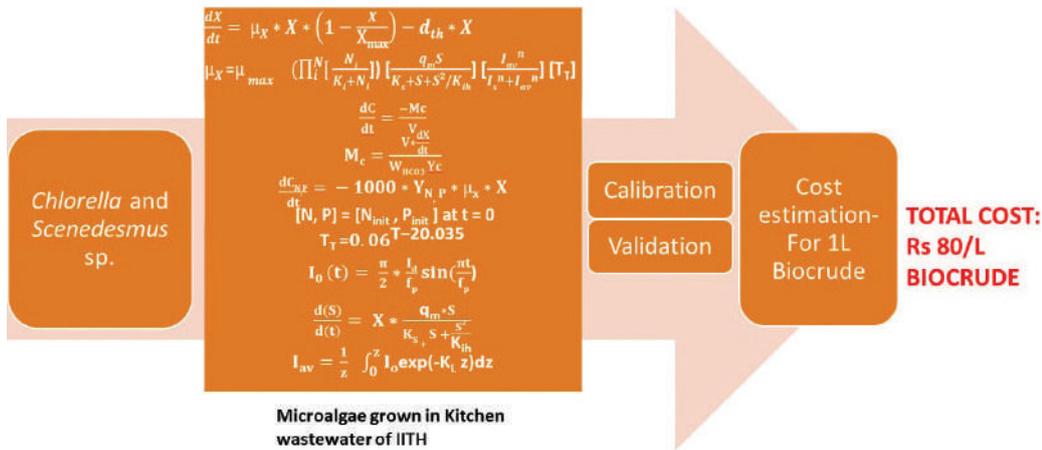
Fig. 12. Riverbed instabilities at various scales: (a) micro-scale, (b) meso-scale and (c) macro-scale [Physics of Fluids 32, 061301 (2020)].

12. Riverbed instabilities by Dr. SK Zeeshan Ali

Riverbed instabilities arise from an interplay between a flowing fluid and an erodible granular bed at their interface. The fluid shears the sediment grains to erode, giving rise to wide-ranging landforms. Riverbed instabilities span over a wide spectrum of spatiotemporal scales (micro-, meso- and macro-scale) of sedimentary patterns. Research on riverbed instabilities (as shown in Figure 12) would help to provide precise mechanism of their formation across various fluvial environments.

Computer Science & Engineering

The Department of Computer Science and Engineering (CSE) has made rapid progress and is continuing to establish itself through state-of-the-art research and teaching. The department comprises of twenty-one faculty members, with expertise in various research areas including theoretical computer science, algorithms, graph theory, networking, distributed systems, compilers, formal methods, machine learning, architecture and image / video processing. In addition to the regular BTech, MTech and PhD programs, the CSE Department has been successfully running the MDs and eMDs programs for working professionals. The department faculty members are recipients of substantial research grants from government agencies like SERB / DST / MHRD, DST-JST, JICA and industry partners such as Intel, IBM, Honeywell, Redpine Signals, SRC and AMD. Faculty members of the CSE department published papers in top-tier venues e.g., CVPR, ICs and CP. Dr Rogers Mathew, Assistant Professor has received **SERB-MATRICS** (Mathematical Research Impact Centric Support) Grant. Our faculty Dr Sathya Peri, Dr Saurabh, Dr Vineeth and Dr Rogers have received various prestigious awards and recognitions.

EVERYBODY IN THIS COUNTRY SHOULD LEARN TO PROGRAM A COMPUTER, BECAUSE IT TEACHES YOU HOW TO THINK."

– Steve jobs

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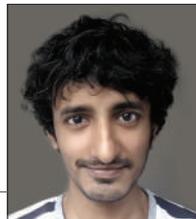
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Patent Filed / Granted

- Patent Title: System and Method of Refocusing A Captured Image, Name of the Inventors: Parikshit S., Vineeth N. Balasubramanian, P. J. Narayanan, Patent Number: 201941042927

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48. Prakash P., Murti C., Nath S., Bhattacharyya C. Nayak A. C., Sharma A., Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); 26 to 30 August 2019; Springer Verlag; 2 (...).

49. Anand A.S., Shyamasundar R.K., Peri S.. Concurrency Computation; John Wiley and Sons Ltd; 2019.

50. Anjana P. S., Kumari S., Peri S., Rathor S., Somani A.. ACM International Conference Proceeding Series; 4 to 7 January 2019; Association for Computing Machinery; 2019.508.

51. Anjana P. S., Kumari S., Peri S., Rathor S., Somani A.. Proceedings - 27th Euromicro International Conference on Parallel, Distributed and Network-Based Processing, PDP 2019; 13 to 15 February 2019; Institute of Electrical and Electronics En (...).

52. Chatterjee B., Peri S., Sa M., Singhal N.. ACM International Conference Proceeding Series; 4 to 7 January 2019; Association for Computing Machinery; 2019.168.

53. Chaudhary V. P., Juyal C., Kulkarni S., Kumari S., Peri S.. Atig M. F. Schwarzmann A. A.. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); 19 to 21 June 2019; Sprin (...).

54. Juyal C., Kulkarni S., Kumari S., Peri S., Somani A.. Ghaffari M. Nesterenko M. Tixeuil S. Tucci S. Yamauchi Y.. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); 22 October 2019 (...).

55. Peri S., Reddy C. K., Sa M.. Xiao Z. Yang L.T.Balaji P. Li T. Li K. Zomaya A.. Proceedings - 21st IEEE International Conference on High Performance Computing and Communications, 17th IEEE International Conference on Smart City and 5th IEEE International Conferenc (...).

56. Peri S., Sa M., Singhal N.. Atig M. F. Schwarzmann A. A.. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); 19 to 21 June 2019; Springer; 2019. 327

57. Peri S., Singh A., Somani A.. Podelski A. Taiani F.. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); 9 to 11 May 2018; Springer Verlag; 2019.157.

58. Chaudhary E., Joshi S., "Pinaka: Symbolic Execution meets Incremental Solving", TACAS, Lecture Notes in Computer Science Vol. 11429 pp234-238, 2019.

59. Pote Y., Joshi S., Meel K.S., "Phase Transition Behaviour of Cardinality and XOR Constraints". IJCAI International Joint Conference on Artificial Intelligence; 10 to 16 August 2019; International Joint Conferences on Artificial Intelligence; 20 (...).

60. "Big Data Analytics for Nabbing Fraudulent Transactions in Taxation System P. Mehta, J. Mathews, S Kumar, K Suryamukhi, C. S. Babu, SVKV Rao International Conference on Big Data, 95-109".

61. "Big Data Analytics for Tax Administration P Mehta, J Mathews, S Kumar, K Suryamukhi, CS Babu, S. V. K.V Rao, International Conference on Electronic Government and the Information".

62. "Curtailing the Tax Leakages by Nabbing Return Defaulters in Taxation System P. Mehta, J. Mathews, S. Kumar, K. Suryamukhi, CS BabuAustralasian Conference on Data Mining, 183-195".

63. "Identifying Malicious Dealers in Goods and Services Tax P. Mehta, J. Mathews, S.V. K.V. Rao, K. S. Kumar, K. Suryamukhi, C. .S Babu 2019 IEEE 4th International Conference on Big Data Analytics (ICBDA), 312-316".

64. Jha N. K., Mittal S., Mattela G.. Proceedings - 32nd International Conference on VLSI Design, VLSID 2019 - Held concurrently with 18th International Conference on Embedded Systems, ES 2019; 5 to 9 January 2019; Institute of Electrical and Ele (...).

65. Wang H., Ibrahim M., Mittal S., Jog A.. Proceedings of the International Conference on Super computing; 43642; Association for Computing Machinery;2019.184.

66. Bhattacharjee U., Srijith P.K., Desarkar M.S.. 2019 11th International Conference on Communication Systems and Networks, COMSNETS 2019; 7 to 11 January 2019;

Institute of Electrical and Electronics Engineers Inc.; 2019. 726.

67. Bhattacharjee U., Srijith P. K., Desarkar M. S.. 2019 11th International Conference on Communication Systems and Networks, COMSNETS 2019; 7 to 11 January 2019; Institute of Electrical and Electronics Engineers Inc.; 2019.886.

68. Aravind N. R., Kalyanasundaram S., Kare A. S.. Pal S. P. Vijayakumar A.. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); 14 to 16 February 2019; Springer Verla (...).

69. Thamilselvam B., Kalyanasundaram S., Rao M. V. P.. 2019 11th International Conference on Communication Systems and Networks, COMSNETS 2019; 7 to 11 January 2019; Institute of Electrical and Electronics Engineers Inc.; 2019.789.

70. Aditya Chattopadhyay, Piyushi Manupriya, Anirban Sarkar, V. Balasubramanian, Neural Network Attributions: A Causal Perspective, Proceedings of International Conference on Machine Learning (ICML'19), Jun 2019.

71. Arghya Pal, V. Balasubramanian, Zero-shot Task Transfer, Proceedings of the IEEE / CVF International Conference on Computer Vision and Pattern Recognition (CVPR'19), Jun 2019.

72. Chaitanya Devaguptapu, Ninad Akolekar, Manuj Sharma, V. Balasubramanian, Borrow from Anywhere: Pseudo Multi-modal Object Detection in Thermal Imagery, Workshop on Perception beyond the Visible Spectrum, IEEE/CVF International Conference on Computer Vision (...).

73. Joseph K. J, Arghya Pal, S. Rajanala, V. Balasubramanian, C4Synth: Cross-Caption Cycle-Consistent Text-to-Image Synthesis, Proceedings of IEEE Winter Conference on Applications of Computer Vision (WACV'19), Jan 2019.

74. Joseph K. J., Vamshi Teja R., Krishnakant Singh, V. Balasubramanian, Submodular Batch Selection for Training Deep Neural Networks, Proceedings of International Joint Conference on Artificial Intelligence (IJCAI'19), Aug 2019.

75. Mayank Singh, Abhishek Sinha, Nupur Kumari, Balaji Krishnamurthy, Harshitha Machiraju, V. N. Balasubramanian, Harnessing the Vulnerability of Latent Layers in Adversarially Trained Models, Workshop on Safe Machine Learning, International Conference on Learni (...).

76. Nupur Kumari, Abhishek Sinha, Mayank Singh, Harshitha Machiraju, Balaji Krishnamurthy, V. Balasubramanian, Harnessing the Vulnerability of Latent Layers in Adversarially Trained Models, Proceedings of International Joint Conference on Artificial Intelligen (...).

77. Sai Vikas D., Akshay C., Wei Guo, S. Ninomiya, V. Balasubramanian, An Adaptive Supervision Framework for Active Learning in Object Detection, in Proceedings of the British Machine Vision Conference (BMVC'19), Sep 2019.

78. Tejaswi K., Nagendar G., Guruprasad Hegde, V. Balasubramanian, C. V. Jawahar, Region-Based Active Learning for Efficient Labeling in Semantic Segmentation, Proceedings of IEEE Winter Conference on Applications of Computer Vision (WACV'19), Jan 2019.

Funded Research Projects

- Dr. Antony Franklin, Project Type: Grant-in-Aid, Project Code: MHRD/CSE/F157/2019-20/G222, Project Title: Network Slice Life-cycle Management for 5G Mobile Network, Sponsoring Agency: SPARC, MHRD, 71.6L.

- Dr. Vineeth N Balasubramanian, Project Type: Grant-in-Aid, Project Code: SERB/CSE/F121/2020-23/G272, Project Title: Advanced Vision Technologies for Road Mobility and Safety, Sponsoring Agency: SERB IMPRINT II-C, 118.4L.

- Dr. Rogers Mathew, Project Type: Grant-in-Aid, Project Code: G275, Project Title: Fractional intersecting families, Sponsoring Agency: SERB (MATRICS), 2.2L.

- Dr. Sathya Peri, Project Type: Grant-in-Aid, Project Code: G277, Project Title: Numerical Technique to Solve Boundary Value Problems in Solid Mechanics, Sponsoring Agency: DST, 16.9L

- Dr. Sathya Peri, Project Type: Grant-in-Aid, Project Code: G279, Project Title: An Efficient Distributed Framework for Smart Contract Execution in Blockchain Systems., Sponsoring Agency: MeitY, 40.5.L

- Dr. Upadrasta Ramakrishna, Project Code: AMD/CSE/F136/2019-20/S85, Project Title:

AMD-IITH Compilers Collaboration 2019-2020, Sponsoring Agency: AMD, 7.9L.

- Dr. Upadrasta Ramakrishna, Project Code: Redpine/CSE/F136/2019-20/S88, Project Title: Designing efficient Compilers for Machine Learning, Sponsoring Agency: Redpine, 0.9L.

- Dr. Kotaro Kataoka, Project Code: Weathernews/F102/2019-20/S94, Project Title: Blockchain, Sponsoring Agency: Weathernews Inc., 11.44L.

- Dr. Vineeth N Balasubramanian, Project Code: Honeywell/CSE/F121/2019-20/S106, Project Title: Artificial Intelligence Lab Set Up And usage Agreement, Sponsoring Agency: Honeywell, 47.2L.

- Dr. Manohar Kaul, Project Type: Sponsored, Project Code: GreatFour/CSE/F160/2019-20/S107, Project Title: Label Generation using Geometric Deep Learning, Sponsoring Agency: GreatFour Systems, 8.1L.

- Dr. Sathya Peri, Project Code: Shell/CSE/F137/2019-20/S110, Project Title: Development of Efficient parallel image segemtation Algorithms, Sponsoring Agency: Shell Technology Center Bangalore, 15L

- Dr. Krishna Mohan C, Project Code: OPPO, Project Title: Optimized Video Bokeh in OPPO mobile devices, Sponsoring Agency: OPPO R&D, Hyderabad, 13L.

Seminars Conducted

- 6th Annual International Conference on Algorithms and Discrete Applied Mathematics (CALDAM 2020), IIT Hyderabad, 13-15 February 2020. Website: https://www.iith.ac.in/~caldam2020/CALDAM Indo-French Pre-Conference School on Algorithms and Combinatorics, 10-11 February 2020, IIT Hyderabad.

- Workshop chair of International Conference of Distributed Computing and Networking (ICDCN) 2020. Arranged workshops at ICDCN 2020 on 4th January at Kolkata

Awards & Recognitions

1. Dr. Rogers Mathew, Assistant Professor has received SERB-MATRICS (Mathematical Research Impact Centric Support) Grant.

2. Dr. Sathya Peri, Associate Professor, was a recipient of ASEM Duo Fellowship along with Prof. Maria Potop-Butucaru.

3. Dr. Sathya Peri, Associate Professor, was a recipient of Best Poster Award for our paper "An Efficient Framework for Concurrent Execution of Smart Contracts", in the PhD symposium of ICDCN 2019.

4. Dr. Saurabh Bhanuprasad Joshi, Assistant Professor has done MaxSAT Evaluation 2019.

5. Dr. Saurabh Bhanuprasad Joshi, Assistant Professor Grade-I, Computer Science and Engineering has received Bronze Medal in various categories for Open-WBO-Inc-SVCOMP 2020.

6. Dr. Saurabh Joshi, Assistant Professor has secured 3rd place for Pinaka in ReachSafety-Floats subcategory, 6th in Termination category- Invited article for Virtual Volume on 25th anniversary of CP.

7. Dr. Vineeth N Balasubramanian, Associate Professor, has received Best Paper Award Runner-up, ACM India Joint International Conference on Data Sciences and Management of Data (CoDS-COMAD), 2020.

8. Dr. Vineeth N Balasubramanian, Associate Professor, has received Outstanding Reviewer for IEEE/CVF CVPR, 2019 (a top-tier conference in computer vision).

Highlights

Pinaka, designed & developed at IIT Hyderabad is a single-path symbolic execution engine incorporated with incremental solving and eager infeasibility checks. At SVCOMP2020 (9th International Competition on Software Verification), Pinaka was placed 3rd in Reach Safety-Floats subcategory and was the fastest verifier in all the categories it participated in whenever it produced an answer.
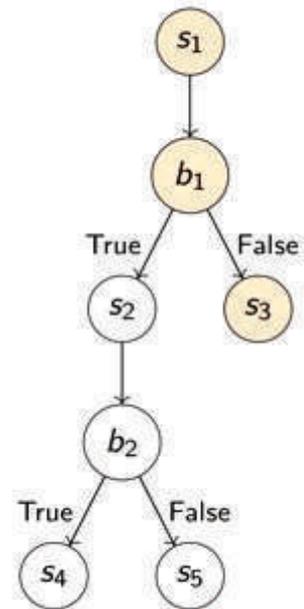
```
1  int x = 10,y;
2  x = x+y;
3  if(x==0) {
4      x=x+1;
5      if(y < -10)
6          x=x-1;
7  }
8  else{
9      x=0;
10 }
11 assert(x==0) ;
```

Formula:

$$(x_0 == 10) \wedge (y_0 == \alpha)$$
$$\wedge(x_1 == x_0 + y_0) \wedge (x_1 != 0)$$
$$\wedge(x_2 == 0) \wedge \neg(x_2 == 0)$$

Inner Working of Pinaka – A fast and accurate software Program Verifier.

Design

The Department of Design currently offers Bachelor of Design (BDes), Master of Design (MDes), and PhD in Design along with a Minor Program in Design for the BTech students. The departmental approach has been to encourage and engage its immediate community of users. The faculty are involved in teaching and research in various domains of design Spanning Virtual Reality, Architecture, Product Design, UI/UX, Communication & Media Design, Experience Design, Animation, Films, Design for Sustainability, Photography etc. Both faculty and student teams have been actively involved in providing design support to various users and communities through various design initiatives. The Design Innovation Centre which is funded by the Ministry of Human Resource and Development is an active incubator for cutting edge innovations in design. The department has been actively involved in creating new narratives in the Indian context through future-ready virtual reality tools. The Department of Design at IIT-Hyderabad offers a vibrant environment for learning, practising and exploring several facets of design. The department envisions to creatively engage in the space between technologies and people. This involves facilitating innovation in the key emergent areas such as Participatory and collaborative Design, Professional Ethics / Sustainability, Product Systems and Services, Design and Education, Wellness, Crowd Sourced Design. The department is engaged in interdisciplinary work in various domains like sustainability, mobility, healthcare and experience design. The Department primarily aims to lead the initiative of guiding and shaping behaviours towards a responsible and safe environment. In pursuit of this, it continues to engage and contribute to the micro-environment of the institute is myriad ways as also enhancing the larger social environment via work in education, urban design, heritage, and narratives. Promoting and developing new ways of doing reflective practice, the Department tries to achieve new harmonies between theory and practice.

THE WHOLE PURPOSE OF EDUCATION IS TO TURN MIRRORS INTO WINDOWS."
– *Sydney J. Harris*

Faculty

Deepak John Mathew
PhD – MS University of Baroda
Professor & HoD
Research Areas: Photography;
Elements of Design; Aesthetics;
History of Design

Prasad S Onkar
PhD – IISC Bangalore
Assistant Professor
Research Areas: Product Design; Computer Aided
Conceptual Design; 3D Sketching; Virtual Reality;
Haptics; Interaction Design

Neelakantan P K
PhD – IIT Bombay
Assistant Professor
Research Areas: Architectural Design;
Early Stage Design Process; Aesthetics;
Experiential Installations; Urban Planning;
Art and Performance Studies

Delwyn Jude Remedios
Assistant Professor
Research Areas: Animation; Film;
Virtual Reality; Children Story Books;
Graphic Novels; Illustrations; e-Learning

Shiva Ji
Assistant Professor
Research Areas: Design for Sustainability;
Sustainability Assessment Methods; LCA;
Environmental Planning and Design;
Virtual Reality Applications in Architecture

Seema Krishnakumar
Assistant Professor
Research Areas: Information Design;
Data Visualization; Interactive Storytelling;
Journalism Design; Photo Documentary;
Multimedia Storytelling

Ankita Roy
Assistant Professor
Research Areas: Publication and Book Design;
Ancient Scripts; Tessellations & Geometrical
Patterns; Kufic Calligraphy; Design Pedagogy;
Innovation Design; UX and UI Design;
Pop-Up Book Design; Environmental Graphics;
Cartographic Info-Graphics;
Perspective Drawing;
Architectural Reconstruction; Illustration

Book / Book Chapter

- The Magic of Mandu – Suhur-e-Shaadiabad (ISBN:978-8193208540) Chapter Contributor, Visualizer, Architectural Reconstructions, Illustrator and Book Designer - Ankita Roy. The Magic of Mandu is a collaborative effort to recreate the ruined city of Mandu that once was.

- Xplore Khajuraho (ISBN 978-8193208557) Research, Visualizer, Architectural Ground Plans, Illustrator and Book Designer – Ankita Roy. The book attempts to explore the sacred religious capital of the Chandela dynasty with evocative photographs, detailed ground plans a (...).

- Seema Krishnakumar, Ammachi in Justin, Babitha and Sriram, Abhirami (ed), Salt and Pepper and Silver linings. readme books, 139-142, 2019, ISBN 978-8193915820.

- Ji Shiva., Punekar R. M. (2019) Intervening on 'Building As A Product' and 'Habitation As A Service' in Contemporary Urban Settings for Adaptive Micro Habitation Design – Indicative Global Case Studies. ISBN: 978-88-95651-26-2, pp 1123-1128. Edizioni POLI.design.

- The Monolithic Temples of South India: Architectural Prototypes, Pedarapu Chenna Reddy Eds., History, Culture and Archaeological Studies: Recent Trends Rajukalidoss P, Mathew D. J. Edited Volume (2019) BR Publishing Corporation, Delhi.

Publications (Journals)

1. Mandal, A. M. (2019). Xplore Khajuraho. ISBN 978-8193208557 Resurrect Books.
2. Mandal, M., Sakkal, M., & Roy, A. (2019). Magic of Mandu – Suhur-e-Shaadiabad, Chapter Name: Metropolis of Mandu. Magic of Mandu – Suhur-e-Shaadiabad, 1.
3. Rautray, P., Roy, A., Mathew, D. J., & Eisenbart, B. (2019). Bio-brick – Development of sustainable and cost effective building material. Proceedings of the International Conference on Engineering Design, ICED, 2019-August, 3171-3180. https://doi.org/10.1017/dsi.2019.324.
4. Rajukalidoss, P., & Mathew, D. J. (2019). Architectural and Intangible Cultural Heritage Significance of Āntāl-Vatapatraśāyī Temple, Srivilli Puttur (Doctoral dissertation, Indiant Institute of Technology Hyderabad). Āntāl-Vatapatraśāyī.
5. Mathew, D. J., & Rautray, A. P. (2019). IIT-H partners with Odisha Tech Institute to develop bio-brick. .

6. Mathew, D. J., & Rautray, P. (2019). IIT-Hyderabad creates bio-bricks from agricultural waste.
7. Mathew, D. J. (2019). IIT Hyderabad creates VR experience for 'Oral Historical Narrative' of Begum Hayat Bakshi.
8. Chowdhary, N. P., & Mathew, D. J. (2019). IIT Hyderabad Coffee Table Book: Celebrating 10 Years of the Institute (Doctoral dissertation, Indian Institute of Technology Hyderabad).
9. Lokku, D. S., Onkar, P. S., & Mathew, D. J. (2019). Leveraging design innovation for ensuring creation of value: An approach to identify the corresponding design concerns towards enabling the design practice. Smart Innovation, Systems and Technologies, 135, 133–142. https://doi.org/10.1007/978-981-13-5977-4_11.
10. Ji Shiva., Punekar R. M. (2019) Intervening On 'Building As A Product' and 'Habitation As A Service' in Contemporary Urban Settings For Adaptive Micro Habitation Design – Indicative Global Case Studies. ISBN: 978-88-95651-26-2, pp 1123-1128. Edizioni POLI.design, Milano, Italy.

Publications (Conference)

1. 1. K. V. Rakhin, Prasad S. Onkar, J. Hayavandana, Haptic Design of Textiles: Perceptual Cues Involvement in Woven Fabric Compliance Detection. International Conference on Handlooms, Nonwovens and Technical Textiles, Hyderabad, 27-28 February, 2020.
2. Lokku D. S., Onkar P. S., Mathew D. J., Chakrabarti A.. Smart Innovation, Systems and Technologies; 9 to 11 January 2019; Springer Science and Business Media Deutschland GmbH; 2019.133.
3. Ji Shiva., Punekar R. M. (2019) A Critical Study of Choke Point in Sustainable Recycling of Household Waste in an Assamese Village Setting. In: Chakrabarti A. (eds) Research into Design for a Connected World. Smart Innovation, Systems and Technologies, Vol 135, pp 165-173. Springer, Singapore.
4. Ji Shiva., Punekar R. M. (2019) Exploring Attributes of Vernacular Assam Type House Design Techniques in Contemporary Setting. In: Reddy B., Mani M., Walker P. (eds) Earthen Dwellings and Structures. Springer Transactions in Civil and Environmental Engineering. pp 419-433. Springer, Singapore.
5. Ji Shiva., Punekar R. M. (2019) The Ethno-Cultural Influences on "Assam Type" Building Typology – A Case of Barduwa, Assam. In: Chakrabarti A. (eds) Research into Design

for a Connected World. Smart Innovation, Systems and Technologies, vol 134, pp 15-26. Springer, Singapore.

6. Delwyn Jude Remedios Deepak John Mathew Paper Title: An experiment to preserve oral traditions through 360-degree virtual reality animation film Conference: International Conference on Recent Trends and Sustainability in Crafts & Design, Novemb (...).

7. Delwyn Jude Remedios Deepak John Mathew Poster Title: Parallel Narratives in Cinematic Virtual Reality Conference: World Design Organization (WDO) – Research and Education Forum 2019.

8. 360-degree Virtual Reality Animation Trailer title Ma Saheba – The Queen of Hyderabad displayed at Rajiv Gandhi Hyderabad International Airport. This project is a part of the Design Innovation Centre (DIC) at IIT Hyderabad (Dept. of Design) displayed as a part of Hyderabad Design Week organised by World Design Organisation (WDO) PI: Deepak John Mathew, & Co PI: Delwyn Jude Remedios.

9. Experimental animation film 'NAKAB (Masks): Students from SRFTI: Sharad Uikey, Asthita, Bhuvan, Rishi Bhaumik, Sopaan PundalikGuide: Delwyn Jude Remedios 17th Frames Film Festival 2020.

10. Experimental animation film 'NAKAB (Masks): Students from SRFTI: Sharad Uikey, Asthita, Bhuvan, Rishi Bhaumik, Sopaan Pundalik Guide: Delwyn Jude Remedios Selected in ANIFEST 2019, organised by TASI (The Animation Society of India.

11. Authors: Neelakantan P. K. & Prasad Onkar, Thinking Outside Boxes a text-based installation the 2019 India Human Computer Interaction Conference held in Hyderabad November 2019.

12. Addressing Transformation of Businesses: An Approach based on Service Innovation with Design Innovation as an Enabler Lokku D S, Mathew D J QUIS 16 (Services Conference) June 2019, Karlstad, Sweden.

13. An experiment to preserve Oral Traditions through 360 Degree Virtual Reality Animation Film Mathew D. J., Remedios D. J. International Conference on Recent Trends and Sustainability in Crafts and Design (November, 2019) published : November, 2019.

14. Bhandari U., Mathew D. J., Chakrabarti A., Smart Innovation, Systems and Technologies; 9 to 11 January 2019; Springer Science and Business Media Deutschland GmbH; 2019.947

15. Design Innovation Dimensions and Bottom of the Pyramid Market Principles: A Study to bring these together for an Approach to address Quality of Living Lokku D S, Mathew D J IASDR 2019 – International Association of Societies on Design Research September (...).

16. Frameworks for Exploring Artificial Intelligence as a technique in Computer Generated Art Mathew D. J., Tsukka J. Seeing A. I. in Fashion (SAIF 2019), NIFT Kannur Conference Paper.

17. Life-Raft: Autonomous Mathew D. J., Eisenbart B., Rautray P. Swinburne Research Conference 2019 Poster Presentation.

18. Lokku D. S., Onkar P. S., Mathew D. J., Chakrabarti A., Smart Innovation, Systems and Technologies; 9 to 11 January 2019; Springer Science and Business Media Deutschland GmbH; 2019.133.

19. Photographs: A Visual Research Method Tool in Design Process Mathew D. J., Sen A., DO World Design Assembly Oct 2019, Hyderabad.

20. Prallel Narrratives in Cinematic Virtual Reality Mathew D. J., Remedios D. J. WDO World Design Assembly Poster Presentation: October, 2019.

21. Rautray P., Roy A., Mathew D. J., Eisenbart B.. Proceedings of the International Conference on Engineering Design, ICED; 5 to 8 August 2019; Cambridge University Press; 2019.3171

22. Review of Tranformative Technology and Related Pedagogy in School: Teaching learning Practice to froster creativity Som S., Mathew D. J., Vincs K. WDO World Design Assembly Conference Proceedings.

23. Saha I., Bhandari U., Mathew D. J., Chakrabarti A.. Smart Innovation, Systems and Technologies; 9 to 11 January 2019; Springer Science and Business Media Deutschland GmbH; 2019.483.

24. Saha I., Mathew D.J., Chakrabarti A., Smart Innovation, Systems and Technologies; 9 to 11 January 2019; Springer Science and Business Media Deutschland GmbH; 2019.211.

25. Social Network Analysis of Indian Bridal Fashion through Social Media Mining Mathew D J, Saha I, Kundu S SAIF'19 (May 2019) NIFT Kannur (To be published in a journal).

Funded Research Projects

- Dr. Shiva Ji, Project Type: Grant-in-Aid, Project Code: DST/EE/F205/2019-20/G236, Project Title: Financial Assistance for the Consortium Mode Proposal under the Indian Heritage in Digital Space (IHDS) of Interdisciplinary

Cybcer Physical Systems (ICPS) Programme of the Department of Science & Technology, New Delhi, Sponsoring Agency: DST, 39.8L.

- Prof. Deepak John Mathew, Project Type: Grant-in-Aid, Project Code: CEP/Design/ F132/2019-20/W31, Project Title: Sitar National Camp, Sponsoring Agency: NIFT, 5.4L.
- Prof. Deepak John Mathew, Project Type: Grant-in-Aid, Project Code: DST/DES/ F132/2019-20/G265, Project Title: Tangible and Intangible Heritage of Telangana a visual documentation and design intervention, Sponsoring Agency: SHRI, 22.3L.
- Prof. Deepak John Mathew, Project Type: Grant-in-Aid, Project Code: WDO/DS/ F132/2019-20/W39, Project Title: Display Exhibition during the Conference, Sponsoring Agency: WDO, 3L.

Awards & Recognitions

- Mr. Delwyn Judo Remedios, Assistant Professor Animation film titled, 'Ek Cup Chaha' Student: Sumit Yempalle Guide: Delwyn Jude Remedios.
- Official Selection at Kancas City FilmFest International 2020
- Official Selection at Washington DC Independent Film Festival 2020.
- Ram Mohan Viewers Choice Award (RMVCA).
- Runner Up at Anifest, International animation film festival conducted by The Animation Society of India (TASI), 2019.
- Special Mention Award by Jury at Anifest, 2019.
- Global Leadership Award - Film Making' in the Animation Category at the Chhatrapati Shivaji International Film Festival, conducted at the National Film Archive of India, Pune, 2019.
- Best Direction in Animation Category at the Chhatrapati Shivaji International Film Festival, Pune, 2019.
- Best Student film at Pickurflick Indie Film festival, Dec, 2019.

- Selected as one of the top 3 finalists at ADI battle of projects as part of PDF 20 in Film and Animation Category.
- Selected as finalist at MAAC 24 FPS, 2019 International Animation Awards.
- Official Selection at 6th Rajasthan International Film Festival, 2020.
- Experimental animation film NAKAB (Masks).
- Students from SRFTI: Sharad Uikey, Asthita, Bhuvan, Rishi Bhaumik, Sopaan Pundalik, Guide: Delwyn Jude Remedios.
- 17th Frames Film Festival 2020.
- Selected in ANIFEST 2019, organised by TASI (The Animation Society of India).
- Dr. Deepak John Mathew, Professor, Design has received Best paper Award SAIF'19 (May 2019).
- Dr. Deepak John Mathew, Professor, Design got Distinguished paper at iCorD 2019.
- Dr. Deepak John Mathew, Professor, Design has been selected as a Jury member State Lalit Kala Academy Photography National Competition.
- Dr. Deepak John Mathew, Professor, Design has been selected as a Jury Member for Wedding photographer of the Year, Better photography Magazine.

Highlights

The Design Innovation Center (DIC), IIT Hyderabad conducted 2 days Hand holding a workshop with its spokes institutions IIIT Kancheepuram, IIIT Sri City and IIIT Hyderabad from 27th-28th Feb, 2020 at IIT Hyderabad. Prof. Deepak John Mathew, Principal Design Investigator of DIC headed the workshop. On the first day, the spoke institutes gave presentations on their innovative products. On the second day workshop, they discussed on how to convert engineering ideas and technological innovations into viable products. Representatives from spoke institutes, faculty, and students of the design department have participated in the workshop.

Electrical Engineering

Since its inception in 2008, EE Department @ IITH has progressed rapidly into a full-fledged, multi-faceted department having the largest number of faculty and students in IITH. The EE Department has 29 full-time faculty and 5 visiting faculty and it caters to close to 500 students. The thrust of the department is invention and innovation. Research grants to the tune of 100 crores is a testament for the drive / capabilities of our Faculty, spanning across four major domains, viz., Communication and Signal Processing, Micro / Nano Electronics & VLSI, Power Systems and Power Electronics, and Control Systems, EE independently runs four MTech programs in the major domain and offers several interdisciplinary MTech programs in collaboration with the other departments at IITH. With multiple offers in hand, our BTech students are well placed across different top-notch MNCs. Moreover, offers for higher studies in Ivy league universities have become commonplace for our undergraduate toppers. Placements for Masters and PhD programs have also been consistently lucrative. A couple of our research scholars have become faculty in IITs and NITs. Last but not the least, the emphasis on practical work and state-of-the-art research work has led to the incubation of four start-ups. Two of these start-ups have revenue in-flow and will pretty soon be getting Series-A funding. We at EE aim to be pioneers rather than peers.

EDUCATION IS THE TRANSMISSION OF CIVILIZATION."
– *Will Durant*

Faculty

K Sri Rama Murty
PhD – IIT Madras

Associate Professor & HoD
Research Areas: Signal Processing;
Speech Analysis, Recognition & Synthesis;
Machine Learning

Mohammed Zafar Ali Khan
PhD – IISC Bangalore

Professor
Research Areas: Wireless Communications;
MIMO Decoding; Commensal Radar;
CPS Security and Dynamic Spectrum Allocation

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Professor
Research Areas: Wireless Communications;
MIMO Decoding; Commensal Radar;
CPS Security and Dynamic Spectrum Allocation

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Professor
Research Areas: Internet of Intelligent
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Computer Aided Diagnosis; Intelligent and
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PhD – IIT Bombay

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Research Areas: Control Theory;
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Research Areas: Biomedical Image and Signal
Analysis; Air Quality Analysis; Network
Information Theory; Computer Vision;
Artificial Intelligence; Radar and Sonar Imaging
and Signal Processing

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Research Areas: Analog and Radio Frequency VLSI
Chip Design; Receiver; Phase Locked Loop;
Low Noise Amplifier; Energy Harvesting

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Research Areas: Wide Area Monitoring and
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Power Market Design

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Research Areas: PPM Induction
Motor Drives; Multi-Level Inverters;
Micro-Grids

Sumohana Channappayya
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Research Areas: Image and Video Quality
Assessment; Biomedical Image Processing;
Machine Learning

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Research Areas: VLSI Systems Resource-Constrained
Applications; Low Power Design Techniques;
Machine Learning Hardware Design; Signal Processing
Algorithm and VLSI Architectures; Digital Arithmetic;
Hardware Security; Real-time Battery Health
Monitoring for the Electric Vehicles; Healthcare
Technology and Chip-design Targeting Remote Health
Monitoring including Cardio-Vascular Diseases;
Diabetes; Autism Spectrum Disorder; Neurological
Disorder; Orthopaedically Handicapped Patients;
Accelerating Cancer Diagnostic Procedures Through
Hardware-Software Co-design; Design for Testability
and Reliability

Faculty

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Research Areas: Wireless Communications;
Physical Layer Modulation;
Synchronization Techniques;
Channel Coding Techniques

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Research Areas: Computer-Aided Power
System Analysis and Modeling; AI Techniques
Applications for Power Systems Security;
Improvement; Power System Protection and
Optimization Distribution System Automation;
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Research Areas: Biosensors;
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PhD – University of California, USA

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Research Areas: Flexible and Wearable
Nanoelectronics;
Nanomaterials Based Devices and Circuits;
Eco-Friendly Electronics; Paper Electronics;
Electrochemical Sensors and Supercapacitors

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Associate Professor
Research Areas: Resource Allocation for 5G;
Visible Light Based Communications; Security
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Operation in the Unlicensed Spectrum

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Research Areas: Smart Grids; Power System
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Architectures; Ontologies for Power System
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Bio-chemical Sensors

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Research Areas: Modulation and Coding for
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and Statistical Signal Processing; Multimedia;
Image and Video Processing; Artificial Neural
Networks; Computer Vision; and Wavelet
Analysis

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B Yegnanarayana
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Research Areas: Digital Signal Processing;
Speech; Computer Vision and
Neural Networks

Saidhiraj Amuru
Adjunct Assistant Professor
Research Areas: Wireless Communications;
Applications of AI and Machine learning in
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Nixon Patel
Adjunct Professor
Research Areas: Wireless Communications;
Applications of AI and Machine learning

Patent Filed / Granted

- Patent Title: Discrimination of Filled and Unfilled Grains of Rice Using Thermal Images, Name of the Inventors: . Rajalakshmi, Ajay Kumar, Patent Number: TEMP/E-1/20223/2019-CHE.

- Patent Title: IITH LORA Mote – Low-Power Long Range,, Name of the Inventors: P. Rajalakshmi, Subhra S, Patent Number: TEMP/E-1/31845/2019-CHE.

- Patent Title: A Method of Receiving Signal Stream And A Receiver, Name of the Inventors: Kuchi, Kiran Kumar; Makandar, Sibgath Ali Khan; Gudimitla, Koteswara Rao; Amuru, Saidhiraj, Patent Number: PCT/IN2019/050424.

- Patent Title: A Method of Receiving Signal Stream And A Receiver Thereof, Name of the Inventors: Kuchi, Kiran Kumar; Makandar, Sibgath Ali Khan; Gudimitla, Koteswara Rao; Amuru, Saidhiraj, Patent Number: 201841020438.

- Patent Title: Cloud Radio, Massive Mimo System And Methods Thereof, Name of the Inventors: Kiran Kumar Kuchi; Saidhiraj Amuru, Patent Number: 201841043360.

- Patent Title: Method and System for Classifying Speed of A User Equipment, Name of the Inventors: Kuchi, Kiran Kumar; Makandar, Sibgath Ali Khan; Amuru, Saidhiraj, Patent Number: PCT/IN2019/050554.

- Patent Title: Method and System for Detecting Physical Random Access Channel (Prach) Transmission from Multiple User Equipment's, Name of the Inventors: Kuchi, Kiran Kumar; Makandar, Sibgath Ali Khan; Amuru, Saidhiraj, Patent Number: PCT/IN2019/050677.

- Patent Title: Method and System for Generating A Transmit Waveform For Reference Sequences, Name of the Inventors: Kiran Kumar Kuchi; Makandar Sibgath Ali Khan; Saidhiraj Amuru, Patent Number: PCT/IN2019/050792.

- Patent Title: Method and System for Scheduling A Pool of Resources to A Plurality of User Equipment's, Name of the Inventors: Kuchi, Kiran Kumar; Amuru, Saidhiraj; Dureppagari, Harish Kumar; Manne, Pavan Kumar Reddy, Patent Number: PCT/IN2019/050585.

- Patent Title: System and Method for Generating Reference Signals with Low Peak-To-Average Power Ratio (Papr) Waveform, Name of the Inventors: Kiran Kumar Kuchi; Makandar Sibgath Ali Khan; Saidhiraj Amuru, Patent Number: 201841040625.

- Patent Title: An on-chip miniature microscope using micro-LED light sources, Name of the Inventors: Shishir Kumar, Ekta Prajapati, Srikanth Manepally, Patent Number: In process, will update soon.

- Patent Title: 5G New Radio Physical Random Access Channel (Nr-Prach) Receiver, Name of the Inventors: Kiran Kumar Kuchi; Makandar Sibgath Ali Khan; Patent Number: PCT 201841034881

- Patent Title: A Method of Receiving Signal Stream and A Receiver Thereof, Name of the Inventors: Kiran Kumar Kuchi; Makandar Sibgath Ali Khan; Gudimitla Koteswara Rao; Sai Dhiraj Amuru, Patent Number: PCT 201841020438

- Patent Title: A Method of Receiving Signal Stream and A Receiver Thereof, Name of the Inventors: Kiran Kumar Kuchi; Saidhiraj Amuru; Makandar Sibgath Ali Khan, Patent Number: PCT 201941009771.

- Patent Title: System and Method to Generate a Waveform in a Communication Network, Name of the Inventors: Kiran Kumar Kuchi, Patent Number: IN, PCT, US US 16/323,969 EP 17838906.

- Patent Title: Systems and Methods for Generating A Low Peak-to-Average Power Ratio (Papr) Data and Reference Signal, Name of the Inventors: Kiran Kumar Kuchi; Makandar Sibgath Ali Khan; Gudimitla Koteswara Rao; Saidhiraj Amuru, Patent Number: PCT 201841020438.

- Patent Title: Method and System for Classifying Speed of A User Equipment, Name of the Inventors: Kiran Kumar Kuchi; Makandar Sibgath Ali Khan; Saidhiraj Amuru, Patent Number: PCT 201841028421.

- Patent Title: Method of Determining Modulation And Coding Scheme (Mcs) And A System Thereof, Name of the Inventors: Kiran Kumar Kuchi; Saidhiraj Amuru, Patent Number: PCT 201841043360.

- Patent Title: Multiplexing of Multiple User Traffic using Single or Multiple Waveforms in Downlink, Name of the Inventors: Kiran Kumar Kuchi;, Patent Number: PCT/EU/EP 201947006811
- Patent Title: Multi-User Multiple-Input And Multiple-output (Mu-Mimo) L2 Scheduler, Name of the Inventors: Kiran Kumar Kuchi; Saidhiraj Amuru; Harish Kumar Dureppagari; Pavan Kumar Reddy Manne, Patent Number: PCT 201841029885

Book / Book Chapter

- An accelerated computational approach in proteomics (book chapter) in the book titled Biomedical Signal Processing – Advances in Theory, Algorithms and applications, Springer. Editors: Naik, Ganesh (Ed.),November 2019, ISBN 978-981-13-9097-5
- Extraction of ECG Significant Features for remote CVD Monitoring (book-chapter) in the book titled Biomedical Signal Processing - Advances in Theory, Algorithms and Applications. Springer. Editors: Naik, Ganesh (Ed.), November 2019, ISBN 978-981-13-90 (...)
- Nano-Magnetic computing for next-generation Interconnects and Logic Design by Sanghamitra Debtory, Santhosh Sivasubramani, Swati Ghosh Acharyya and Acharyya, A. (Book Chapter) in the book titled VLSI and Post-CMOS Devices, Circuits and Modelling in t (...)
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6. Patel, A., & Khan, M. Z. A. (2019b). Optimal Channel Reservation for Primary Users in Spectrum Sharing. IEEE International Symposium on Personal, Indoor and Mobile Radio

Communications, PIMRC, 2019-September. https://doi.org/10.1109/PIMRC.2019.8904255

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9. N. R. Banavathu and M. Z. A. Khan, Optimizat. ion of N-out-of-K Rule for Heterogeneous Cognitive Radio Networks, in IEEE Signal Processing Letters, vol. 26, no. 3, pp. 445-449, March 2019, doi: 10.1109/LSP.2019.2893999.

10. Y. Manchuri, A. Patel and M. Z. Ali Khan, Detection of False Data Injection Attacks on CPS Using Coded Cosine Similarity Tests," 2019 International Conference on Smart Applications, Communications and Networking (SmartNets), Sharm El Sheik, Egypt, 2019, pp. 1-6, doi: 10.1109/SmartNets48225.2019.9069752.

11. Amarlingam, M., & Rajalakshmi, P. (2019). Smartphone Based Acoustic Navigation Tool for IoT Networks. Wireless Personal Communications, 108(3), 1547–1569. https://doi.org/10.1007/s11277-019-06484-x.

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16. Francis, K. J., Chinni, B., Channappayya, S. S., Pachamuthu, R., Dogra, V. S., & Rao, N. (2019). Multiview spatial compounding using lens-based photoacoustic imaging system. Photoacoustics, 13, 85-94. https://doi.org/10.1016/j.pacs.2019.01.002.

17. Jagadish, B., Mishra, P. K., Kiran, M. P. R. S., & Rajalakshmi, P. (2019). A real-time health 4.0 framework with novel feature extraction and classification for brain-controlled iot-enabled environments. Neural Computation, 31(10), 1915-1944. https://doi.org/10.1162/neco_a_01223.

18. Jagadish, B., & Rajalakshmi, P. (2019). A Novel Feature Extraction Framework for Four Class Motor Imagery Classification using Log Determinant Regularized Riemannian Manifold. Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, 6754-6757. https://doi.org/10.1109/EMBC.2019.8857393.

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22. Rajalakshmi, P. (2019). On building a smarter ecosystem using the internet of intelligent

things: Progress and future challenges. CSI Transactions on ICT, 7(3), 243–250.

23. Rajalakshmi, P., Reddy, D., & Bharath, R. (2019). CNN based framework for representative detection of liver images for CAD and tele-sonography applications. CSI Transactions on ICT, 7(2), 131-135.

24. Kiran, M. P. R. S.; Rajalakshmi, P. (May-19-2019) Saturated Throughput Analysis of IEEE 802.11ad EDCA For High Data Rate 5G-IoT Applications IEEE Transactions on Vehicular Technology 68(5) 4774-4785 https://doi.org/10.1109/TVT.2019.2903890

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80. V. Seshadri Sravan Kumar, "Computation of Initial Conditions for Dynamic Analysis of a Doubly Fed Induction Machine based on Accurate Equivalent Circuit", IEEE International Electric Machines & Drives Conference (IEMDC), USA

81. A. Patel and Mohammed Zafar Ali Khan, "Comparing Energy Efficiency of Spectrum Sharing Paradigms", accepted in IEEE SmartNets 2019, Sharm-el Sheik, Eygpt, Dec. 17-19, 2019, pp 1-6.

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83. Nayeem H., Syed A., Khan M.Z.A.. Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS; 23 July 2019 through 27 July 2019;Institute of Electrical and Electronics Engineers Inc.;2019.1175

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85. Qadeer S., Mohammed Zafar Ali Khan, Yousuf khan M. (2019), "Computation of Discrete Fourier Transform (FFT): A Review Article". In: Nath V., Mandal J. (eds) Lecture Notes in Electrical Engineering, vol 476. Springer, Singapore, pp 381-390.

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Funded Research Projects

- Dr. Abhinav Kumar, Project Type: Grant-in-Aid, Project Code: DST/EE/F150/2019-20/G231, Project Title: Cooperative Isolated Renewable Energy Systems for Enhancing Reliability of Power in Rural Areas, Sponsoring Agency: DST, 11.3L.

- Dr. Aditya T Siripuram., Project Type: Grant-in-Aid, Project Code: G206, Project Title: Signal Processing Perspectives on Unsupervised Graph Learning, Sponsoring Agency: SERB, 11.6L.

- Dr. Amit Acharyya, Project Code: CARS/EE/F091/2019-20/S109, Project Title: Development of Digital Visualization & Proof of Concept for See Through Armour, Sponsoring Agency: ODF, 29.5L.

- Dr. Amit Acharyya, Project Type: Grant-in-Aid, Project Code: DRDO/EE/F091/2019-20/G238, Project Title: Corrosion Fatigue Crack Sensing in Ship Steel by Acoustic Emission Sensor Along with Detection and Identification using Customized Machine Learning, Sponsoring Agency: NRB, DRDO, 164.4L.

- Dr. Amit Acharyya, Project Type: Grant-in-Aid, Project Code: DST/EE/F091/2019-20/G221, Project Title: Financial Assistance for the Cluster Proposals Under the Internet of Things (IoT) Research of Interdisciplinary Cyber Physical Systems (ICPS) Programme of the Department of Science & Technology (DST), GOI, New Delhi, Sponsoring Agency: DST, 98.1L.

- Dr. Amit Acharyya, Project Code: Xilinx/EE/F091/2019-20/S81, Project Title: Research and Course-integration Engagements with Xilinx, Sponsoring Agency: Xilinx Inc. USA, 67.4L

- Dr. Ashudeb Dutta, Project Type: Grant-in-Aid, Project Code: Meity/EE/F006/2019-20/G266, Project Title: Design of Dynamic MAC and PHY SoC for Low power and long Range Networks, 199.6L.

- Dr. Lakshmi Prasad N, Project Type: Grant-in-Aid, Project Code: G14, Project Title: Index Coding for Wireless Communications, Sponsoring Agency: DST, 7L

- Dr. Lakshmi Prasad N, Project Type: Grant-in-Aid, Project Code: G278, Project Title: Coding Techniques for Distributed Computing, Sponsoring Agency: SERB, 2.2L

- Dr. Naresh Kumar Emani, Project Type: Grant-in-Aid, Project Code: G214, Project Title: Investigation of the Carrier Surface Recombination in III-V Semiconductors for on-chip Nanophotonic Applications, Sponsoring Agency: SERB, 45.3L.

- Dr. Naresh Kumar Emani, Project Type: Grant-in-Aid, Project Code: G85, Project Title: Electrical Excitation of Plasmons in Metallic Nanostructures, Sponsoring Agency: SERB under Ramanujan Fellowship Scheme, 38L.

- Dr. Rajalakshmi P, Project Type: Grant-in-Aid, Project Code: G174, Project Title: AI based High Throughput Phenotyping to Accelerate Crop Improvement through Crop images Captured from Unmanned Aerial Vehicle (UAV) with On-Vehicle Sensors, Sponsoring Agency: MeiTY, 22L.

- Dr. Rajalakshmi P, Project Type: Grant-in-Aid, Project Code: G216, Project Title: Design and Fabrication of Passenger Drone, Sponsoring Agency: MEITY, 100L.

- Dr. Rajalakshmi P, Project Type: Grant-in-Aid, Project Code: G283, Project Title: Technology Innovation HUB TIH on Autonomous Navigation and Data Acquistion Systems (UAV, RoV..), Sponsoring Agency: DST: NM-ICPS, 725L.

- Dr. Rajalakshmi P, Project Type: Grant-in-Aid, Project Code: G48, Project Title: Data Science-based Farming Support System for Sustainable Crop Production under Climatic Change (DSFS) Project, Sponsoring Agency: DST, 60L.

- Dr. Rupesh Ganpatrao Wandhare, Project Type: Grant-in-Aid, Project Code: SERB/EE/F210/2019-20/G267, Project Title: Design and Development of a Hybrid DC Bus Power Supply with the High Voltage Ride through Capability and the High Fault Tolerance, Sponsoring Agency: SERB, 29.5L.

- Dr. Sharma G V V, Project Type: Sponsored, Project Code: BEL/EE/F063/2019-20/S105, Project Title: Basic Simulation for Preamble Detection, Sponsoring Agency: BEL, 8.1L.

- Dr. Sharma G V V, Project Type: Grant-in-Aid, Project Code: MHRD/EE/F063/2019-20/G237, Project Title: Grant of Advance to Nodal Centres for Organising Smart India Hackathon 2019 Hardware Edition, Sponsoring Agency: MHRD, 15L.

- Dr. Shishir Kumar, Project Type: Grant-in-Aid, Project Code: G182, Project Title: Graphene Nanopores for Selective Molecular Filtering, Sponsoring Agency: DST Nano Mission, 7.5L.
- Dr. Soumya Jana, Project Type: Grant-in-Aid Project Title: Development of an Artificial Intelligence (AI) Based Accurate Refractive Outcome Prediction Model Post Cataract Surgery, Sponsoring Agency: Department of Biotechnology, India, 11.5L.
- Dr. Soumya Jana, Project Type: Sponsored, Project Code: Asahi/EE/F061/2019-20/S83, Project Title: Investigation into Blood Pressure from Camera, Sponsoring Agency: Asahi Kasei, Japan, 2.8L.
- Dr. Sri Rama Murty Kodukula, Project Type: Sponsored, Project Code: AKM/EE/F001/2019-20/S97, Project Title: Commissioned Research, 2.8L.
- Dr. Sri Rama Murty Kodukula, Project Type: Grant-in-Aid, Project Code: DST/EE/F001/2019-20/G261, Project Title: DST-Worldbank initiative to Strengthen Africe Centers of Excellence, 9.5L.
- Dr. Sri Rama Murty Kodukula, Project Type: Sponsored, Project Code: Qulabs/EE/F001/2019-20/S92, Project Title: Development of Keyword Spotting System, 26.6L.
- Dr. Sri Rama Murty Kodukula, Project Type: Sponsored, Project Code: Zen3/EE/F001/2019-20/S93, Project Title: Obtaining Technical Services of Sponsored Research 7.7L.
- Dr. Sumohana S Channappayya, Project Type: Sponsored, Project Code: Cars/EE/F100/2019-20/S95, Project Title: Object Detection and Tracking (ODT) in Infrared Images with Applications to Guidance and Control, 9.5L.
- Dr. Sumohana S Channappayya, Project Type: Sponsored, Project Code: Qualcomm/EE/F100/2019-20/S91, Project Title: Qualcomm Innovation Fellowship India 2019, 10.8L.

Seminars Conducted

- Indo-Japan Midterm Evaluation, IIT Hyderabad, May 2019.

Awards & Recognitions

- Dr. Amit Acharyya, Associate Professor, has been nominated for the Associate Editor in the IEEE Transactions on Nanotechnology (TNano) in February 2020.
- Dr. Amit Acharyya, Associate Professor, has been selected as a Visiting Research Fellow in the University of Southampton, UK from 2015-2020.
- Dr. Kaushik Nayak, Assistant Professor has been selected for IEEE Senior Membership Grade.
- Dr. Rajalakshmi P, Professor, has attended SATREP - m2smart Project Symposium in Nagoya Electrics, Japan, April 2019.
- Dr. Rajalakshmi P, Professor, has attended Indo-Japan Data Sciences Farming Sciences meeting in University of Tokyo, October 2019.
- Dr. Saidhiraj Amuru, Assistant Professor, has received Best Paper Award at COMSNETS 2020, Best Reviewer Award and IEEE Wireless Communications Letters.
- Dr. Sushmee Badhulika, Associate Professor, has received Suzuki Foundation Fellowship.
- Prof. Mohammed Zafar Ali Khan, Professor, has received 2020 DUO-India Professor Fellowship Award.

Highlights

Eco-friendly, light-weight and mechanically stable melamine sponge (MS) was chemically engineered using electrospunNiO nanofibers for facile fabrication of the tactile sensor. The UV filter exhibited a remarkable UPF (UV Protection Factor) of 87.7 while the strain sensor exhibited a gauge factor of 34 with a maximum strain withstanding capability of 76.3%. The pressure sensor displayed a wide dynamic sensing range of 50 N-700 N with a sensitivity 3.75kPa-1 which are significantly higher than similar sensors fabricated using advanced methodologies.
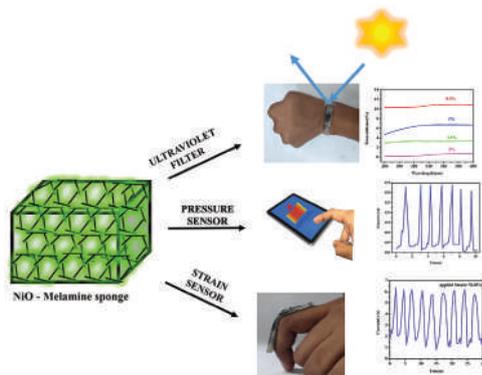
Fe-doped 2D ZnO obtained through band gap engineering and a 1D electrospun BiVO4 nanofiber on an ITO-coated PET substrate resulted in a heterostructure based broadband photo detector (PD). The PD exhibited ultra-high responsivity and EQE values. The robustness of the flexible PD was examined under the conditions of repeated bending cycles (up to 500), yielding a stable response. The facile and cost-effective fabrication of this high-performance device provides a new approach for developing flexible electronics and high-performance optoelectronic devices.
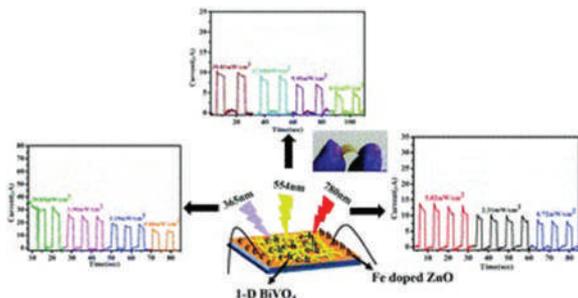
Drone Based Sensing and AI-Driven High-Throughput Phenotyping for Agriculture by Prof. P Rajalakshmi and team in Collaboration with ICRISAT, Hyderabad and PJTSAU, Hyderabad.

In recent years, automation, imaging solutions have paved the way for many high throughput phenotyping studies in agriculture. In the current scenario, the standard phenotyping methodologies (i.e., manual observations or laboratory assessments) are costlier, time-consuming, labour-intensive, destructive, and are frequently not standardized. Semi-automated systems have also been applied to investigate various components of plant growth and development, thus contributing to crop improvement programs. Researchers used ground-based platforms like handheld, fixed position

static cameras, ground-based imagery sensors to capture the images of the crop fields. However, the field of view of the static cameras is minimal, and hence these techniques are not widely adopted in the real-time scenario. In recent times, the usage of unmanned aerial vehicles (UAV) equipped with cameras and sensors have become very popular in remote sensing and monitoring applications. The UAVs equipped with cameras can have a wide field of view with broad coverages, and also have advantages such as low cost, easy deployment, and high spatial, as well as temporal resolutions when compared to airborne or space-borne remote sensing. Recently, non-invasive methods, based on UAV imaging techniques such as RGB, multispectral, hyperspectral, IR cameras, etc., are used to study the anatomical and physiological traits like crop health, crop nutrients, disease tolerance, water stress, crop yield, etc. using AI/ML-based algorithms. UAV mounted with Hyperspectral imager is shown in Figure 3.

Technology Development

Low Temperature, Low Pressure, Fine Pitch Cu-Cu Thermo-Compression Bonding Technique

ToT (non-exclusive) with Solid Blocks Semiconductor Pvt. Ltd., Kochi)

PIs: Prof. Shiv Govind Singh, Dr. Siva Rama Krishna Vanjari

The present invention relates to a promising low temperature, low pressure and medium vacuum Cu-Cu Thermo-compression bonding with an optimally chosen ultra-thin layer of alloy passivation used in 3D IC interconnects, 3D IC packaging which greatly helps in reduction of interconnect length and RC delay of CMOS compatible integrated circuits. This can be also extended for heterogeneous integration like ASIC with MEMS or Optical devices etc.
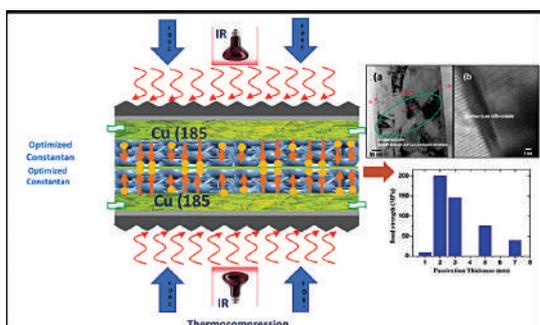
## Agriculture Domain

Device for Milk Adulteration Detection PI: Prof. Shiv Govind Singh Field Trial is on

Overview.

Milk adulteration detection, on the basis of the conventional chemical tests and the adulterant specific approaches, seems to be unsuitable, as far as the development of a low-cost, portable and fail-proof device is concerned. As an alternative, simultaneous monitoring of multiple biophysical properties of milk has been proposed and validated. Such properties inherently carry the signature of pure milk, and can hence be used as references for establishing the purity, or the deviation therefrom, of any milk sample. Towards this, at first, simultaneous monitoring of pH and ac impedance of milk has been explored, and a proof of concept has been established. As a first step towards realizing the envisaged milk adulteration detection system, it is essential to develop a working prototype that can facilitate the measurement of both pH and impedance on a single platform. This project is dedicated in this direction. Herein, we intend to develop a working prototype for milk pH and milk impedance measurement, on a single platform, for the ultimate goal of milk adulteration detection. The specific goals of this project are outlined below.
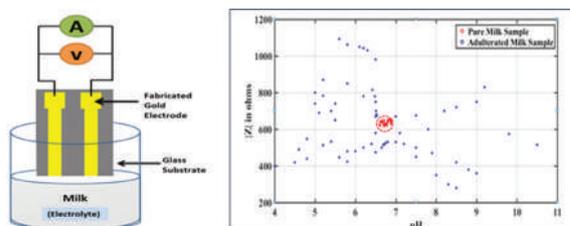

CommSense: The key idea to this technology lies in focusing on already known information from received signals e.g. pilot carriers in the communication signal frames. Comparing the received signal with the expected properties of the pilot, we can get an estimate of the change in the environment based on the change in channel properties. Existing LTE telecommunication infrastructure is utilized for this environment sensing task. After the channel characteristics are estimated, those can be used to obtain phenomenological knowledge of the environment using Application Specific Instrumentation framework. This system was implemented using software-defined radio platforms and GNU Radio software support. This technique was effectively applied to Crowd Estimates, Indoor Occupancy Estimation and Vehicle detection and classification.
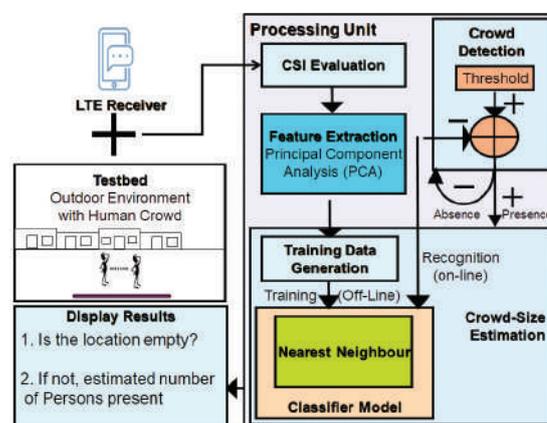
Quality Measurement of Flowing Water: The implementation of a novel, inexpensive and a portable system for rapid measurements of physicochemical parameters like pH, total dissolved solids, and turbidity of flowing water has been demonstrated. The system efficiently determines the variation in light intensity due to pH, TDS, and turbidity at various concentration levels. Results prove that absorption response based concentration values provided high accuracy of detection.
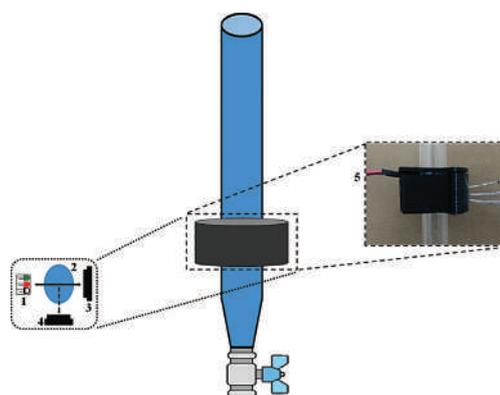
India's ascent up the 5G Ladder

Prof. Kiran Kuchi, Department of Electrical Engineering, IIT Hyderabad.

The advent of 4G technology has led to radical changes all over the world, especially by way of smart phones that have had a staggering impact on our lives. Far from being a mere evolutionary successor of 4G, 5G technology is slated to revolutionize the telecommunications sector in the near future. 5G technology will go much beyond connecting people – 5G applications include integrating a whole range of machines into the internet, such as smart metering (electricity / water / gas), industrial sensors, tracking of people/assets, machined farming, agri-tech, perishable goods management, pollution monitoring, healthcare applications, video surveillance etc. On the economic front, within the next decade, 5G / IoT is expected to add hundreds of Trillions of USD to the world economy. This is an unprecedented economic opportunity that India cannot afford to let go of.

Current 5G Initiatives in India

The development of 5G happens through global forums, one such forum which has been active is, the 3rd Generation Partnership Project (3GPP). It's a partnership between seven Standards Development Organizations (SDOs) of which Telecommunications Standards Development Society, India (TSDSI) is a member. 3GPP kick-started the 5G project in 2016 where certain Indian entities contributed to the development of 5G New Radio (NR) technical specifications. The International Telecommunication Union (ITU), a UN body that lays down requirements for 5G, had earlier adopted the so-called Low-Mobility-Large-Cell (LMLC) use case as a mandatory 5G requirement in 2017. This requirement was adopted by ITU mainly as a result of sustained effort by the Indian Government through the Department of Telecommunications (DoT) and TSDSI to address the unique Indian rural broadband deployment scenario. The LMLC based 5G technology will deliver ultra-fast, low-latency mobile internet and next-generation IoT services in both cellular and mm-wave spectral bands, common to all 5G candidate standards and an additional technological enhancement that has the ability to provide broadband connectivity to rural users using ultra-long range cell sites. This enhancement will ensure that 100% of India's villages are covered

from towers located at panchayat villages, whereas nearly a third of such villages would be out of coverage otherwise. The Indian LMLC 5G submission exploits a new transmit waveform that increases cell range. Several other such enhancements that enable large cells are being pursued by Prof. Kuchi in the standards fora. Adoption of LMLC based 5G standards in India will enable India to leap forward in the 5G space, with key innovations introduced by Indian entities accepted as part of global wireless standards for the first time. The nation stands to gain enormously both in achieving the required 5G penetration in rural and urban areas as well as in nurturing the nascent Indian R&D ecosystem to make a global impact. The current national efforts are aligned with the national digital communication policy that promotes innovation, equipment design and manufacturing out of India for the world market.

In an effort to spur 5G development in India, DoT has sanctioned the "Indigenous 5G Testbed" program with a project outlay of 224 Crores to IITM, IITH, CEWiT, IITK, IITB, IISc, and SAMEER. This program started yielding results in the form of prototype base stations, CPE/UE and NB-IoT chip sets that are being demonstrated under lab conditions. IIT Hyderabad, in particular, stands out with major contributions to key 5G technologies such as cloud RAN base station with massive MIMO capability, 5G UE prototype, and cellular NB-IoT chip set for connecting sensors and meters to the internet. This 5G radio access technology is being integrated with the core network and other subsystems developed by the participating institutes towards a full-fledged demonstration and field trial.

Liberal Arts

The department of Liberal Arts at IIT Hyderabad is a leading center for the study of a highly diverse range of subjects including Cultural Studies, Economics, English (Literature and Language), Psychology, Linguistics, Sociology, Social Anthropology and Development Studies. Academic programs such as International Relations, and Media and Fine Arts are soon to be integrated into the existing structure. While its primary focus remains world class research in the fields of humanities and social sciences, the department is also deeply committed to teaching innovative and intellectually stimulating courses to undergraduate and post graduate students of the institute. In addition, Liberal Arts at IIT Hyderabad places a lot of importance on interdisciplinary collaborations resulting in academic and financial development through projects of national and international importance. Currently, the department offers undergraduate courses at the institute and also has a strong post graduate program that confers MA in Development Studies and PhD in all disciplines listed.

Unique in its constitution and vision, the department of Liberal Arts at IIT Hyderabad strives to pursue excellence in teaching and research to benefit students, academics and the wider society. The department aspires to enrich the academic and creative life of the institute, encourage cutting-edge scholarship, and cultivate a deeper understanding of humanity at large.

EDUCATION IS A CAPITAL TO THE POOR MAN, AND AN INTEREST TO THE RICH MAN."
– Horace Mann

Faculty

Haripriya Narasimhan
PhD – Syracuse University - NY, USA
Associate Professor & HOD
Research Areas: Media; Gender; Health; India

Badri Narayan Rath
PhD – ISEC Bangalore
Professor
Research Areas: Economic Growth;
Industrial Economics; International Economics;
Energy Economics and Applied Econometrics

Indira Jalli
PhD – Hyderabad Central University
Associate Professor
Research Areas: Nation and Culture

Amrita Deb
PhD – BHU, Varanasi
Associate Professor
Research Areas: Positive Psychology;
Clinical Psychology and
Personality Psychology

KP Prabheesh
PhD – IIT Madras
Associate Professor
Research Areas: Macroeconomics;
International Finance and
Applied Econometrics

M P Ganesh
PhD – IIT Bombay
Associate Professor
Research Areas: Cross-Cultural Virtual Teams;
Workplace Bullying;
Cross-Cultural Collaborations

Mahati Chittem
PhD – University of Sheffield, UK
Associate Professor
Research Areas: Chronic Disease
Management; Health Behaviours

Shubha Ranganathan
PhD – IIT Bombay
Associate Professor
Research Areas: Culture and Mental Health;
Qualitative Research Methods; Gender;
Critical Psychology;
Chronicity and Care-giving

Srirupa Chatterjee
PhD – IIT Kanpur
Associate Professor
Research Areas: American Literature;
Body Studies; Gender Studies;
Literary Theory

Nandini Ramesh Sankar
PhD – Cornell University, USA
Assistant Professor
Research Areas: 20th Century and Contemporary
Poetry; Visual Arts; Theories of the Gift;
Literature and Philosophy

Prakash Mondal
PhD – IIT Delhi
Assistant Professor
Research Areas: Theoretical Linguistics;
Language and Computation;
Language and Biology;
Philosophy of Language and Mind

Anindita Majumdar
PhD – IIT Delhi
Assistant Professor
Research Areas: Medical Anthropology;
Kinship; Reproduction; Infertility

Aalok Khandekar
PhD – Rensselaer Polytechnic Institute
Assistant Professor
Research Areas: Science Technology and
Society Studies (STS); Environmental
Sustainability; Urban Studies;
Cultural Anthropology

Chandan Bose
PhD – University of Canterbury,
New Zealand
Assistant Professor
Research Areas: Ethnography; Historiography;
Visual Anthropology; Artisanal Communities and
Production; Critical Heritage Studies;
Memory; Futures

Shuhita Bhattacharjee
PhD – University of Lowa
Assistant Professor
Research Areas: Nineteenth-Century
Literature and Culture; Religion and the
Post-Secular; Gender and Sexuality Studies;
Postcolonial Studies; Graphic Novels;
Literature and Culture of The Diaspora

Amrita Datta
PhD – International Institute of Social
Studies, Erasmus University Rotterdam
Assistant Professor
Research Areas: Development Studies; Migration
and Development; Gender and Development;
Village and Longitudinal Studies

Paresh Kumar Narayan
Alfred Deakin
Professor of Finance
Assistant Professor
Research Areas: Financial Econometrics;
Applied Time Series Econometrics;
Applied Finance Energy;
Transport and Financial Markets

Nimmi Rangaswamy
Researcher, Microsoft Research Labs India
Adjunct Professor

Kathryn Hummel
Visiting Assistant Professor
Research Areas: Narrative Ethnography;
Arts-based Research; Cultural and
Media Studies; Poetry and Poetics

Book / Book Chapter

- Majumdar, A., (2019). Surrogacy: Oxford India Short Introductions. New Delhi: Oxford University Press.
- Bose C., (2019). Perspectives on work, home, and identity from artisans in Telangana: Conversations around craft. Springer International Publishing.
- Language, Biology, and Cognition: A Critical Perspective (Springer Nature).
- Majumdar A., (2019). Beyond essentialism: Ecofeminism and the friction between gender and ecology. Women and Gender Studies in India: Crossings(66-78). Taylor and Francis.

Publications (Journals)

1. Pellur, M., Narasimhan, H., & Mahadevan, S. (2019). Socio-cultural dimensions of congenital adrenal hyperplasia: An ethnographic study from Chennai, South India. Indian Journal of Endocrinology and Metabolism, 23(2), 227-231. https://doi.org/10.4103/ijem.IJEM-177-18.

2. Narasimhan, Haripriya Within the Limits: Moral Boundaries of Class and Gender in Urban India. Contributions To Indian Sociology 53(2) 357-360https://doi.org/10.1177/0069966719833464 Jun-19 2019.

3. Badri Narayan Rath and Vaseem Akram., (2019). A reassessment of total factor productivity convergence: Evidence from cross-country analysis, Economic Modelling, 82:87-98.

4. Badri Narayan Rath and Danny Hermawan., (2019). Does information and communication technologies foster economic growth in Indonesia? Bulletin of Monetary Economics and Banking, 22(1):103-122.

5. Seema Narayan, Thai-Ha Le, Badri Narayan Rath, and Nadia Doytch., (2019). Petroleum consumption and economic growth relationship: evidence from the Indian state, Asia-Pacific Sustainable Development Journal, 26(1): 21-65.

6. Vaseem Akram and Badri Narayan Rath., (2019). Is there any evidence of tax-and-spend, spend-and-tax, or fiscal synchronization from panel of Indian state? Applied Economics Letters, 26(18):1544-1547.

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24. Chua, K., Nair, S., & Ganesh MP. (2019). Strategies in Developing an Aviation & Aerospace Skill Ecosystem for the State of Telangana, India–Case Study of TASK-Telangana Academy for Skill and Knowledge. International Journal of Aviation, Aeronautics, and Aerospace, 6(1), 4.

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27. K. S., N., & Majumdar, A. (2019). Care for the Dying: A Study of Community and State Action in Palliative Care in Kerala, India. Indian Institute of Technology Hyderabad

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29. Bose, C. (2019). Perspectives on work, home, and identity from artisans in Telangana: Conversations around craft. In Perspectives on Work, Home, and Identity From Artisans in Telangana: Conversations Around Craft. Springer International Publishing. https://doi.org/10.1007/9783030125165

30. Bose, C. (2019b). Craft-Through-Relatedness; Relatedness-Through-Craft. Perspectives on Work, Home, and Identity From Artisans in Telangana, 169-208.

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33. Bose, C. (2019f). Showing, Making and Selling for the Market. Perspectives on Work, Home, and Identity from Artisans in Telangana, 209-256.

34. Bose, Chandan We Who Wove with Lotus Thread: Summoning Community in South India Contributions To Indian Sociology 53(3)454-457,10.1177/0069966719860343.

35. Bhattacharjee, S. (2019a). Of Mahatmas and Chelas: Theosophy and the Cartography of the Supernatural in Richard Marsh and F. Anstey. Victorian Popular Fictions Journal, 1(2), 147-163.

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Publications (Conference)

1. Eden G., Sharma S., Roy D., Joshi A., Nocera J. A., Rangaswamy N.. ACM International Conference Proceeding Series;1 November 2019 through 3 November 2019; Association for Computing Machinery; 2019.

2. Joshi T., Gupta S. S., Rangaswamy N., Nielsen P. Kimaro H. C.. IFIP Advances in Information and Communication Technology;1 May 2019 through 3 May 2019; Springer New York LLC;2019.280.

3. Prabhat S., Mangurkar I., Motwani A., Rangaswamy N.. 25th Americas Conference on Information Systems, AMCIS 2019;15 August 2019 through 17 August 2019; Association for Information Systems; 2019.

4. Prabhat S., Nanavati S., Rangaswamy N. ACM International Conference Proceeding Series; 4 January 2019 through 7 January 2019; Association for Computing Machinery; 2019.

5. Suri V.R., Rangaswamy N., Joshi T., Joshi M., Nanavati S. ACM International Conference Proceeding Series; 4 January 2019 through 7 January 2019; Association for Computing Machinery; 2019.

Funded Research Projects

• Dr. Anindita Majumdar, Project Code: Stockholms/LA/F187/2019-20/S87, Project Title: From Waste to Profit, Gender, Biopolitics and Neoliberalism in Indian Commercial Surrogacy, Sponsoring Agency: Swedish Research Council, 4L.

• Dr. Mahati Chittem, Project Code: Sydney/LA/F082/2019-20/S96, Project Title: Psychosocial Concerns in Head and Neck Cancer: A Cross Cultural Study of Indian and Australian Patients, 2.5L.

Seminars Conducted

• Organizer, The Arts, Knowledge and Critique in the Digital Age in India: Addressing Challenges in the Digital Humanities, a two-day international conference, in collaboration with Sahapedia, New Delhi, November 2019.

• International seminar on The performing body: Conversations on healing with medical humanities, organized in IIT Hyderabad, February 1-2, 2019.

• Coordinator of GIAN course on Clinically applied anthropology II: Ethnographic methods for mental health research and practice in India, IIT Hyderabad, December 2019 (Foreign Faculty – Dr. Sumeet Jain, University of Edinburgh).

Awards & Recognitions

• Dr. Aalok Dinkar Khandekar, Assistant Professor has been selected as the Editor-in-Chief of Engaging Science, Technology, and Society, the Open Access journal of the Society for Social Studies of Science.

• Dr. Anindita Majumdar, Assistant Professor has been Invited to be member of International Advisory Board, Medical Anthropology Theory Journal; and External Scholar- Member at the Centre for Cultures of Reproduction (CORTH), University of Sussex.

• Dr. Prabheesh K. P,. Associate Professor, has been invited by Asian Development Bank Institute (ADBI), as resource person in Research Conference on Economic Integration in Asia and Europe: Lessons and Recommended Policies for the special issue of Journal of Economic Integration (JEI), Tokyo, Japan.

• Dr. Prabheesh K. P., Associate Professor, has been invited by Bank Indonesia (the Central Bank), to act as a discussant at the 'Joint workshop of Bank Indonesia, Asian Development Bank Institute and the Asian Pacific Applied Economics Association', Jakarta, Indonesia, on 3rd Oct 2019.

• Dr. Prabheesh K. P., Associate Professor, has been invited by Bank Indonesia (the Central Bank), to act as a resource person, at a workshop on Enhancement Bank Indonesia Working Paper", held at Jakarta, Indonesia, on 8-9 May 2019.

• Dr. Prakash Chandra Mondal, Assistant Professor has been Inducted into the Editorial Board of Palgrave Communications, a Nature Journal.

• Dr. Shuhita Bhattacharjee, Assistant Professor has received Charles Wallace Grant for International Archival Research, British Council, 2020.

• Dr. Badri Narayan Rath, Professor, has served as a Guest Editor, Special Issue (August 2019 – February 2020), Economic Modelling (Elsevier).

• Dr. Badri Narayan Rath, Professor, has been selected as the Associate Editor (March 2020-till date) SN Business & Economics (Springer Nature).

- Dr. Badri Narayan Rath, Professor, has been selected as the Associate Editor (January 2020- till date) Palgrave Communications (Nature Publishing Group).
- Dr. Badri Narayan Rath, Professor, has been invited as the resource person by the Asian Development Bank Institute (ADBI) for conference on the "Blue Economy, Ocean Tourism, and Sustainable Ocean Infrastructure" in Fiji, 25-27, February 2020.
- Dr. Badri Narayan Rath, Professor, has been invited as a resource person by the Nanchang University, China to 1st International Workshop on Applied Economics, 27 December 2019.
- Dr. Badri Narayan Rath, Professor, has been invited as a resource person by the Xi'an University of Finance and Economics, China to Economic Modelling conference, 29 Nov – 1 Dec, 2019.
- Dr. Badri Narayan Rath, Professor, has been invited by the Central Bank of Indonesia (Bank Indonesia) to act as a discussant in the

13th BMEB International Conference, Bali – Indonesia, August 29-30, 2019.

Highlights

Students of Creative Arts and Design wing of the Department of Liberal Arts, IIT Hyderabad, showcase their artwork in an Origami Exhibition displayed in the campus. Aditi Anuj, an origami artist, conducted a lecture-cum-workshop to develop creative skills in the students. The workshop also taught the students that the bends in origami and life (pressure and problems) can also be constructive in life.

Origami is the art of paper folding, which is often associated with Japanese culture. In modern usage, the word "origami" is used as an inclusive term for all folding practises, regardless of their culture of origin. The goal is to transform a flat square sheet of paper into a finished sculpture through folding and sculpting techniques. Modern origami practitioners generally discourage the use of cuts, glue, or markings on the paper.

Materials Science & Metallurgical Engineering

It was started as a Department of Materials Science and Engineering in 2009, beginning with the PhD programme followed by the MTech programme in Materials Science and Engineering in 2010. The department name was changed to 'Department of Materials Science and Metallurgical Engineering' in 2014 with the beginning of the BTech programme. With a motto of 'Atoms to Applications' the vision of the department is, 'to be a globally recognized centre of excellence in materials research, translating fundamental understanding into the development of innovative, sustainable and environment-friendly technologies and products for social needs'. Currently, MSME has fifteen faculty members with research interests spanning across various disciplines of structural, functional and computational materials science. Research paths are formulated to produce outputs with international standards and closely designed with national research laboratories and industries to cater the national needs. Currently, MSME has an annual intake of about 20 BTech and 12 MTech students. The annual intake is planned to increase to about 30 from 2020 BTech batch. The department offers a unique UG curriculum comprised of fractal courses which facilitates the expansion of the core subject acumen as well as personal skills. The department prepares its students for professional roles to perform in industry and cutting edge R&D, as well as encourages them for the entrepreneurship. Department has over 50 registered PhD scholars who are working in fundamentals to advanced themes and applied areas. MSME faculty members carry out a large number of sponsored research and consultancy works, funded through various agencies. Department publishes a large number of articles in reputed international journals and this number has been growing rapidly with every passing year. Faculty members have good international collaborations and involved actively in joint programmes, such as GIAN, SPARC and international bilateral research programmes. Department offers several outreach programmes such as TEQIP faculty development programmes and workshops.

THERE ARE THREE THINGS EXTREMELY HARD: STEEL, A DIAMOND, AND TO KNOW ONE'S SELF."
– *Benjamin Franklin*

Faculty

Bharat B Panigrahi
PhD – IIT Kharagpur

Associate Professor & HoD
Research Areas: Powder Metallurgy; Sintering;
Nanocrystalline Materials; High Entropy
Alloys; Max Phase and Mxene; Microstructure-
Properties of Steels; Titanium Alloys;
Composites; Additive Manufacturing

Pinaki Prasad Bhattacharjee
PhD – IIT Kanpur

Professor
Research Areas: High Entropy Alloys;
Thermo-Mechanical Processing;
Crystallographic Texture;
Mechanical Properties

BS Murty
PhD – IISC Banglore

Professor
Research Areas: Nanocrystalline Materials;
High Entropy Alloys; Bulk Metallic Glasses;
Thermodynamics and Kinetics of Phase
Transformations; Transmission Electron
Microscopy and Atom Probe Tomography

Janaki Ram GD
PhD – IIT Madras

Professor
Research Areas: Materials Joining and Additive
Manufacturing

Suhash Ranjan Dey
PhD – University Paul-Verlaine - Metz,
France

Associate Professor
Research Areas: Multi-Component Alloys;
Titanium Alloys; CIGS / CZTS Solar Cells;
Electrodeposition; Biomaterials;
Interstitial Free Steels

Ranjith Ramadurai
PhD – IISC Bangalore

Associate Professor
Research Areas: Multifunctional Thin Films;
Piezoresponse Force Microscopy;
Hybrid Piezoelectrics;
Piezoelectric Sensors and Actuators

Saswata Bhattacharya
PhD – IISC Bangalore

Associate Professor
Research Areas: Phase-Field Modeling of
Microstructural Evolution in Alloys and
Oxides; Phase Transformations;
Micro Mechanical Modeling

Mudrika Khandelwal
PhD – University of Cambridge, UK

Associate Professor
Research Areas: Cellulose Composites;
Drug Delivery; In Situ Modifications;
Food Packaging

Atul Suresh Deshpande
PhD – Max-Planck Institute of Colloids
and Interfaces - Potsdam, Germany

Associate Professor
Research Areas: Nanomaterial Synthesis;
High Entropy Oxides; Super Hydrophobic
Materials; Energy Storage Materials

Subhradeep Chatterjee
PhD – IISC Bangalore

Assistant Professor
Research Areas: Phase Transformations;
Electron Microscopy;
Welding and Solidification Processing;
Microstructural Modelling

Rajesh Korla
PhD – University of Cambridge, UK

Assistant Professor
Research Areas: Deformation Behavior of
Materials at Room Temperature and High
Temperature

Sai Rama Krishna Malladi
PhD – Technische Universiteit Delft,
The Netherlands

Assistant Professor
Research Areas: In Situ Transmission Electron
Microscopy; Phase Transformations in Materials;
Electrochemsitry and Corrosion;
Graphene Based Super Capacitors;
Materials for Energy Applications

Shourya Dutta Gupta
PhD – Swiss Federal Institute of
Technology Lausanne
Assistant Professor
Research Areas: Plasmonics; Nanophotonics;
Biosensing; Raman Spectroscopy;
Nanofabrication; Active Devices;
Graphene Devices

Chandrasekhar Murapaka
PhD – Nanyang Technological University
(NTU), Singapore
Assistant Professor
Research Areas: Nanomagnetic Materials;
Spintronic Based Memory and Logic Devices

Mayur Vaidya
PhD – IIT Madras
Assistant Professor
Research Areas: Diffusion-deformation
Correlation in Materials; Phase Growth and
Interdiffusion Kinetics in Thermoelectric
Materials; Diffusion in Multicomponent Alloys;
Processing; Characterization and Stability of
Nanocrystalline Alloys

Patent Filed / Granted

- Patent Title: Domain wall tunnelling and logic operations in ferromagnetic nanostructures, Name of the Inventors: Surya Jammalamadaka, Chandrasekhar Murapaka and Sreeveni M. D., Patent Number: 201941048936.

- Patent Title: Pharmaceutical Compositions and Delivery Systems for Prevention and Treatment of Candidiasis, Name of the Inventors: Mudrika Khandelwal, Shivakalyani Adepu, Patent Number: PCT/IB2019/057802.

- Patent Title: Nanoreactor comprising a membrane condenser, Name of the Inventors: Henny Zandbergen, Sai Rama Krishna Malladi, Zahra Holahdouz Esfahani, Majid Ahmadi, Patent Number: WO/2019/231320.

- Patent Title: Electrochemical Synthesis of nanocrystalline multicomponent alloy thin films / coatings in an aqueous medium, Name of the Inventors: Chokkakula L. P. Pavithra, Kunda Siri Kiran Janardhana Reddy and Suhash Ranjan Dey, Patent Number: 20194103178 (Filed).

- Patent Title: 20. Metallic glass based protective decorative thin film coating and method of producing the same, Name of the Inventors: B. S. Murty, M. S. Ramachandra Rao, P. Priyesh, Ritu Das, R. Seshadri, G. Srivazhagan, H. Raghottaman and S. Loganathan, Patent Number: 201941025401.

Book / Book Chapter

- B. S. Murty, J. W. Yeh, S. R. Ranganathan, P. P. Bhattacharjee, High Entropy Alloys, 2nd Edition, Elsevier, 2019.

Publications (Journals)

1. Gourav Mundhra, V. S. Hariharan and B. S. Murty, Design of a novel Al-Ti-Zr light-weight alloy: CALPHAD and experiments, J. Alloys Compd. 835 (2020): 155304. Year :: 2019.

2. M. Vaidya, Ameey Anupam, J. Vijay Bharadwaj, Chandan Srivastava, B. S Murty, Grain growth kinetics in CoCrFeNi and CoCrFeMnNi high entropy alloys processed by spark plasma sintering, J. Alloys Compd. 791 1114-1121.

3. Ameey Anupama, S. Kumar, Naveen M. Chavan, B.S. Murty, Ravi Sankar Kottadaa, First Report on Cold Sprayed AlCoCrFeNi HEA and its Isothermal Oxidation, J. Mater. Res. 34 (2019) 796-806.

4. Lavanya Raman, K. Guruvidyathri, Geeta Kumari, S. V. S. Narayana Murty, Ravi Sankar Kottada and B. S. Murty, Phase evolution of refractory high entropy alloy CrMoNbTiW during mechanical alloying and spark plasma sintering, J. Mater. Res. 34 (2019) 756-766.

5. M. Vaidya, G. Mohan Muralikrishna and B. S. Murty, High entropy alloys by mechanical alloying: A review, J. Mater. Res. 34 (2019) 664-686.

6. B. Bhushan, B.S. Murty and K. Mondal, A New approach for synthesis of ZnO nanorod flowerets and subsequent pure free-standing ZnO nanorods, Adv. Powder Technol. 30 (2019) 39-41.

7. Anirudha Karati, K. Guruvidyathri, V. S. Hariharan and B. S. Murty, Thermal stability of AlCoFeMnNi high-entropy alloy, Scripta Mater. 162 (2019) 465-467.

8. S. L. Pramod, Ravikirana, A. K. Prasada Rao, B. S. Murty and S. R. Bakshi, Microstructure and mechanical properties of as-cast and T6 treated Sc modified A356-5TiB2in-situ composite, Mater. Sci. Eg. A 739 (2019) 383-394.

9. M. Vaidya, K. Guruvidyathri and B. S. Murty, Phase formation and thermal stability of CoCrFeNi nd CoCrFeMnNi equiatomic high entropy alloys, J. Alloys Compd. 774 (2019) 856-864.

10. Ajeet K. Srivastav, Niraj Chawake, Devinder Yadav, N. S. Karthiselva and B.S. Murty, Localized pore evolution assisted densification during spark plasma sintering of nanocrystalline W-5wt.%Mo, Scripta Mater. 159 (2019) 41-45.

11. M. Vaidya, Anirudha Karati, A. Marshal, K. G. Pradeep and B. S. Murty, Phase evolution and stability of nanocrystalline CoCrFeNi and CoCrFeMnNi high entropy alloys, J. Alloys Compd. 770 (2019) 1004-1015.

12. Anupam, Ameey; Kottada, Ravi Sankar; Kashyap, Sanjay; Meghwal, Ashok; Murty, B. S.; Berndt, C. C.; Ang, A. S. M. Understanding the microstructural evolution of high entropy alloy coatings manufactured by atmospheric plasma spray processing, Applied Surface Science 505, 144117 10.1016/j.apsusc.2019.144117.

13. Davis, D., Shah, A. F., Panigrahi, B. B., & Singh, S. (2019). Effect of Cr2AlC nanolamella addition on tribological properties of 5W-30 engine oil. Applied Surface Science, 493, 1098–1105. https://doi.org/10.1016/j.apsusc.2019.07.097.

14. Rohila, S., Mane, R. B., Naskar, S., & Panigrahi, B. B. (2019). Viscous flow assisted sintering of AlCoCrFeNi high entropy alloy powder. Materials Letters, 256. https://doi.org/10.1016/j.matlet.2019.126668.

15. Roopavath, U. K., Sah, M. K., Panigrahi, B. B., & Rath, S. N. (2019). Mechanochemically synthesized phase stable and biocompatible β-tricalcium phosphate from avian eggshell for the development of tissue ingrowth system. Ceramics International, 45(10), 12910-12919. https://doi.org/10.1016/j.ceramint.2019.03.217.

16. Mane, Rahul B.; Ampolu, Haribabu; Rohila, Sahil; Panigrahi, Bharat B. (2019)Oxidation kinetics of Ti3GeC2 MAX phase Corrosion Science 151, 81-86 https://doi.org/0.1016/j.corsci.2019.02.018.

17. M. Vaidya, G. Mohan Muralikrishna and B. S. Murty, High entropy alloys by mechanical alloying: A review, J. Mater. Res. 34 (2019) 664-686.

18. B. Bhushan, B. S. Murty and K. Mondal, A New approach for synthesis of ZnO nanorod flowerets and subsequent pure free-standing ZnO nanorods, Adv. Powder Technol. 30 (2019) 39-41.

19. Anirudha Karati, K. Guruvidyathri, V. S. Hariharan and B. S. Murty, Thermal stability of AlCoFeMnNi high-entropy alloy, Scripta Mater. 162 (2019) 465-467.

20. S. L. Pramod, Ravikirana, A. K. Prasada Rao, B. S. Murty and S. R. Bakshi, Microstructure and mechanical properties of as-cast and T6 treated Sc modified A356-5TiB2in-situ composite, Mater. Sci. Eg. A 739 (2019) 383-394.

21. M. Vaidya, K. Guruvidyathri and B. S. Murty, Phase formation and thermal stability of CoCrFeNi nd CoCrFeMnNi equiatomic high entropy alloys, J. Alloys Compd. 774 (2019) 856-864.

22. Ajeet K. Srivastav, Niraj Chawake, Devinder Yadav, N. S. Karthiselva and B.S. Murty, Localized pore evolution assisted densification during spark plasma sintering of nanocrystalline W-5wt.%Mo, Scripta Mater. 159 (2019) 41-45.

23. M. Vaidya, Anirudha Karati, A. Marshal, K.G. Pradeep and B. S. Murty, Phase evolution and stability of nanocrystalline CoCrFeNi and CoCrFeMnNi high entropy alloys, J. Alloys Compd. 770 (2019) 1004-1015.

24. Anupam, Ameey; Kottada, Ravi Sankar; Kashyap, Sanjay; Meghwal, Ashok; Murty, B. S.; Berndt, C. C.; Ang, A. S. M. Understanding the microstructural evolution of high entropy alloy coatings manufactured by atmospheric plasma spray processing, Applied Surface Science 505, 144117 10.1016/j.apsusc.2019.144117.

25. Davis, D., Shah, A. F., Panigrahi, B. B., & Singh, S. (2019). Effect of Cr2AlC nanolamella addition on tribological properties of 5W-30 engine oil. Applied Surface Science, 493, 1098–1105. https://doi.org/10.1016/j.apsusc.2019.07.097.

26. Rohila, S., Mane, R. B., Naskar, S., & Panigrahi, B. B. (2019). Viscous flow assisted sintering of AlCoCrFeNi high entropy alloy powder. Materials Letters, 256. https://doi.org/10.1016/j.matlet.2019.126668.

27. Roopavath, U. K., Sah, M. K., Panigrahi, B. B., & Rath, S. N. (2019). Mechanochemically synthesized phase stable and biocompatible β-tricalcium phosphate from avian eggshell for the development of tissue ingrowth system. Ceramics International, 45(10), 12910-12919. https://doi.org/10.1016/j.ceramint.2019.03.217.

28. Mane, Rahul B.; Ampolu, Haribabu; Rohila, Sahil; Panigrahi, Bharat B. (2019) Oxidation kinetics of Ti3GeC2 MAX phase Corrosion Science 151, 81-86 https://doi.org/10.1016/j.corsci.2019.02.018.

29. Rohila, S., Mane, R. B., Ummethala, G., & Panigrahi, B. B. (2019). Nearly full-density pressureless sintering of AlCoCrFeNi-based high-entropy alloy powders. Journal of Materials Research, 34(5), 777-786.

30. Ishtiyak, M., Jana, S., Narayanswamy, S., Nishad, A. K., Panigrahi, G., Bhattacharjee, P. P., & Prakash, J. (2019). Intrinsic extremely low thermal conductivity in BaIn2Te4: Synthesis, crystal structure, Raman spectroscopy, optical, and thermoelectric properties. Journal of Alloys and Compounds, 802, 385–393. https://doi.org/10.1016/j.jallcom.2019.06.036.

31. Murty, B., Yeh, J., Ranganathan, S., & Bhattacharjee, P. (2019). High-entropy alloys. Elsevier.

32. Reddy, S. R., Sunkari, U., Lozinko, A., Guo, S., & Bhattacharjee, P. P. (2019). Microstructure and texture of a severely warm-rolled and annealed AlCoCrFeNi2.1 eutectic high entropy alloy. In P. R. H. Kestens L.A.I. Pirgazi H. ,. Minh T. N. (Ed.), Journal of Physics: Conference Series (Vol. 1270, Issue 1). Institute of Physics Publishing. https://doi.org/10.1088/1742-6596/1270/1/012054

33. Reddy, S., Sunkari, U., Lozinko, A., Saha, R., Guo, S., & Bhattacharjee, P. (2019). Microstructural design by severe warm-rolling for tuning mechanical properties of AlCoCrFeNi2. 1 eutectic high entropy alloy. Intermetallics, 114, 106601–106601.

34. Reddy, S. R., Yoshida, S., Bhattacharjee, T., Sake, N., Lozinko, A., Guo, S., Bhattacharjee, P. P., & Tsuji, N. (2019). Nanostructuring with Structural-Compositional Dual Heterogeneities Enhances Strength-Ductility Synergy in Eutectic High Entropy Alloy. Scientific Reports, 9(1). https://doi.org/10.1038/s41598-019-47983-y

35. Reddy, S. R., Yoshida, S., Sunkari, U., Lozinko, A., Joseph, J., Saha, R., Fabijanic, D., Guo, S., Bhattacharjee, P. P., & Tsuji, N. (2019). Engineering heterogeneous microstructure by severe warm-rolling for enhancing strength-ductility synergy in eutectic high entropy alloys. Materials Science and Engineering A, 764. https://doi.org/10.1016/j.msea.2019.138226

36. Sunkari, U., Chatterjee, S., & Bhattacharjee, P. (2019). Microstructure and properties of intermetallic strengthened CoCrFeNi2.1Nbx high entropy alloys.

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bismuth ferrite epitaxial thin films Bulletin of Materials Science 42(5)UNSP 208,10.1007/s12034-019-1904-3.

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68. Mohan, M. M. Saj; Bandyopadhyay, Soumya; Jogi, Tushar; Bhattacharya, Saswata; Ramadurai, Ranjith 2019 Realization of rhombohedral, mixed, and tetragonal like phases of BiFeO3 and ferroelectric domain engineering using a strain tuning layer on LaAlO3(001) substrate Journal of Applied Physics 125(1)12501 10.1063/1.5054372.

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80. Kelp, G.; Arju, N.; Lee, A.; Esquivel, E.; Delgado, R.; Yu, Y.; Dutta-Gupta, S.; Sokolov, K.; Shvets, G. (FEB 21 2019)Application of metasurface-enhanced infra-red spectroscopy to distinguish between normal and cancerous cell types ANALYST 144 (4) 1115-1127 https://doi.org/10.1039/c8an01433g.

81. Krishnia, S., Murapaka, C., Sethi, P., Gan, W., Wong, Q., Lim, G., & Lew, W. (2019). Current-induced spin-orbit effective field modulations in synthetic anti ferromagnetic structures. Journal of Magnetism and Magnetic Materials, 475, 327–333.

82. Lew, W., Wong, Q., Murapaka, C., Law, W., Gan, W., & Lim, G. (2019). Enhanced spin-orbit torques in rare-earth Pt/[Co/Ni] 2/Co/Tb systems.

83. Wong, Q., Murapaka, C., Law, W., Gan, W., Lim, G., & Lew, W. (2019). Enhanced Spin-Orbit Torques in Rare-Earth Systems. Physical Review Applied, 11(2), 24057–24057

Publications (Conference)

1. Reddy S. R., Sunkari U., Lozinko A., Guo S., Bhattacharjee P. P. Kestens L. A. I. Pirgazi H. Minh T. N. Petrov R.H.. Journal of Physics: Conference Series; 4 August 2019 through 9 August 2019; Institute of Physics Publishing; 2019.

2. "R Ganguly, A Acharyya, R Ramadurai, Planar and out of Plane Configuration Based Flexible Sensor of PVDF Polymer Meeting Abstracts, 2037-2037"

3. Vivek C. P., Kranthi K. P., D. S. Jagadeesh, Athira K. S., Srinath G., S. Suryakumar, S. Chatterjee: Weld Deposition of Nickel on Titanium for Surface Hardening with Ti-Ni-based Intermetallic Compounds, Intl. Conf. Mater. Mfg. Meth. (3M – 2019), NIT Tichy, I (...)

4. Kannan P. K., Chaudhari S., Kukkadapu M., Dey S. R.Conference Record of the IEEE Photovoltaic Specialists Conference;16 June 2019 through 21 June 2019; Institute of Electrical and Electronics Engineers Inc.; 2019.975

5. Yadav B. S., Dey S. R., Dhage S. R. Saji K. J. Anju K. S. John H. Mohan P.A. Jayaraj M. K. AIP Conference Proceedings; 3 January 2019 through 5 January 2019; American Institute of Physics Inc.; 2019.

Funded Research Projects

Magnetic Properties of Nanocrystalline Multi-Component Alloy Thin Film Coatings through a Single Step Electrodeposition for Sensor Applications, Sponsoring Agency: MHRD, 50L.

Awards & Recognitions

- Dr. Ranjith Ramadurai, Associate Professor, has been nominated and selected as a Visiting Professor at University of Artois, Lens, France. (If one may call it as a recognition).

- Dr. Suhash Ranjan Dey, Associate Professor, PhD Research Scholar - Mr. P. K. Kannan has received SERB-Purdue University Overseas Visiting Doctoral Fellowship 2018 from Department of Science and Technology (DST), India spent one year (2019) at Professor Rakesh Agrawal's (Purdue University, USA) laboratory.

- Dr. B. S. Murty, Professor, Director, has received INAE Outstanding Teacher Award (2019).

- Dr. Shivakalyani Adepu (Completed PhD with Dr. Mudrika Khandelwal) has been awarded BIRAC biotechnological ignition grant 2019 to incubate the developed during her PhD.

- Dr. Shivakalyani Adepu (Completed PhD with Dr. Mudrika Khandelwal) has been awarded BIRAC biotechnological ignition grant 2019 to incubate the developed during her PhD.

Highlights

IIT Hyderabad Researchers Develop Essential Oils-based Drug Delivery Systems to treat Fungal Infections. Supported by the SERB (under DST) and CSR grants from AT&T, this medication can even counter fungi that have developed resistance to conventional anti-fungal drugs. Herbal essential oils and their ingredients are a promising class of effective antimicrobials Thymol found in oregano oils, carvacrol found in thyme and eugenol found in clove oil, have excellent antimicrobial action against all types of Candida fungi. The problem with essential oils and their components is that they are sensitive to temperature, light, and pH, and decompose easily. Currently researchers are developing antifungal panty liners for mitigating vaginal candidiasis. The developed formulation can also be used as a transdermal patch / mucoadhesive patch to treat skin and mucocutaneous infections without inducing resistance in the fungal species.

Treat Fungal Infections the Herbal Way!

IIT Hyderabad develops essential-oils-based drug delivery system

Uses antimicrobial natural oils like

- Oregano oil
- Thyme oil
- Clove oil

Compliments to Dr. Mudrika Khandelwal & her student Shivakalyani Adepu for their research

@SanjayDhotremp @SanjayDhotreMP @OfficeOfSDhotre @mp_sanjaydhotre

Mathematics

The Department, founded along with the Institute in 2008, aspires to evolve into an internationally acclaimed centre for theoretical, interdisciplinary and applicable mathematical research, supporting and complementing the expertise extant in and around Hyderabad.

Teaching Fulcrum: As one of the basic science departments, the department remains as the fulcrum of teaching that offers many foundational math courses for the entire community of students at IIT Hyderabad. The department further offers a minor in Mathematics for the undergrad students. From the academic year 2017-18, the department has started to offer a new undergrad programme called the B Tech (Math and Computing). The Master of Science programme of the department allows specialisation in two streams, viz., Theoretical Mathematics and Applied Math and Computing. The vibrant doctoral programme of the department attracts students of varied interests and has been successful in creating researchers who are well-prepared to enter both the academia and the industry.

Leverageable Research: The Department has young and dedicated faculty working both in pure and applied branches of Mathematics who actively collaborate with their counterparts from within and outside the department. Faculty members have achieved many distinctions – for instance, they have been invited to be part of research committees of the Government of India, are established resource personnels in programmes promoting both basic and advanced Mathematics and are members of the editorial board of reputed journals.

THE TRUE SPIRIT OF DELIGHT, THE EXALTATION, THE SENSE OF BEING MORE THAN MAN, WHICH IS THE TOUCHSTONE OF THE HIGHEST EXCELLENCE, IS TO BE FOUND IN MATHEMATICS AS SURELY AS POETRY."
– Bertrand Russell

Faculty

Jayaram Balasubramaniam

PhD – Sri Satyasai Institute of Higher Learning

Professor & HoD
Research Areas: Approximate Reasoning; Connectives in Multi-Valued Logic

C S Sastry

PhD – IIT Kanpur

Professor
Research Areas: Wavelets; Inverse Problems and Sparse Representation Theory

Puranam Anantha Lakshmi Narayana

PhD – IIT Kharagpur

Associate Professor
Research Areas: Fluid Mechanics; Convection in Porous Media; Linear and Non-linear Stability Analysis

G Ramesh

PhD – IIT Madras

Associate Professor
Research Areas: Functional Analysis; Operator Theory

Daniel Sukumar

PhD – IIT Madras

Associate Professor
Research Areas: Functional Analysis; Banach Algebra

Venku Naidu Dogga

PhD – IIT Madras

Associate Professor
Research Areas: Harmonic Analysis; Functional Analysis

Narasimha Kumar

PhD – TIFR, Bombay

Associate Professor
Research Areas: Arithmetic Geometry and Algebraic Number Theory

Tanmoy Paul

PhD – ISI Calcutta

Assistant Professor
Research Areas: Functional Analysis

Pradipto Banerjee

PhD – University of South Carolina

Assistant Professor
Research Areas: Number Theory

Bhakti Bhusan Manna

PhD – TIFR CAM

Assistant Professor
Research Areas: Partial Differential Equations

Amit Tripathi

PhD – IISC Bangalore

Assistant Professor
Research Areas: Algebraic Geometry and Commutative Algebra

Sameen Naqvi

PhD – IIT Kanpur

Assistant Professor
Research Areas: Reliability Theory; Stochastic Orders; Applied Statistics; Risk Theory

Neeraj Kumar
PhD – University of Genoa, Italy
Assistant Professor
Research Areas:
Commutative Algebra

Dipankar Ghosh
PhD – IIT Bombay
Assistant Professor
Research Areas: Commutative Algebra

Satya Prakash Singh
PhD – IIT Bombay
Assistant Professor
Research Areas: Optimal Design Theory;
Order Restricted Experiments;
Cluster Randomized Trials and
Crossover Designs

Publications (Journals)

1. GAlgebras In International Summer School on Aggregation Operators (pp. 83-94). Springer, Cham.

2. Sasmal, P., Jampana, P., & Sastry, C. S. (2019). Construction of highly redundant incoherent unit norm tight frames as a union of orthonormal bases. Journal of Complexity, 54. https://doi.org/10.1016/j.jco.2019.03.001

3. Theeda, P., Kumar, P., Sastry, C., & Jampana, P. (2019). Reconstruction of sparse-view tomography via preconditioned Radon sensing matrix. Journal of Applied Mathematics and Computing 59 (1-2), 285-303.

4. Chandra, B. S., Sastry, C. S., & Jana, S. (2018). Robust heartbeat detection from multimodal data via CNN-based generalizable information fusion. IEEE Transactions on Biomedical Engineering, 66(3), 710-717.

5. Gautam, K., & Narayana, P. A. L. (2019). On the stability of carbon sequestration in an anisotropic horizontal porous layer with a first-order chemical reaction. Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences, 475(2226). https://doi.org/10.1098/rspa.2018.0365

6. Gautam, K., Narayana, P., & Hill, A. (2019). Thermo-convective carbon sequestration in horizontal porous layers. IMA Journal of Applied Mathematics, 84(3), 650-668.

7. Naidu, D., & Ramesh, G. (2019). On absolutely norm attaining operators. Proceedings-Mathematical Sciences, 129(4), 54–54.

8. Venku Naidu, D., & Ramesh, G. (2019). On absolutely norm attaining operators. Proceedings of the Indian Academy of Sciences: Mathematical Sciences, 129(4). https://doi.org/10.1007/s12044-019-0491-y

9. Bala, Neeru; Golla, Ramesh Spectral properties of absolutely minimum attaining operators Banach Journal of Mathematical Analysis 10.1007/s43037-019-00032-2.

10. Ramesh, G.; Kumar, P. Santhosh. Spectral theorem for quaternionic normal operators: Multiplication form Bulletin Des Sciences Mathematiques 159, UNSP 102840, 10.1016/j.bulsci.2020.102840.

11. Daptari, S., & Paul, T. (2019). Some geometric properties of relative Chebyshev centres in Banach spaces. Contemporary Mathematics, 737, 77-87.

12. Sukumar, D. (2019). Some comparative results on eigenvalues, pseudospectra and condition spectra. The Journal of Analysis, 1–11.

13. Sivaramakrishnan, C., Sukumar, D., & Naidu, D.V. (2019). On the images of Dunkl–Sobolev spaces under the Schrödinger semi group associated to Dunkl operators. Journal of Pseudo-Differential Operators and Applications, 10(1), 93-120.

14. Sivaramakrishnan, C.; Sukumar, D.; Dogga, Venku Naidu. 2019 On the images of Sobolev spaces under the Schrodinger semi group Advances in Pure and Applied Mathematics 10(1) 65-79, 10.1515/apam-2016-0116.

15. Naidu, D., & Ramesh, G. (2019). On absolutely norm attaining operators. Proceedings-Mathematical Sciences, 129(4), 54-54.

16. Patra, P. S., & Dogga, V. (2019). Hardy's theorem and rotation for Dunkl transform. Complex Variables and Elliptic Equations, 1-13.

17. Sivaramakrishnan, C., Sukumar, D., & Naidu, D.V. (2019). On the images of Dunkl–Sobolev spaces under the Schrödinger semigroup associated to Dunkl operators. Journal of Pseudo-Differential Operators and Applications, 10(1), 93-120.

18. Kumar, Narasimha : A variant of multiplicity one theorems for half-integral weight modular forms, Acta Arithmetica 190 (2019), no. 1, 75--85.

19. Kumar, Narasimha; Kaushik, Surjeet. Simultaneous behaviour of the Fourier coefficients of two Hilbert modular cusp forms, Archiv der Mathematik 112 (2019), no. 3, 241-248

20. Upta, V. K., & Jayaram, B. (2019, July). Importation Ravindra, G.V., & Tripathi, A. (2019). Rank 3 ACM bundles on general hyper surfaces in P5. Advances in Mathematics, 355. https://doi.org/10.1016/j.aim.2019.106780

21. Jayanthan, A., & Kumar, N. (2019). Syzygies, Betti Numbers, and Regularity of Cover Ideals of Certain Multipartite Graphs. Mathematics, 7(9), 869-869.

22. Ghosh, D. (2019). Some criteria for regular and Gorenstein local rings via syzygy modules. Journal of Algebra and Its Applications, 18(5), 1950097-1950097.

23. Ghosh, D., Mallick, P., & Puthenpurakal, T. (2019). Asymptotic associate primes. Journal of Pure and Applied Algebra, 223(10), 4246–4267.

24. Ghosh, D., & Puthenpurakal, T. (2019a). A short proof of a result of Katz and West. Journal of Commutative Algebra, 11(2), 237–240.

25. Ghosh, D., & Puthenpurakal, T. (2019b). An asymptotic bound for Castelnuovo-Mumford regularity of certain Ext modules over graded complete intersection rings. Journal of Algebra, 537, 278-296.

26. Ghosh, D., & Puthenpurakal, T. (2019c). Vanishing of (co) homology over deformations of Cohen-Macaulay local rings of minimal multiplicity. Glasgow Mathematical Journal, 61(3), 705-725.

27. S. P. Singh and O. Davidov (2019), "On the design of experiments with ordered experimental treatments", Journal of Royal Statistical Society: Series B, 81(5), 881-900.

Publications (Conference)

1. V. Gupta and B. Jayaram, Importation Algebras, 10th Intl. Summer School on Aggregation Operators, AGOP 2019, Olomouc, Czech Republic, July 1- 4, 2019.

2. S. H. Kulkarni and G. Ramesh ,Absolutely minimum attaining closed operators, ICWAA conference proceedings Journal of Analysis, Year 2019 DOI:https://doi.org/10.1007/s41478-019-00189-x

3. Contemporary Mathematics (vol 737) 'Some geometric aspects of relative chebyshev centre in Banach spaces' Pg 77-87 (with Soumitra Daptari).

Funded Research Projects

Seminar Conducted

- Advanced Functional Analysis and its Applications (TEQIP Workshop) website: https://sites.google.com/iith.ac.in/afa/home2) Symposium on Geometry of Banach spaces Date: Dec 1, 2 2019. Venue: IIT Hyderabad https://www.icts.res.in/program/perfectoid2019.

- Importation Algebras, 10th Intl. Summer School on Aggregation Operators - AGOP 2019, Olomouc, Czech Republic, July 1-4, 2019.

- "ACM vector bundles on hyper surfaces", Workshop on "Bundles, Cycles and Motives" at HRI, Allahabad (5-8th March, 2020) ACM vector bundles on hyper surfaces, Academic visit, IIT Bombay (February, 2020).

- Invited Speaker at "International Conference on Number Theory", Kerala School of Mathematics, 23-26 January 2020, Invited speaker at the conference on "Perfectoid spaces", ICTS, Bengaluru, 9-20 Sep, 2019.

- Nonlinear stability analysis of some flow problems in porous media. International Conference on Mathematical Sciences and its Applications (ICMSA). 9-11 August 2019. GITAM University Hyderabad. Delivered an invited talk. 2. Stability of flows through porous media: linear and nonlinear methods. Indian Mathematical Society Annual Conference held at IIT Kharagpur from 22-25 November, 2019. Delivered an invited talk and chaired a session. 3. On numerical methods for fluid flow and stability in porous media. National Workshop on Physics of Fluids, Methods and Applications. 20-22 February 2020. Delivered an invited talk. GITAM University Hyderabad.

- "On A Subclass of Norm Attaining Operators" National Seminar on Functional Analysis held at St. Berchmann's college, Changanaserry Kottayam, Kerala, India. 2. A Subclass of Norm Attaining Operators: Conference on Functional Analysis @ IIT Bombay- 2019 Indian Institute of Technology Bombay, held from October 17-20, 2019. 3. A New Subclass of Norm Attaining Operators: The Fifteenth Workshop on Numerical Ranges and Numerical Radii at Toyo University, Kawagoe Campus, Japan, June 21-24, 2019.

- Boundedness and Compactness of linear combination of composition operators in the "16th Discussion Meeting in Harmonic Analysis" held at the Department of Mathematics, IISER Bhopal, India during December 16-19, 2019.

Mechanical & Aerospace Engineering

The Department of Mechanical and Aerospace Engineering is committed to achieving India's goal of sustainable self-reliance in industrial, manufacturing, aerospace and the energy sector through cutting edge research, excellence in teaching and product development. The department has several core research thrusts in consonance with the above objectives. Our faculty in manufacturing focus on additive manufacturing, incremental forming and advanced welding techniques that have critical relevance to the industry and the defence sector for manufacturing of high-end components. The study of material properties under dynamic loading, acoustics, vibrations and thermal/mechanical shocks, as well as damage analysis in composite structures, is a thrust area for our design faculty. A few faculty also work in the area of nonlinear dynamics, NDT, aerodynamics and robotics. Our faculty in thermo-fluid stream engage in cutting edge research in energy technology by developing and analyzing advanced combustion and propulsion systems, testing new types of renewable fuels, improving heat transfer efficiencies in critical heat exchange systems and doing high-fidelity CFD analysis of wind turbines. Our thrust area in aerospace engineering includes expertise both in structures and propulsion and tackle critical problems like thermo-acoustic instability and fluid-structure interactions. Our faculty are also heavily involved in product development with some highlights including the launch of all-electric motorbikes and the development and commercialization of cost-competitive N-95 masks during the current pandemic. Currently, the Department of Mechanical & Aerospace Engineering is offering an undergraduate programme (BTech) and postgraduate programmes (MTech and PhD). The department seeks to expand into newer research avenues and encourages faculty applicants with outstanding academic credentials to join us, especially in the thrust areas of manufacturing and aerospace engineering. The coming semester we are starting MTech in Aerospace Engineering.

RESEARCH IS TO SEE WHAT EVERYBODY ELSE HAS SEEN, AND TO THINK WHAT NOBODY ELSE HAS THOUGHT." – *Albert Szent-Gyorgyi*

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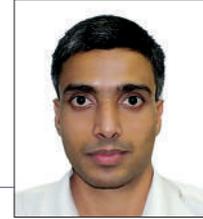
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Patent Filed / Granted

- Patent Title: 1. A System for a Sheet Metal Working and a Process Thereof, Name of the Inventors: N V Reddy, A Subrahmanyam, G Ramu, R K Verma, D V Raju, S Guha (with Tata Steel, UAY Project), Patent Number: Application Number: 201941008005, Patent filed on February 28, 2019

- Patent Title: 2. A Deposition and Deformation based Additive Manufacturing System for Fabrication of Complex Geometries, Name of the Inventors: G E Srinath, S Suryakumar, N V Reddy, Patent Number: Indian Patent Application no: 201941016062, Patent filed on April 23, 2019

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tanol isomers and isooctane under engine like hot injector body conditions FUEL 237, https://doi.org/191-201 10.1016/j.fuel.2018.09.142.

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78. Aparna Gangele, Ashok Akarapu, Chandrasekhar Sharma, Prem Pal, Ashok Kumar Pandey, "Frequency analysis of hexagonal microbeam with 2D nanofiber mat," IOP Materials Research Express, Vol. 6(8), pp. 085631 (1-10), 2019; DOI; PDF [First and second authors contributed equally].

Publications (Conference)

1. Hoskoti L., Misra A., Sucheendran M.M.. AIAA Scitech 2019 Forum; 7 January 2019 through 11 January 2019;American Institute of Aeronautics and Astronautics Inc, AIAA; 2019.

2. Tripathi M., Misra A., Sucheendran M. M. Journal of Spacecraft and Rockets; American Institute of Aeronautics and Astronautics Inc.;2019.744

3. Ghaisas N.S., Ghate A. S., Lele S. K. 11th International Symposium on Turbulence and Shear Flow Phenomena, TSFP 2019;30 July 2019 through 2 August 2019; International Symposium on Turbulence and Shear Flow Phenomena, TSFP; 2019.

4. Bhagat A., Gijare H., Dongari N. Locker by D. Emerson D. R. Wu L. Zhang Y. AIP Conference Proceedings; 23 July 2018 through 27 July 2018; American Institute of Physics Inc.; 2019.

5. Gijare H., Bhagat A., Dongari N. Lockerby D. Emerson D. R. Wu L. Zhang Y. AIP Conference Proceedings; 23 July 2018 through 27 July 2018; American Institute of Physics Inc.; 2019.

6. Panchasara H., Kolhe P. S., Agrawal A. K. Proceedings of the ASME Turbo Expo; 17 June 2019 through 21 June 2019; American Society of Mechanical Engineers (ASME); 2019.

7. Michael E., Keerthi S. K., Kant K., Kolhe P., Banerjee R., Chakravarthy S. R. ASME 2019 Gas Turbine India Conference, GTINDIA 2019; 5 December 2019 through 6 December 2019; American Society of Mechanical Engineers (ASME); 2019.

8. Murugan R., Sellan D., Kolhe P. S. ASME 2019 Gas Turbine India Conference, GTINDIA 2019; 5 December 2019 through 6 December 2019; American Society of Mechanical Engineers (ASME); 2019.

9. Kant K., Kumar M., Reddy R., Banerjee R., Mangadoddy N., Vanka S. ASME 2019 Gas Turbine India Conference, GTINDIA 2019; 5 December 2019 through 6 December 2019; American Society of Mechanical Engineers (ASME); 2019.

10. Michael E., Keerthi S. K., Kant K., Kolhe P., Banerjee R., Chakravarthy S. R. ASME 2019 Gas Turbine India Conference, GTINDIA 2019; 5 December 2019 through 6 December 2019; American Society of Mechanical Engineers (ASME); 2019.

11. Sellan D., Murugan R., Balusamy S. ASME 2019 Gas Turbine India Conference, GTINDIA 2019; 5 December 2019 through 6 December 2019; American Society of Mechanical Engineers (ASME); 2019.

13. Akiwate, Deepak; Mohan, Shashi Ranjan; Venkatesham, B; Suryakumar S. (2019): "Acoustic characterization of additive manufactured layered porous materials", INTER-NOISE and NOISE-CON Congress and Conference Proceedings, 258 (4), 3651-3658, InterNoise 19, Ju (...)

14. Kumar N., Khaderi S.N., Rao K. T. Ragulskis M. Vibroengineering Procedia; 28 November 2019 through 30 November 2019; JVE International; 2019.255

15. Akiwate D., Mohan S. R., Venkatesham B., Suryakumar S. Calvo-Manzano A. Delgado A. Perez-Lopez A. Santiago J. S. INTER-NOISE 2019 MADRID - 48th International Congress and Exhibition on Noise Control Engineering; 16 June 2019 through 19 June 2019; Sociedad Espanol (...)

16. Jade N., Bhirodkar S., Venkatesham B. Ragulskis M. Vibroengineering Procedia; 28 November 2019 through 30 November 2019; JVE International; 2019.54

17. "Siva Teja Golla, B. Venkatesham, Experimental study on the effect of perforated baffles on sloshing noise in a rectangular tank under periodic excitation, NSA 2019, 17-19 Oct 2019, Cuttak, India"

18. A Subrahmanyam, R. Lingam, K Hayakawa, S Tanaka, N V Reddy, 2019, Double sided Incremental Forming - Experimental and Numerical Investigation of Residual Stresses in Incremental Forming, APSTP 2019, Tokyo, July 31 – Aug 3, 2019, Invited Talk

19. K Martinsen, S A Carla, T Kito, M Matsumoto, N V Reddy, G D Sverre, 2019, Closed Loop Tolerance Engineering Modelling and Maturity Assessment in a Circular Economy Perspective, EcoDesign 2019, Yokohama, Nov 25-27, 2019.

20. M Matsumoto, S Hirose, K Martinsen, S Suryakumar, N V Reddy, G D Sverre, 2019, Additive Manufacturing for Circular Manufacturing: Trends and Challenges – A Survey in Japan, Norway, and India; Eco Design 2019, Yokohama, Nov 25-27, 2019.

21. N V Reddy, S Suryakumar, M Matsumoto, K Martinsen, G D Sverre, 2019, Incremental Sheet Metal Forming: A Candidate Process for Circular Manufacturing, Eco Design 2019, Yokohama, Nov 25-27, 2019.

22. S Suryakumar, N V Reddy, 2019, Advanced Manufacturing Capabilities in Existing

Machinery: A Case Study of Retrofitting CNC and Weld-Deposition for Additive Manufacturing, Eco Design 2019, Yokohama, Nov 25-27, 2019.

Funded Research Projects

- Dr. Harish Nagaraj Dixit, Project Type: Grant-in-Aid, Project Code: MTR/2019/001158, Project Title: Stability of a Three-Dimensional Vortex with Radial Density Stratification, Sponsoring Agency: SERB Matrics grant, 2.2 L

- Dr. Mahesh M S, Project Code: ANS/MAE/F185/2019-20/S84, Project Title: A CFD Approach to Transient Analysis of Starting of a High Speed Jet Under Water, 12L.

- Dr. Muvvala Gopinath, Project Type: Grant-in-Aid, Project Code: SERB/MAE/F220/2019-20/G263, Project Title: Real Time Monitoring and Control of Cooling Rates in Laser Based Additive Manufacturing for Ensuring Microstructural Homogeneity, Controlling and Dimensional Accuracy, Micro-craacks and Delamination and Investing their Effects on the Mechanical Properties (...), Sponsoring Agency: SERB, 30.8L.

- Dr. Pankaj Sharadchandra Kolhe, Project Type: Grant-in-Aid, Project Code: CRG\2019\005507, Project Title: Experimental Investigation into the Effect of Aerodynamics within the Primary Zone of Biofuel Operated Swirl Stabilized Gas Tubine Combustor on Combustion and Emissions Characteristics, Sponsoring Agency: DST-SERB, 27.3L

- Dr. Sayak Banerjee., Project Type: Grant-in-Aid, Project Code: SERB/MAE/F219/2019-20/G264, Project Title: An Experimental and Theoretical Investigation of the Combustion Kinetics of Lemon Peer Oil - A Novel Potential Biofuel for Jet Engines - in a Premised Laminar Flame, Sponsoring Agency: Department of Science and Technology, 26.2L.

- Dr. Suryakumar S, Project Type: Grant-in-Aid, Project Code: DST/MAE/F056/2019-20/G228, Project Title: Development of an Integrated Metal Additive and Formative Manufacturing System to Enhance Complexity and Properties, Sponsoring Agency: DST, 48.5L.

- Dr. Syed Nizamuddin Khaderi, Project Type: Grant-in-Aid, Project Code: GIAN/MAE/F152/2019-20/G252, Project Title: 171008L07 The Mechanics of Metal Foams and Lattice Materials, 8.2 L.

- Dr. Venkatesham Balide, Project Type: Grant-in-Aid, Project Code: DIH/MAE/F057/2019-20/G249, Project Title: Low Noise Energy Efficient High RPM Bearing for Electrical Vehicle, Sponsoring Agency: DHI, 137.4L.

- Dr. Venkatesham Balide, Project Code: Fleetguard/MAE/F057/2019-20/S98, Project Title: Acoustic Performance of Automative Air intake Filtration System, Sponsoring Agency: Fleetguard Filters Private Limited, 4.7L.

- Dr. Viswanath Chinthapenta, Project Code: Dassault/MAE/F117/2019-20/S89, Project Title: Biomechanical Simulations of Resuncitation, Sponsoring Agency: La Foundation DSS, 12.1L.

Awards & Recognitions

- Mr. Veerababu D, "Acoustical Society of America International Student Grant" from the Committee for International Research and Education (CIRE) of the Acoustical Society of America (ASA) in the year 2019.

- Mr. Siva Teja G, "Acoustical Society of America International Student Grant" from the Committee for International Research and Education (CIRE) of the Acoustical Society of America (ASA) in the year 2019.

- Dr. Ashok Kumar Pandey, Associate Professor, has done Daad-IIT-Master Sandwich program for Combined Masters Thesis guidance to Mr. Aakash Swami at TU Dresden.

- Dr. Harish Nagaraj Dixit, Associate Professor, has been awarded the JNCASR Visiting Faculty.

- Dr. Harish Nagaraj Dixit, Associate Professor, PhD student, Mr. Anjishnu Choudhury was awarded SERB's OVDF fellowship to spend 12 months at UBC Vancouver, Canada.

Highlights

a. Development of a low-frequency noise control sheet absorber having with six times lesser thickness than traditional acoustic material requirements – Inspired from Honey Bee Hive

b. Evaporation studies on ethanol-based fuel droplet using infrared thermal imaging

c. Computations of high-speed flows for Aero applications using finite-volume methods and RANS and hybrid RANS / LES models for turbulence

d. Mechanics based integrated product and process design system for Incremental Forming is developed and tested on custom designed and developed machine that can form components upto 1m by 1m opening size

e. Aerodynamic studies on multirotor wind turbine

f. Bubble entrapment occurs when a drop impacts a smooth surface. High-speed jets and secondary bubbles are created in the drop and the bubble during impact leads to significant energy dissipation

g. Projectile impact study on the metallic foam

h. Sectorial plane wave imaging (SPWI) is an advanced array-based ultrasonic technique to image weld defects with high accuracy and better resolution.

i. Progressive damage studies in Carbon Fiber reinforced Polymer (CFRP) structures

j. Simulation of turbulent combustion of diesel-butanol fuel mixtures under CI Engine conditions
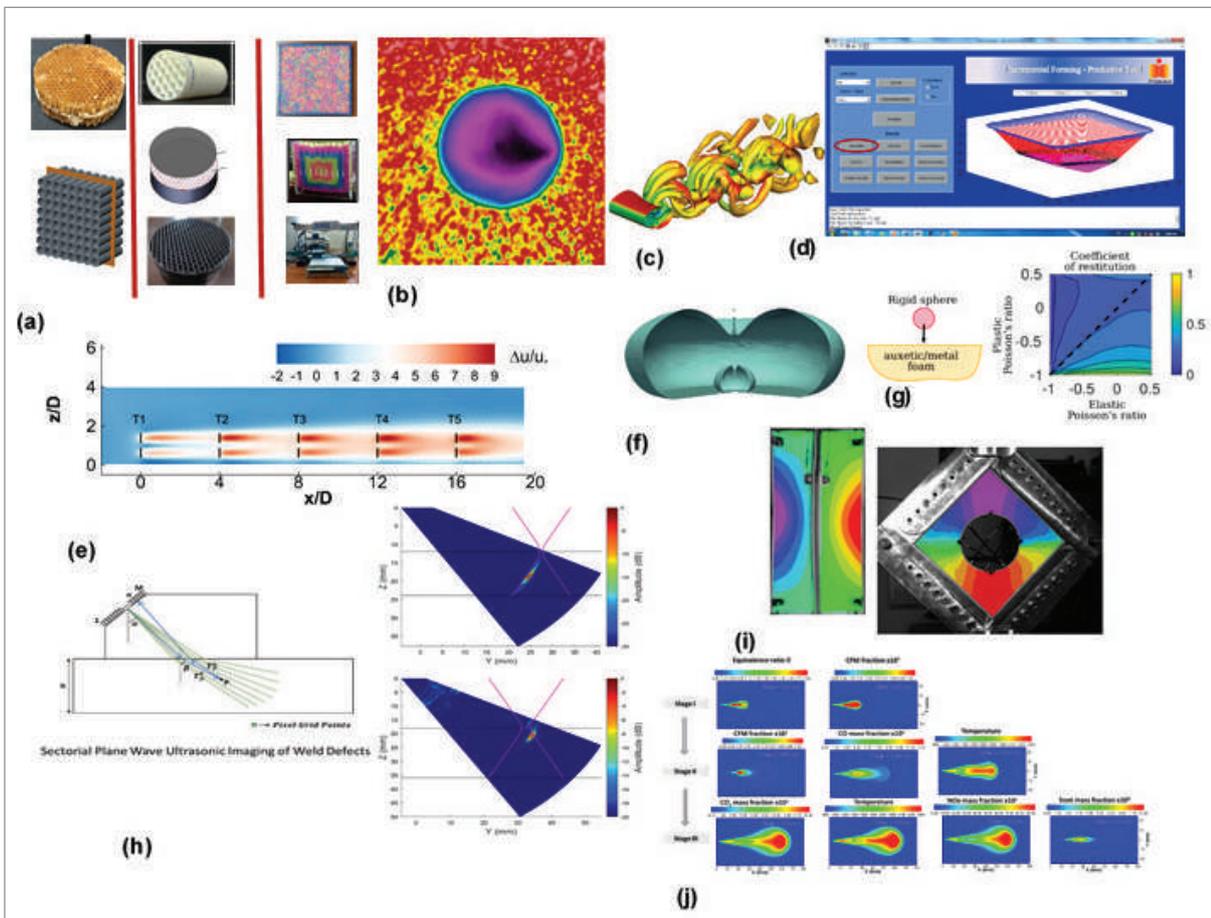
Physics

The Department of Physics at IIT Hyderabad is a rapidly growing department, presently the department has 18 permanent faculty members, 8 technical staff, ~180 students (PhD, MSc and BTech (Engineering Physics). The department had significant success at academic as well as research fronts during the FY 19-20. Department graduated BTech, MSc batches and few PhD students. The department has included several advanced teaching experiments in the earlier established labs. The department has several groups pursuing research in diverse areas of physics. Presently, their efforts are concentrated mainly in the area of high energy Physics, Optics, Spectroscopy, Laser-Plasma Physics, Computational Condensed Matter Physics and Experimental Condensed Matter Physics. The department is in the process of establishing state-of-the-art research laboratories from the sponsored (DST, FIST, DSIR, DAE, CSIR and so on) and institute supported projects. The department has procured several high-end equipment such as LASER, MFM, Nano-MOKE, Interferometer, SQUID, XRD, VSM etc funded by JICA. The faculty of the department have published nearly 300 international journals and also delivered several talks at prestigious national / international workshops / conferences. Our faculty and students received several recognitions in terms of membership from the renowned scientific organizations and awards from conferences, respectively.

THE TRUE LABORATORY IS THE MIND, WHERE BEHIND ILLUSION WE UNCOVER THE LAWS OF TRUTH."
– *Jagadish Chandra Bose*

Faculty

Saket Asthana
PhD – IIT Bombay
Professor & HoD
Research Areas: Ferroelectrics; Energy, Storage; Piezoelectrics; Multiferroics; Piezoluminisence

Anjan Kumar Giri
PhD – Utkal University
Professor
Research Areas: Flavor Physics and CP Violation; Neutrino Physics; BSM

Venkatakrishnan Kanchana
PhD – Anna University
Professor
Research Areas: Condensed Matter Theory; Thermoelectric Properties; Fermi Surface Topology; Optical Properties; Topological Materials; Magnetic Properties

Prem Pal
PhD – IIT Delhi
Professor
Research Areas: MEMS Technology; Silicon Micro Machining; MEMS-based Sensors; Thin Films; Solar Cell

Manish K Niranjan
PhD – University of Texas at Austin, USA
Associate Professor
Research Areas: Theoretical Condensed Matter Physics; Electronic Structure; Surface and Interface Physics; Quantum Transport

Shantanu Desai
PhD – Boston University, USA
Associate Professor
Research Areas: Galaxy Clusters and Cosmology; Pulsars; Astrostatistics and Data Mining; Gravitational Wave Searches

Narendra Sahu
PhD – IIT Bombay
Associate Professor
Research Areas: Dark Matter Phenomenology; Neutrino Mass; Baryon Asymmetry of the Universe

Suryanarayana Jammalamadaka
PhD – IIT Madras
Associate Professor
Research Areas: Magnetic Materials; Device Physics; Spintronics; Data Storage; Non Volatile Memory; Multiferroics; Mesoscopic Physics; Atomic Junction; Molecular Magnetism

Jyoti Ranjan Mohanty
PhD – Humboldt University, Germany
Associate Professor
Research Areas: Nanomagnetism; Magnetic Microscopy; Ultrafast Magnetism; Multiferroics; Data Storage; Tera-Hertz Spectroscopy

Vandana Sharma
PhD – PRL, Ahmedabad
Associate Professor
Research Areas: Intense Laser Field Interaction with Micro to Nano Particles; Table-Top Hard X-Ray Generation; Ultrafast Imaging of Small to Complex Molecules; A Few Body Quantum Dynamics

Raavi Sai Santosh Kumar
PhD – University of Hyderabad
Associate Professor
Research Areas: Optics and Spectroscopy of Energy Conversion Materials

Raghavendra Srikanth Hundi
PhD – Harish Chandra Research Institute
Assistant Professor
Research Areas: Physics Beyond Standard Model; Neutrino Masses

Indian Institute of Technology Hyderabad

Bhuvanesh Ramakrishna
PhD – The Queens University of Belfast, UK
Assistant Professor
Research Areas: Laser plasma Interaction

Anurag Tripathi
PhD – Harish-Chandra Research Institute
Assistant Professor
Research Areas: High Energy Physics; Perturbative Quantum Chromodynamics; Infrared Structure of Gauge Field Theories

Shubho R Roy
PhD – Brown University, USA
Assistant Professor
Research Areas: Nonperturbative String and Quantum Field theory; AdS/CFT; Quantum Black Holes

Priyotosh Bandyopadhyay
PhD – Harish-Chandra Research Institute, Allahabad
Assistant Professor
Research Areas: LHC; Higgs Physics; Supersymmetry; Neutrino; Collider Physics

Arabinda Haldar
PhD – IIT Bombay
Assistant Professor
Research Areas: Magnonics; Microwave Magnetics; Nanomagnetic Devices; Micromagnetics; Nanofabrication

Joyjit Kundu
PhD – IMSc., India
Assistant Professor
Research Areas: Statistical physics of condensed matter systems

Patent Filed / Granted

- Patent Title: Fluorescent Polyethylene Glycol, Name of the Inventors: Aravind Kumar Rengan, Aswathi Thomas, Appidi Tejaswini, Jyoti Ranjan Mohanty, Patent Number: 201841030149.

- Patent Title: Domain wall tunnelling and logic operations in ferromagnetic nanostructures, Name of the Inventors: Suryanarayana Jammalamadaka, Chandrasekhar Murapaka, Sreeveni Mozhikunnath Das, Patent Number: 201941048936.

- Patent Title: Memristor based device and method for detecting Bovine Serum Albumin (BSA), Name of the Inventors: Suryanarayana Jammalamadaka and Dwipak Prasad Sahu, Patent Number: 201941034084.

- Patent Title: 3-D Identification of Subcutaneous Structures, Name of the Inventors: Dr. V. Kamisetti, Dr. K L Narayana Deepak, Dr. Vandana Sharma, Mr. M Venkata Amaresh Kumar, Patent Number: 201941014930.

Book / Book Chapter

- Quantum Collisions and Confinement of Atomic and Molecular Species-Photoionization of Acetylene Doped in Helium Nanodroplets by EUV Synchrotron Radiation.

- Intriguing single photon induced processes in Helium nanodroplets.

Publications (Journals)

1. Banerjee, K., Alvi, S. B., Rengan, A. K., & Asthana, S. (2019). Investigation on the discharge energy storage density of the Rb substituted $Na0.5Bi0.5TiO3$ relaxor ferroelectric and its suitability for the orthopedic application. Journal of the American Ceramic Society, 102(11), 6802-6816. https://doi.org/10.1111/jace.16596.

2. Banerjee, K., & Asthana, S. (2019). Resolution of ambiguity between the depolarization and ferroelectric-relaxor transition temperature through dielectric studies in lead-free perovskite $K0.5Bi0.5TiO3$. Materials

Chemistry and Physics, 231, 344–350. https://doi.org/10.1016/j.matchemphys.2019.04.043.

3. Cilaveni, G., Ashok Kumar, K. V., Raavi, S. S. K., Subrahmanyam, C., & Asthana, S. (2019). Control over relaxor, piezo-photocatalytic and energy storage properties in Na0.5Bi0.5TiO3 via processing methodologies. Journal of Alloys and Compounds, 798, 540-552. https://doi.org/10.1016/j.jallcom.2019.05.235.

4. Goutham, C., Raavi, S., & Asthana, S. (2019). Particle size dependent properties of Na0.5Bi0.5TiO3 synthesized using hydrothermal technique. AIP Conference Proceedings, 2082(1), 30010-30010.

5. Kandula, K., Patri, T., & Asthana, S. (2019). Nd3+ and Nb5+ Co-Substitution Inducing a Large Electrocaloric Response in Na0.5Bi0.5TiO3 Lead-Free Ceramics. Physica Status Solidi (b), 256(8), 1900001-1900001.

6. Raju, K., Kandula, K., Asthana, S., & Patri, T. (2019). Effect of La3+-donor substitution on structural, micro structural, dielectric and ferroelectric characteristics of BLNT-BZT solid solutions. Phase Transitions, 92(1), 1-12.

7. Rao, T. D., Sattibabu, B., & Asthana, S. (2019). Predicting High Magneto-Electric Coupling in Gd Substituted BiFeO3. Physica Status Solidi (b), 256(11), 1900097-1900097.

8. Y Li et al., (Belle Collaboration), Measurements of the Branching Fractions $\{B\}(B^{-} \setminus$, Phys. Rev. D 100 (2019) 11, 112010.

9. S. Choudhury et al., (2019), Simulation studies of B to Kll' at Belle, Springer Proc. Phys. 234 (2019) 127-132.

10. S Mishra and A Giri (2019) S3 Extended Standard Model and Scalar Triplet Leptogenesis, Springer Proc. Phys. 234 (2019) 347-352.

11. S Sahoo et al (2019), Exploring Lepton Non-universality in b $\setminus$ rightarrow c l $\bar{\nu}$_lb→cl Decay Modes in the Light of Recent Experimental Data, Springer Proc. Phys. 234 (2019) 463-467.

12. S Jia et al., (Belle Collaboration 2019), Observation of a vector charmonium like state in e^+e^- \to D^+_sD_{s1}(2536)^-+c, Phys.Rev.D 100 (2019) 11, 111103

13. H Li et al (Belle Collaboration 2019), Azimuthal asymmetries of back-to-back \pi^\pm-(\pi^0,\eta,\pi^\pm), Phys. Rev.D 100 (2019) 9, 092008

14. P K Resmi et al (Belle Collaboration 2019), First measurement of the CKM angle phi3 with B to DK decays, JHEP 10 (2019) 178

15. Y Jin et al (Belle Collaboration 2019), Observation of tau to \pi^- \nu_{\tau} e^+ e^-τ and search for \tau^- \to \pi^- \nu_{\tau} \mu^+ \mu^-τ, Phys.Rev.D 100 (2019) 7, 071101.

16. M A Acero et al (Nova Collaboration), First Measurement of Neutrino Oscillation Parameters using Neutrinos and Antineutrinos by NOvA, Phys.Rev.Lett. 123 (2019) 15, 151803.

17. S Jia et al (Belle Collaboration 2019), Search for \Omega(2012)\to K\Xi(1530) \to K\pi\ XiΩ(2012)→KΞ(1530)→KπΞ at Belle, Phys. Rev.D 100 (2019) 3, 032006.

18. P C Chou et al (Belle Collaboration 2019), Search for B^0 \to X(3872) \gamma B →X(3872)γ, Phys.Rev.D 100 (2019) 1, 012002

19. R Mizuki et al (Belle Collaboration 2019), Observation of a new structure near 10.75 GeV in the energy dependence of the e^{+} e^-→ Υ (nS), JHEP 10 (2019) 220.

20. M A Acero et al (NOvA Collaboration 2019), Observation of seasonal variation of atmospheric multiple-muon events in the NOvA Near Detector, Phys.Rev.D 99 (2019) 12, 122004.

21. Y B Li et al (Belle Collaboration 2019), First measurements of absolute branching fractions of the \Xi_c^+Ξ baryon at Belle, Phys.Rev.D 100 (2019) 3, 031101.

22. V Bhardwaj et al (Belle Collaboration 2019), Search for X(3872)X(3872) and X(3915) X(3915) decay into \chi_{c1} \pi^0χ, Phys. Rev.D 99 (2019) 11, 111101.

23. Y T Lai et al (Belle Collaboration 2019), Measurement of branching fraction and final-state asymmetry for the \bar{B}^{0}\to K^{0}_{S}K^{\mp}\pi^{\pm}, Phys. Rev.D 100 (2019) 1, 011101.

24. B Pal et al (Belle Collaboration 2019), Evidence for the decay B^0\to p\bar{p}\pi^0B , Phys.Rev.D 99 (2019) 9, 091104.

25. K Chilikin et al Belle Collaboration 2019), Evidence for B^+ \rightarrow h_c K^+B and observation of \eta_c(2S) to p \bar{p} \pi^+ \pi^-η, Phys. Rev.D 100 (2019) 1, 012001.

26. R Seidl et al (Belle Collaboration 2019), Transverse momentum dependent production cross sections of charged pions, kaons and protons produced in inclusive e^+e^-e annihilation, Phys. Rev.D 99 (2019) 11, 112006

27. R Garg et al (Belle Collaboration 2019), Search for the B \to Y(4260) K, ~Y(4260) \to J/\psi \pi^+\pi^-B→Y(4260)K, Y(4260)→J/ψπ, Phys. Rev.D 99 (2019) 7, 071102.

28. A B Kaliyar et al (Belle Collaboration 2019), Measurements of branching fraction and direct CPCP asymmetry in B^{\pm}\to K^{0}_{S}K^{0}_{S}K^{\pm}B and a search for B^{\pm}\to K^{0}_{S}K^{0}_{S}\pi^{\pm}B, Phys. Rev.D 99 (2019) 3, 031102.

29. Y B Li et al (Belle Collaboration 2019), First Measurements of Absolute Branching Fractions of the \Xi_c^0Ξ, Phys.Rev.Lett. 122 (2019) 8, 082001.

30. M Sumihara et al (Belle Collaboration 2019), Observation of \Xi(1620)^0Ξ(1620) and evidence for \Xi(1690)^0Ξ(1690) in \Xi_c^+ \rightarrow \Xi^-\pi^+\pi^+Ξ, Phys.Rev.Lett. 122 (2019) 7, 072501.

31. J B Kim et al (Belle Collaboration 2019), Search for CP violation with kinematic asymmetries in the D^0 \to K^+ K^- \pi^+ \pi^-D, Phys. Rev.D 99 (2019) 1, 011104.

32. Y Yusa et al 9Belle Collaboration 2019), Measurement of time-dependent CPCP violation in B^0 \to K^0_S \pi^0 \pi^0B, Phys. Rev.D 99 (2019) 1, 011102.

33. I S Seong et al (Belle Collaboration 2019), Search for a light CP-odd Higgs boson and low-mass dark matter at the Belle experiment, Phys.Rev.Lett. 122 (2019) 1, 011801.

34. E Waheed et al (Belle Collaboration 2019), Measurement of the CKM matrix element |V_{cb}|from B^0\to D^{*-}\ell^{+} \nu_\ell decay, Phys.Rev.D 100 (2019) 5, 052007.

35. E Kou et al (Belle II Collaboration), The Belle II Physics Book, PTEP 2019 (2019) 12, 123C01, PTEP 2020 (2020) 2, 029201 (erratum).

36. Y Guan et al (Belle Collaboration 2019), Observation of Transverse \Lambda/\bar{\Lambda}Λ/ΛHyperon Polarization in e^+e^-e Annihilation at Belle, Phys.Rev.Lett. 122 (2019) 4, 042001.

37. P C Lu et al (Belle Collaboration 2019), Observation of B^{+} \rightarrow p\bar{\Lambda} K^+ K^-B + →p and B^{+} \rightarrow \bar{p}\Lambda K^+ K^+B, Phys. Rev.D 99 (2019) 3, 032003.

38. S Watanuki et al 9Belle Collaboration 2019), Measurements of isospin asymmetry and difference of direct CP asymmetries in inclusive B \to X_s \gammaB→Xs γ decays, Phys.Rev.D 99 (2019) 3, 032012.

39. Laha, A., Malick, S., Singha, R., Mandal, P., Rambabu, P., Kanchana, V., & Hossain, Z. (2019). Magnetotransport properties of the correlated topological nodal-line semimetal YbCdGe. Physical Review B, 99(24). https://doi.org/10.1103/PhysRevB.99.241102.

40. Kumar Sharma, V., Sreeparvathy, P. C., Anees, P., & Kanchana, V. (2019). Transport and topological properties of ThOCh (Ch: S, Se and Te) in bulk and monolayer: A first principles study. Journal of Physics Condensed Matter, 31(43). https://doi.org/10.1088/1361-648X/ab2dca.

41. Sharma, V. K., Sreeparvathy, P. C., & Kanchana, V. (2019). Na2KSb: A promising thermoelectric material. In Y. S. M. Biswas A. Sharma V. K. (Ed.), AIP Conference Proceedings (Vol. 2115). American Institute of Physics Inc. https://doi.org/10.1063/1.5113282.

42. Xu, M., Zhong, X., Lv, J., Cui, W., Shi, J., Kanchana, V., Vaitheeswaran, G., Hao, J., Wang, Y., & Li, Y. (2019). Ti-fraction-induced electronic and magnetic transformations in titanium oxide films. Journal of Chemical Physics, 150(15). https://doi.org/10.1063/1.5089697.

43. Shwetha, G., & Kanchana, V. (2019). Impurity induced cross luminescence in KMgCl3: an ab initio study. Journal of Physics: Condensed Matter, 31(11), 115501.

44. Sreeparvathy, P. C., & Kanchana, V. (2019). Quantum fluctuation in thermo power at the topological phase transition in CaSrX (X: Si, Ge, Sn, Pb) studied from first principles theory. Journal of Physics: Condensed Matter, 31(9), 095501.

45. Sreeparvathy, P. C.; Kanchana, V.; Anees, P.; Vaitheeswaran, G.; 2019 Emergence of strain induced two dimensional metallic state in ReS2 Journal of Solid State Chemistry 269, 138-144 10.1016/j.jssc.2018.09.008.

46. Akarapu, A., Nighot, R. P., Devsoth, L., Yadav, M., Pal, P., & Pandey, A. K. (2020). Experimental and Theoretical Analysis of Drag Forces in Micromechanical-Beam Arrays. Physical Review Applied, 13(3). https://doi.org/10.1103/PhysRevApplied.13.034003.

47. Swarnalatha, V., Pal, P., Pandey, A. K., Narasimha Rao, A. V. N., Xing, Y., Tanaka, H., & Sato, K. (2020). Systematic study of the etching characteristics of Si111 in modified TMAH.

Micro and Nano Letters, 15(1), 52–57. https://doi.org/10.1049/mnl.2019.0443.

48. Swarnalatha, V., Vismaya, K. T., Rao, A. V. N., Pal, P., Pandey, A. K., Tanaka, H., & Sato, K. (2020). Etching mechanism behind the high-speed etching of silicon in NH2OH-added alkaline solutions. IEEJ Transactions on Sensors and Micromachines, 140(1), 24–30. https://doi.org/10.1541/ieejsmas.140.24.

49. Pawar, V., Menon, P., Murty, A., Pal, P., & Pandey, A. (2019). Influence of scalloping on electrostatic forces in comb drive microdevices. ISSS Journal of Micro and Smart Systems, 8(2), 127–134.

50. Rao, A. V. N. ., Pal, P., Pandey, A., Swarnalatha, V., Menon, P., Tanaka, H., & Sato, K. (2019). Aging Effects of KOH+ NH2OH Solution on the Etching Characteristics of Silicon. ECS Journal of Solid State Science and Technology 8 (11), P, 685.

51. Ashok, A., Nighot, R. P., Sahu, N. K., Pal, P., & Pandey, A. K. (2019). Design and analysis of micro cantilever beams based on arrow shape. Micro system Technologies, 25(11), 4379-4390. https://doi.org/10.1007/s00542-019-04555-4.

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Publications (Conference)

1. B. Krishna and A. Haldar, "Tunable Magnetic and Microwave Properties in Spin-ice-type Nanomagnetic Arrays", DAE Solid State Physics Symposium (DAE-SSPS-2019), Dec 18-22, 2019, IIT Jodhpur, Jodhpur, India.

2. "Ion Source Perturbation and Control in Intense Laser Plasma InteractionS Krishnamurthy1, M Tayyab2, K Makur1, S Bagchi 2, T Mandal 2, J A Chakera 2, P A Naik 2 B Ramakrishna1"

3. "Understanding Laser Plasma Driven Weibel InstabilityS Krishnamurthy 1 , K Makur 1 , S Kraft 2 , J Metzekes 2 , T Cowan 2 , B Ramakrishna 1, National laser symposium, 2019"

4. Sharma V.K., Sreeparvathy P.C., Kanchana V..Biswas A.Sharma V.K.Yusuf S.M..AIP Conference Proceedings;18 December

2018 through 22 December 2018; American Institute of Physics Inc.;2019.

5. Narendra N., Patra S., Sahu N., Shil S., Springer Proceedings in Physics;14 July 2018 through 18 July 2018;Springer;2019.335

6. Narendra N., Sahu Nirakar, Sahu Narendra, Dirac leptogenesis in assistance of dark matter and neutrino mass.PoS ICHEP2018 (2019) 137

7. Satya Srinivas B., Swaranalatha V., Rao A.V.N., Pal P..Sharma R.K.Rawal D.S..Springer Proceedings in Physics;11 December 2017 through 15 December 2017;Springer Science and Business Media, LLC;2019.547

8. Swarnalatha V., Rao A.V.N., Pal P..Sharma R.K.Rawal D.S..Springer Proceedings in Physics;11 December 2017 through 15 December 2017;Springer Science and Business Media, LLC;2019.801

9. Goutham C., Raavi S.S.K., Asthana S..Saji K.J.Anju K.S.John H.Mohan P.A.Jayaraj M.K.. AIP Conference Proceedings;3 January 2019 through 5 January 2019;American Institute of Physics Inc.;2019.

10. Goutham C., Raavi S.S.K., Asthana S..Saji K.J.Anju K.S.John H.Mohan P.A. Jayaraj M.K.. AIP Conference Proceedings;3 January 2019 through 5 January 2019;American Institute of Physics Inc.;2019.

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Funded Research Projects

*   Dr. Anurag Tripathi, Project Type: Grant-in-Aid, Project Code: MHRD/CSE/F159/2019-20/G232, Project Title: Perturbative QCD for Precision Physics at the LHC, Sponsoring Agency: MHRD, 81.1L

*   Dr. Bhuvanesh Ramakrishna, Project Type: Grant-in-Aid, Project Code: SERB/PHY/F156/2019-20/G255, Project Title: Laser Driven Proton Sources for Cancer Therapy, Sponsoring Agency: , 48.1L

*   Dr. Kanchana V, Project Type: Grant-in-Aid, Project Code: DAE/PHY/F014/2019-20/G254, Project Title: Theoretical investigation of Thermoelectric materials, Sponsoring Agency: DAE-BRNS, 27.1L

*   Dr. Kanchana V, Project Type: Grant-in-Aid, Project Code: SERB/PHY/F014/2019-20/G247, Project Title: Design Syhthesis and Physical properties of Topological Materials, Sponsoring Agency: DST-SERB, 17.9L

*   Dr. Prem Pal, Project Type: Grant-in-Aid, Project Code: CSIR/PHY/F037/2019-20/G262, Project Title: Development of High Performance Silicon Etchant for wet bulk Micromac-Inning in MEMS, Sponsoring Agency: , 5.2L

*   Dr. Raavi Sai Santosh Kumar, Project Type: Grant-in-Aid, Project Code: DST/EE/F140/2019-20/G217, Project Title: Interface engineered and energy efficient organic solar cells based on porphyrin small molecules, Sponsoring Agency: BRICS-STI 2017 grant in partnership of China and Brazil , 31.5L

*   Dr. Raavi Sai Santosh Kumar, Project Type: Grant-in-Aid, Project Code: DST/PHY/F140/2019-20/G220, Project Title: Award of Indo-US Science & Technology (IUSSTF) to Dr. Sai Santosh Kumar Raavi, Sponsoring Agency: IUSSTF BASE fellowship scheme, 9.4L

*   Dr. Saket Asthana, Project Type: Grant-in-Aid, Project Code: CSIR/PHY/F035/2019-20/G250, Project Title: Optimization of Maximum attainable Energy Storage density and Efficiency of the cationic-site Disordered Lead free perovskites based Peizoceramics and their solid solutions for the green energy harvesting, Sponsoring Agency: CSIR, 13.5 L

*   Dr. Vandana Sharma, Project Type: Grant-in-Aid, Project Code: MHRD/PHY/F093/2019-20/G225, Project Title: India - UK Partnership in laboratory astro - particle physics, Sponsoring Agency: SPARC, 94.9L

Seminar Conducted

*   Subir Sarkar, Oxford University, August 30, 2019, Does Dark Energy exist?

*   Suchetana Chatterjee, Presidency University, Sept. 20 2019, Supermassive Black Holes and their dark matter haloes

*   Abraham Harte, Dublin City University, Oct 10, 2019, Classical Self-Interaction and its effect on motion

*   Sukanta Bose, IUCAA, October 16, 2019, Testing Einstein with black holes and neutron stars

- Sourabh Nampalliwar, University of Tubingen, Nov 5, 2019, Testing theories of gravity: Look into the future
- Sanjib Sharma, University of Sydney, Jan 16 2020, Bayesian Inference in astronomy: Past, present and future

Awards & Recognitions

- Dr. Arabinda Haldar, Assistant Professor has received IOP Publishing 'Outstanding Reviewer' Award winner for Journal of Physics D: Applied Physics for 2019.
- Dr. Bhuvanesh Ramakrishna, Assistant Professor has been Inducted as UK peer review college memberRoyal society of Edinburgh fellowship to University of Strathclyde.
- Dr. Raavi Sai Santosh Kumar, Associate Professor, has been nominated as Associate Fellow of the Telangana Academy of Sciences for the year 2019.
- Dr. Saket Asthana, Professor, has received Best Reviewer certificate from few journals.
- Dr. Shantanu Desai, Associate Professor, IISER Kolkata student Sajal Gupta, who was a summer intern with me at IITH during Summer of 2018, got the best poster award in the General Relativity and Cosmology section of the 2020 ASI meeting in Tirupati.
- Dr. Suryanarayana Jammalamadaka, Associate Professor, has received Certificate of outstanding contribution in reviewing, Physica E; Low dimensional systems and Nanostructures.
- Dr. Suryanarayana Jammalamadaka, Associate Professor, has received Certificate of outstanding contribution in reviewing, Journal of Magnetism and Magnetic Materials.
- Dr. Suryanarayana Jammalamadaka, Associate Professor, has received IJRULA international award for the best research.

Highlights

Fig. (i) & (ii) Current 3D conducting atomic force microscope (C-AFM) images of the Ag/BSA/GO/ TiO2/FTO device by applying a voltage bias of 9 V and −9 V respectively. This TiO2 based Bio – RRAM device was made to detect bovine serum albumin (BSA) (Journal Ref. : D. P. Sahu and S. Narayana Jammalamadaka Scientific reports, 9, 16141 (2019).

(iii) & (iv) MFM images of FeTO film when we applied magnetic field strength of 300 Oe and -300 Oe in order to prove our concept of demagnetization fields to enhance the TiO2 based DSSC solar cell efficiency (Journal Ref.: U. M. Kannan and S. Narayana Jammalamadaka et. al, Solar energy 187, 281 (2019))
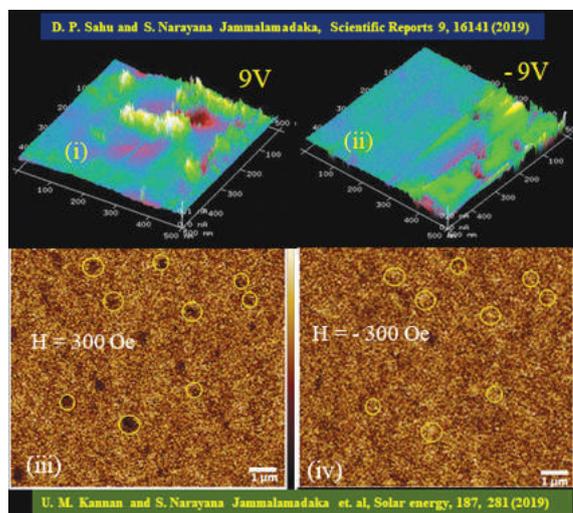
Artificial Intelligence
Virtual Department

The Department of AI @ IIT Hyderabad's mission is to produce students with a sound understanding of the fundamentals of the theory and practise of Artificial Intelligence and Machine Learning. The mission is also to enable students to become leaders in the industry and academia nationally and internationally. Finally, the mission is to meet the pressing demands of the nation in the areas of Artificial Intelligence and Machine Learning.

Faculty

Mathukumalli Vidyasagar
Electrical Engineering
Research Areas: System and Control Theory

C Krishna Mohan
Computer Science & Engineering
Research Areas: Video Content Analysis;
Machine Learning; Sparsity base Methods;
Deep Learning

Vineeth N Balasubramanian
HoD
Computer Science & Engineering
Research Areas: Machine Learning;
Computer Vision

Srijith P K
Computer Science & Engineering
Research Areas: Bayesian Data Analysis;
Probabilistic Machine Learning;
Bayesian Non-Parametrics; Survival Analysis;
Text Analytics

Maunendra Sankar Desarkar
Computer Science & Engineering
Research Areas: Machine Learning;
Recommendation Systems; Information
Retrieval; Machine Learning; Data Mining

Manish Singh
Computer Science & Engineering,
Research Areas: Databases; Data Mining; HCI;
Information Retrieval; Information Visualization

THE VISION IS THE ART OF SEEING THINGS INVISIBLE."
– Jonathan Swift

Faculty

K. Sri Rama Murty
Electrical Engineering
Research Areas: Signal Processing;
Speech Analysis; Pattern Recognition

Sumohana Channappayya
Electrical Engineering
Research Areas: Image and Video Quality
Assessment; Perceptually Optimal Algorithms;
Multimedia Communication

Aditya Siripuram
Electrical Engineering
Research Areas: Signal Processing;
Space Representations; Sampling Techniques;
Optimization

Jayaram Balasubramaniam
Mathematics
Research Areas: Fuzzy Logic Connectives;
Approximate Reasoning

C S Sastry
Mathematics
Research Areas: Wavelets;
Computed Tomography;
Sparsity Seeking Optimization Techniques

Amit Acharyya
Electrical Engineering
Research Areas: Signal Processing;
Embedded AI; VLSI Systems for Next
Generation and Healthcare Systems;
Electronic Aspects of pervasive Computing

Rajalakshmi
Electrical Engineering
Research Areas: AI for Internet of Things;
Embedded Systems

Soumya Jana
Electrical Engineering
Research Areas: Multimedia Signal Processing;
Information Theory; AI for Multimedia

Sathya Peri
Computer Science & Engineering
Research Areas: Distributed Systems;
Graph Analytics; Parallel Processing

G.V.V. Sharma
Electrical Engineering
Research Areas: Communication Theory;
Signal Processing

Lakshmi Prasad Natarajan
Electrical Engineering
Research Areas: Information Theory; Modulation
and Coding for Communications

R Prasanth Kumar
Mechanical & Aerospace Engineering
Research Areas: Dynamics; Control;
Robotics; Mechanotronics

Faculty

Shantanu Desai
Physics
Research Areas: Machine Learning for
Astrophysics

Abhinav Kumar
Electrical Engineering
Research Areas: AI in Wireless Communications;
Green Cellular Networks; Device to Device
Communications

Saidhiraj Amuru
Electrical Engineering
Research Areas: Applications of AI and
ML in Wireless Communications

C. P. Vyasarayani
Mechanical & Aerospace Engineering
Research Areas: Structural Dynamics;
Delay Differential Equations; Parameter
Identification; Optimization

Nixon Patel
Electrical Engineering
Research Areas: Wireless Communications;
Applications of AI and Machine Learning

Suryakumar S
Mechanical & Aerospace Engineering
Research Areas: Additive Manufacturing;
Design

M. V. Panduranga Rao
Computer Science & Engineering
Research Areas: Theoretical Computer Science

Kishalay Mitra
Chemical Engineering
Research Areas: Engineering Optimization,
Machine Learning Applications

Mohan Raghavan
Biomedical Engineering
Research Areas: Computational
Neuroscience

Climate Change
Virtual Department

The Department of Climate Change at the IIT Hyderabad attempts to explore climate change integrating academic knowledge with practical knowledge bringing scientists, engineers, practitioners and students together. The key is an understanding of the strong association between the basic climate sciences, the technology & engineering solutions, and the policy. We, at IITH, plan to be a leading institute in the synergy among these three key areas. This clearly highlights the need for multi-disciplinary courses. We plan to achieve this with a unique curriculum taking the help of IITH's fractal academics programme. The curriculum involves core courses, elective courses, seminar series by the experts of various disciplines, focus group discussions, field visits, and research thesis.

Faculty

Satish Regonda
HoD
Civil Engineering
Research Areas: Urban and Rural Flood Modeling; Climate Sciences; Data Sciences; Statistical Modeling Techniques; Ensemble Forecasting; Tools and Products Development; GIS; R; Shiny

Aalok Khandekar
Liberal Arts
Research Areas: Science, Technology and Society Studies (STS); Environmental Sustainability; Urban Studies; Cultural Anthropology

Abhinav Kumar
Electrical Engineering
Research Areas: AI in Wireless Communications; Green Cellular Networks; Device to Device Communications

THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT."
– Alan Kay

Faculty

Asif Qureshi
Civil Engineering
Research Areas: Environmental Science and Public Health

Bhuvanesh Ramakrishna
Physics
Research Areas: Laser plasma Interaction

Chandra Shekhar Sharma
Chemical Engineering
Research Areas: Polymer and Carbon Nanomaterials; Carbon-MEMS; Electrospun Nanofibers; Nature inspired Functional Surfaces; Drug Delivery; Waste Management; Li-ion batteries and Supercapacitors
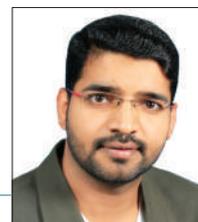
D Chandrasekharam
Civil Engineering
Research Areas: Groundwater Pollution; Geothermal Energy

Debraj Bhattacharyya
Civil Engineering
Research Areas: Water & Wastewater Treatment; Solid Waste Management; Renewable Energy (Biofuel)

Digvijay S Pawar
Civil Engineering
Research Areas: Driver and Pedestrian Behavioral Modeling; Traffic Safety and Accident Analysis; Traffic Operation and Simulation; Intelligent Transportation Systems; Statistical Modelling and Classification Technique; Naturalistic Driving Study And Human Factors

M P Ganesh
Liberal Arts
Research Areas: Cross-Cultural Virtual Teams, Workplace Bullying; Cross-Cultural Collaborations

Harish N Dixit
Mechanical & Aerospace Engineering
Research Areas: Interfacial Flows – Moving Contact Lines; Drop; Bubbles and Thin Films; Hydrodynamic Stability Theory

K B V N Phanindra
Civil Engineering
Research Areas: Groundwater Modeling; Soil-Water-Plant Interactions; Remote Sensing & GIS, Eco-Hydrological Processes

Kaushik Nayak
Electrical Engineering
Research Areas: Electronic Devices Physics; Mesoscopic Electronics

Kishalay Mitra
Chemical Engineering
Research Areas: Machine Learning; Artificial Intelligence; Optimal Control; System Identification; Uncertainty Modeling; Supply Chain; Systems Biology; Wind and Solar Farm Design

Melepurath Deepa
Chemistry
Research Areas: Applied Electrochemistry

Faculty

Niranjan Shrinivas Ghaisas
Mechanical & Aerospace Engineering
Research Areas: Wind Energy, Turbulent Flow Simulations, Computational Mechanics

Pritha Chatterjee
Civil Engineering
Research Areas: Waste Treatment; Resource Recovery from Waste; Bioenergy; Bioelectrochemical Systems; Anaerobic Digestion

Raja Banerjee
Mechanical & Aerospace Engineering
Research Areas: Computational Fluid Mechanics with Emphasis on Multiphase Flow; High Fidelity Solver Development on Accelerators Like Gpu; Experimental and Numerical Study of Interfacial Flows Like Primary Jet Breakup, Sloshing of Liquid In Partially Filled Tanks; Spray And Atomization of Liquid Fuel And Turbulent Non-Premixed Combustion; Nucleate Boiling Using Two-Phase Lattice Boltzmann Method

Raavi Sai Santosh Kumar
Physics
Research Areas: Optics and Spectroscopy of Energy Conversion Materials

Sathya Peri
Computer Science & Engineering
Research Areas: Parallel & Distributed Systems

Sayak Banerjee
Mechanical & Aerospace Engineering
Research Areas: Experimental and Numerical Combustion Kinetics; Kinetic Model Reduction; Bio-fuel Combustion and Emission; Combustion Diagnostics

Shantanu Desai
Physics
Research Areas: Galaxy Clusters and Cosmology; Pulsars; Astrostatistics and Data Mining; Gravitational Wave Searches

Shashidhar
Civil Engineering
Research Areas: Bioremediation; Contaminant Hydrology; Hydraulic Transients; Hydroclimate; Hazardous Waste Management; Wastewater treatment; Remote sensing and GIS applications

Shiva Ji
Design
Research Areas: Design for Sustainability; Sustainability Assessment Methods; LCA; Environmental Planning and Design; Virtual Reality Applications in Architecture

Ch. Subrahmanyam
Chemistry
Research Areas: Catalysis; Nanomaterials and Energy Systems

Sumohana Channappayya
Electrical Engineering
Research Areas: Image and Video Quality Assessment; Biomedical Image Processing; Machine Learning

Vineeth N Balasubramanian
Computer Science & Engineering
Research Areas: Machine Learning; Deep Learning; Computer Vision

Engineering
Science
Virtual Department

A unique program designed to cater to the upcoming demand of the industry and research, training the best of students to have a strong foundation in every field along with a specialization in their topic of interest.

Faculty

Ranjith Ramadurai
HoD
Materials Science & Metallurgical Engineering
Research Areas: Multifunctional Thin Films;
Piezoresponse Force Microscopy;
Hybrid Piezoelectrics;
Piezoelectric Sensors and Actuators

Abhinav Kumar
Electrical Engineering
Research Areas: AI in Wireless Communications;
Green Cellular Networks; Device to Device
Communications

Siva Rama Krishna
Electrical Engineering
Research Areas: Biosensors;
Electrochemistry; MEMS; 3D-IC

Syed Nizamuddin Khaderi
Mechanical & Aerospace Engineering
Research Areas: Solid Mechanics;
Impact Mechanics; Fluid-Structure
Interaction; Lattice Materials;
Metal Foams

Badarinath Karri
Mechanical & Aerospace Engineering
Research Areas: Experimental Fluid
Mechanics; High-Speed Imaging; Cavitation;
Bubble Dynamics

Tanmoy Pal
Mathematics
Research Areas: Functional Analysis

CREATIVITY IS THINKING UP NEW THINGS. INNOVATION IS DOING NEW THINGS."
– Theodore Levitt

Faculty

Digvijay S. Pawar
Civil Engineering
Research Areas: Driver and Pedestrian Behavioral Modeling; Traffic Safety and Accident Analysis; Traffic Operation and Simulation; Intelligent Transportation Systems; Statistical Modelling and Classification Technique; Naturalistic Driving Study And Human Factors

B. Munwar Basha
Civil Engineering
Research Areas: Unsaturated Soil Mechanics; Reliability Based Design; Geotechnical & Geoenvironmental Engineering; Unsaturated Soil Mechanics; Computational Geomechanics; Municipal Solid Waste Landfills; Soil Dynamics and Earthquake Resistant Design; Retaining Structures; Reliability Analysis of Pavement Geotechnics; Rock Mechanics

N.R. Aravind
Computer Science & Engineering
Research Areas: Algorithms; Parameterized Complexity; Graph Theory; Combinatorics

Ramakrishna Upadrasta
Computer Science & Engineering
Research Areas: Compilers; Program Analysis; Optimization; Polyhedral Compilation; Programming Languages and Domain Specific Languages

Devarai Santhosh Kumar
Chemical Engineering
Research Areas: Solid State Fermentation; Submerged Fermentation; Lipase; Biodiesel; Edible Mushroom; Statistical Design of Experiments; Microbial Enzyme Production; Hybrid Biosensor

K.P. Prabheesh
Liberal Arts
Research Areas: Macroeconomics; International Finance and Applied Econometrics

Sandeep K Singh
Biotechnology
Research Areas: Cell and Molecular Neuroscience; Neuron-Glia Interactions; Cell Biology of Glioma

Surendra K. Martha
Chemistry
Research Areas: Materials Electrochemistry with Special Emphasis on Lead-acid, Li-ion, Sodium ion Batteries and Supercapacitors

Chandrasekhar Murapaka
Materials Science & Metallurgical Engineering
Research Areas: Nanomagnetic Materials; Spintronic Based Memory and Logic Devices

• Elan, nvision & Alumni Day

The annual techno-cultural fest of IIT Hyderabad was back yet again with its 11th edition. With an aim to bring the celebration of culture and technology to the youth, ELAN & nvision offers a host of exciting competitions to test one's skills, informal events and proshows to make your weekend unforgettable.

IITH's BOG Chairman, Dr B V R Mohan Reddy has also inaugurated the first issue of "ेRIITH – The Crowning Glory" – Quarterly e-magazine of IITH" during the 11th Edition of Elan & nvision on 16th February, 2020.

IIT Hyderabad celebrated its **Alumni Day** on 5th Jan 2020. It marked the occasion by announcing the first set of Alumni Awards presented to five who had excelled in various fields. Alumni Association plans to launch a website to highlight success stories.

THE FUTURE BELONGS TO THOSE WHO BELIEVE IN THE BEAUTY OF THEIR DREAMS."
– Eleanor Roosevelt

Milan 2020

1st edition of Student Gymkhana's Milan (The General Championship 2020), has been successfully concluded @ IIT Hyderabad. This 10 days long inter-hostel celebration includes competitions ranging from Sports, Cultural and SciTech along with 2 Pronites. The objective was to promote cohesiveness among the students.

EDUCATION IS NOT PREPARATION FOR LIFE; EDUCATION IS LIFE ITSELF."
– John Dewey

• International Day of Yoga

Sports department & NSS Club of IIT Hyderabad has jointly organized 5th international day of yoga on 21 June 2019. Started with lighting of lamp following by a speech about yoga and its uses in practicing on a daily basis, followed by practicing of Yoga "Asanas" and meditation demonstrated by yoga experts. Later there was short speech followed by vote of thanks.

BE SO GOOD THEY CAN'T IGNORE YOU."
– Steve Martin

NSS Activities

UDAAN

One of the most innovative and efficient idea of NSS team under the guidance of NSS faculty in charge is UDDAN. It is a teaching center for underprivileged students include mostly the children of housekeeping staff and non-teaching staff of IITH. UDAAN is organized on every Sunday from 8am-12pm. UDAAN consists of 70-80 students. It is a great initiative which include general awareness, social awareness and career guidance. We selected a special team through a series of interviews for UDDAN. These students are responsible for scheduling every session and following the continuity of the classes.

During the academic year 2019-20, NSS IIT Hyderabad (NSS IITH) pro actively involved in many community development activities. A total of 200+ volunteers joined the movement in this year and participated in various activities organised by NSS IITH. Under the able leadership and guidance off the faculty in charge and associate in charge, NSS IITH pledged to devote the best efforts for betterment of society and nearby villages. Also, in the mission of serving others, NSS IITH aimed at supporting students of IITH to grow their personality by imbibing the thought of togetherness and helping fellow beings.

Along with main stream activities and initiatives of NSS IITH, many volunteers have supported institute level events like Independence Day, Republic Day, Foundation Day, orientation for fresh men. We adopted scanning ID cards for attendance to avoid plagiarism.

NSS IITH has around 200 registered students.

NSS IITH has been successfully doing its part to the society since the dawn. Here's a descriptive list of all the activities it has undertaken during the academic year 2019-20.

Vidhyadhaan

Vidhaydhaan works as a remedial session to clarify the doubts of the kids and ensure that the students learn the concepts through traditional and as well as a fun way of teaching. Students were also shown short videos of interesting topics. We covered five schools in total.

Plastic Waste Free Campaign & Swacchatha hi Seva

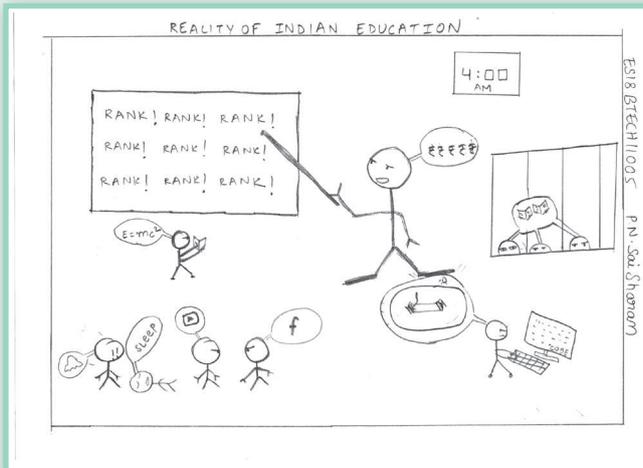> **WHAT THE COUNTRY NEEDS IS DIRTIER FINGERNAILS AND CLEANER MINDS."**
> – *Will Rogers*

• NSS Activities

Orphanage Visit

National Education Day

Fit India Movement

Clean India Drive

EML Series •

IITHyderabad students had a great interaction with **Mr R K Paliwal, Director General of Income Tax (Investigation)** at Gonglur Village in Telangana state, which he has adopted to make it a 'model village.' The Students interacted with residents of Gonglur village and learned about the local culture and traditions.

Mr Sudhakar Naik IRS briefed the students on various aspects of village life, such as working on SHG's agricultural practices, dairy, manufacturing arts, and crafts, among others. The main agenda of students' visits was how IITians can help in developing village communities.

In a fun-filled session, **Personality Development Trainer Dr B V Pattabhiram** interacted with IIT Hyderabad students during an Extra Mural Lecture (EML) and spoke about dealing with stress and simple tools to tackle it.

IIT Hyderabad was honored to host **Dr Y V Reddy, a Padma Vibhushan Awardee, a celebrated Economist, 21st Governor of the Reserve Bank of India and a Retired IAS Officer.** He had wonderful interactive session with students on diverse range of topics such as the interwoven relationship of economy and technical growth, Demonetization, the idea, the implementation and its repercussions, Technology, Innovations and Indian Economy.

• Ek Bharat Shrestha Bharat Campaign

Formation of EBSB Club: Fostering Country's Tradition and Culture

Lohri Celebration by EBSB: Bonfire, Music, Dance, Sweets and Smiles

Ek Bharat Shrestha Bharat Campaign

Sankranti Celebration: Kites, Games & Colours of Joy

మాతృభాషను చులకనగా చూడటమంటే కన్నతల్లిని అవమానించినట్టే.

Observed 'International Mother Language Day: Essay, Slogan and Antakshri Competition, elation of using one's Mother Language

• Inter-IIT Meet 2019

The Inter IIT Meet 2019 witnessed participants from 23 IITs across the country. The closing ceremony has seen some spectacular winning moments. IIT Hyderabad's young and vibrant team has participated in the three meets: Sports, Tech & Cultural and secured 6 medals. Here are a few Glimpses of IIT Hyderabad from Inter-IIT Meet 2019.

Inter IIT Sports Meet – Position – 15, No. of Medals – 2 (Bronzes)

Inter-IIT Meet 2019

Inter IIT Tech Meet – Position – 8, No. of Medals – 3 (Silvers) & 1 (Bronze)
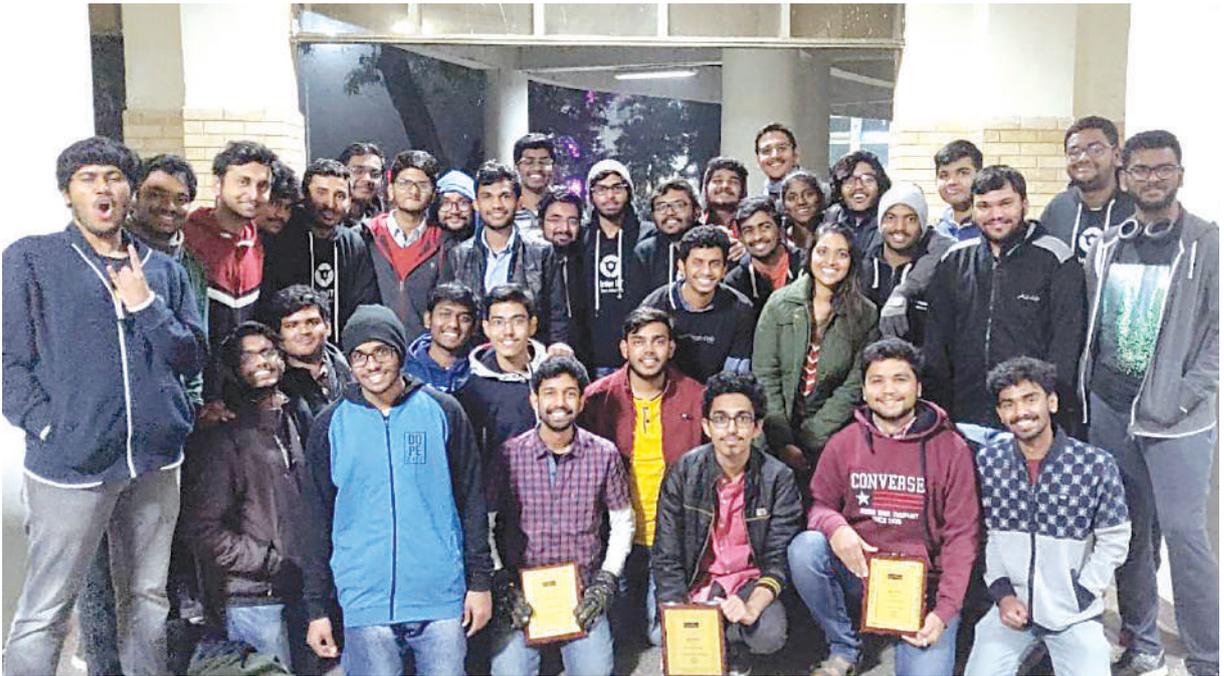
Inter IIT Cultural Meet : Position – 17

• What's New in 2019-2020

New Facilities were inaugurated at IITHyderabad for the benefit of Students, Faculty & Students. They include Sampoorna Supermarket, Badminton Court, Amul Parlor & a Speciality Medical Clinic with specialists like Cardiologists, Dermatologists, Psychiatry & Orthopedics.

An another step taken towards green campus is celebrating every 1st Saturday of the month as "Green Day of the month", mass plantation drive by the IITH residents.

New activity-based credit hours are being introduced like Juggling Workshop, Yoga and mental-physical wellness activities.

Additionally IITH has also hosted 5-day long student exchange program for IIIT Raichur's students (Mentee Institute to IITH) with the students of IIIT Sonepat.


APOLLO SPECIALTY CLINICS — Apollo HOSPITALS

GENERAL MEDICINE — Dr Samyuktha Reddy, MD (General Medicine) — WED & FRIDAY 10 am to 2 pm

DERMATOLOGY — Dr Radha Shah, MD (Dermatology) — WEDNESDAY 10 am to 2 pm

CARDIOLOGY — Dr Ranga Reddy, MD, DM (Cardiology) — WEDNESDAY 2 pm to 6 pm

PSYCHIATRY — Dr Krishna Sahithi, MD (Psychiatry) — WEDNESDAY 2 pm to 6 pm

GYNAECOLOGY — Dr Sindhu, DNB (OBG) — FRIDAY 2 pm to 6 pm

PEDIATRICS — Dr Sreedhar, MD (Pediatrics) — FRIDAY 2 pm to 6 pm

ENT — Dr Sreeram, MS (ENT) — SATURDAY 10 am to 2 pm

ORTHOPAEDICS — Dr Rajasekhar, D-Ortho, DNB-Ortho — SATURDAY 10 am to 2 pm

Laser Lab –
Department of Biotechnology
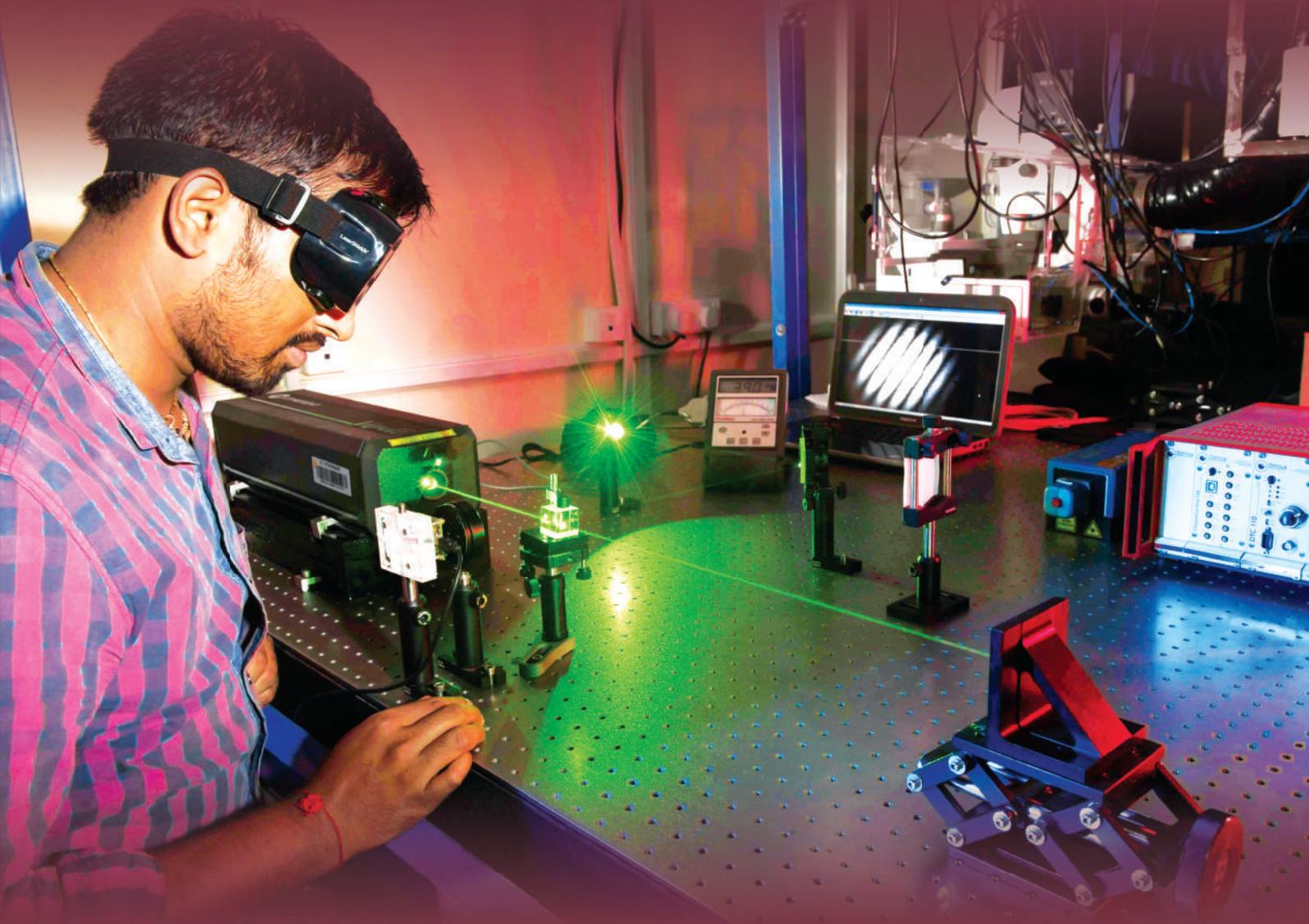
Photograph Courtesy: Dr. Neeraj Kumar, Assistant Professor, Dept. of Mathematics