



Dear Friends,

Greetings from IIT Bombay!

Hope you are healthy and safe.

It has been an extremely eventful November for us here at IIT Bombay. With a heavy heart, we mourn the demise of Prof. A. K. De, former Director IIT Bombay and professor in Mechanical Engineering Department of the Institute. Prof. De passed away peacefully on Oct 30, 2020. He was 95 years old. The Institute's faculty, staff and students condole the demise of Prof. A. K. De with deep sorrow. A condolence meeting was held on November 2, where his colleagues, students, family members and friends shared wonderful memories of Prof. De. Our former Director, Prof. S.P. Sukhatme paid homage to the departed soul by taking us through Prof. De's life story and highlighting Prof. De's contributions in developing IIT Bombay. We present to you Prof. De's life journey in the article titled 'Prof. A. K. De – IIT Bombay's Iron-man!' in this newsletter.

On another note, we finally welcomed the first-year UG students to the IIT Bombay family, with a flurry of online orientations for the students and parents alike. We wish them all a prosperous and successful journey ahead. The atmosphere for the on-roll students has turned quite sombre, with everyone studying vigorously for their end-semester exams. These exams were brought forward for convenience of the final year students, who will be sitting for placements from the first week of December.

This being an online semester, there is bound to be concerns on the usage of unfair means in examinations, however, we are taking all possible measures to avoid the same. IITB has signed an agreement with an online proctoring service, CodeTantra, for exam proctoring, a fully web-based service that runs on all platform- and will make the conduct of exams easier for both students and faculty/proctors, and increase the integrity of the exams.

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News from IIT Bombay



Prof. A. K. De – IIT Bombay's Iron-man!

Prof. A. K. De, a former professor in the Department of Mechanical Engineering and the Director of the Institute from 1974 to 1984, passed away on Oct 30, 2020. He was 95 years old. He was diagnosed with Covid, from which he recovered but succumbed to some secondary complications. The Institute's faculty, staff and students deeply mourn the demise of Prof. De.

A condolence meeting was held on Monday, November 2, 2020 through Webex. The meeting was attended by the Director, Prof. Subhasis Chaudhuri, former director, Prof. S. P. Sukhatme, family members of Prof. De and many faculty members, staff and students of IIT Bombay.

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Project Bandhu

Project Bandhu was initiated by alumni of the Class of 1992, as a part of their silver jubilee reunion in 2017. They pledged to support IIT Bombay, and help students to enhance their emotional well-being. Based on a study of the practices at other leading international universities, there are a number of initiatives under this project which aim to improve help seeking behaviour, identify those in need of care, build resilience and life skills in students.

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Faculty Research at IIT Bombay

Exploring Planetary Sciences using Organic Geochemistry to study life outside the Earth

Prof. Suryendu Dutta, Department of Earth Sciences is one of the recipients of this year's Shanti Swarup Bhatnagar prize. We are truly honored to interview him for our newsletter and present his research work to the alumni community.

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Student Research activities at IIT Bombay

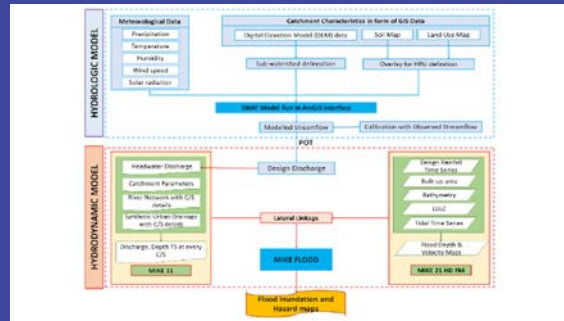


Degradation relations for the tensile properties of corroded reinforcement bar

Name: Raghava Kumar Vanama |
Guide: Prof. Balaji Ramakrishnan |
Department: Civil Engineering (Ph.D.)

According to a study, 50% of the reinforced concrete (RC) structures are experiencing premature failures and requires repair even before ten years from their construction. Repairing/strengthening these corrosion damaged RC structures requires the information on the extent of damage and its effect on their load-carrying capacity. A part of the present study evaluates the tensile properties of the corroded rebar that are corroded up to 79.64% mass loss of three different grades subjected to natural carbonation and simulated chloride attack. Tensile tests were conducted on 38 corroded steel round rebars of 12.7mm nominal diameter obtained from a 54-year-old inland concrete corridor structure, exposed to natural carbonation and on 15 ribbed bare rebars of 16mm nominal diameter subjected to chloride attack through an impressed current method.

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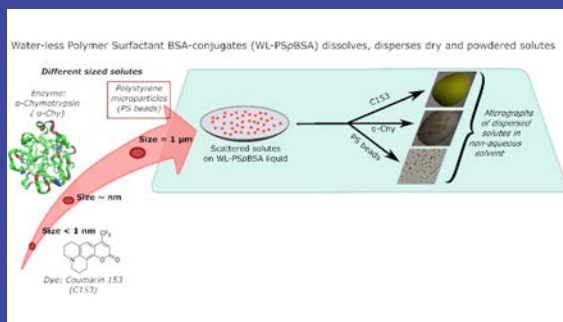


Near-Real-Time flood forecasting for an urban coastal catchment

Name: Mousumi Ghosh | **Guide:** Prof. Subhankar Karmakar & Prof. Subimal Ghosh |
Department: Climate Studies (Ph.D.)

The rapid escalation of various forms of natural disasters like floods, droughts, wildfires, heatwaves are testimonial to the fact the climate change is for real. Floods account for the most widespread, disastrous, frequent and recurring natural disaster in context of the Indian subcontinent. The conventional implementation of structural measures such as the development of flood storage structures, reservoirs, etc. often becomes difficult in urban areas owing to space constraints and rapidly thriving populations. Therefore, it has become desirable to solve these flood damage-related problems through optimal planning and integration of non-structural measures along with the structural ones. With this context, we propose a comprehensive hydrodynamic flood modelling framework in order to lessen the extent and impact of flooding due to extreme rainfall event.

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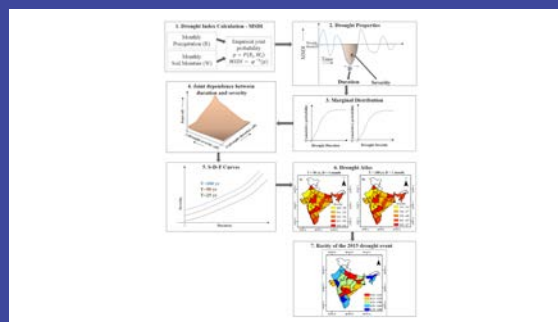


A neat non-aqueous universal solvent: Developed using Protein Polymer Surfactant Bio-conjugation

Name: Anasua Mukhopadhyay |
Guide: Prof. Kamendra P. Sharma |
Department: Chemistry (Ph.D.)

Extensive use of petrochemical solvents in both chemical and pharmaceutical industries in large scales for product manufacturing is causing severe adverse implication on our environment. Demand for 'Green / Bio-solvents' particularly becomes apparent after the Montreal Protocol outlined environmental hazards of using toxic, volatile petrochemical based solvents and the need for green solvents for industrial production. Through our research we aim to develop a universal solvent which can be effective for dissolving different surface chemistry solutes along with the retention of their functions.

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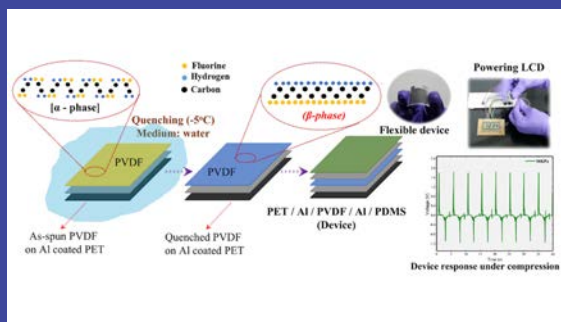


A country-wide drought atlas for India using an integrated, multivariate approach

Name: Sahana V. | **Guide:** Prof. Arpita Mondal | **Department:** Civil Engineering (Ph.D.)

In India, many regions frequently experience drought conditions. Our country's economy is mainly dependent on agriculture. Therefore efficient agricultural drought monitoring is very important. An efficient characterization of agricultural drought condition is possible when both precipitation & soil moisture deficiencies are considered. Therefore we used a multivariate drought indicator called Multivariate Standardized Drought Index (MSDI) to analyse the historical drought conditions caused by simultaneous deficits in precipitation & soil moisture for 30 meteorological sub-divisions in India.

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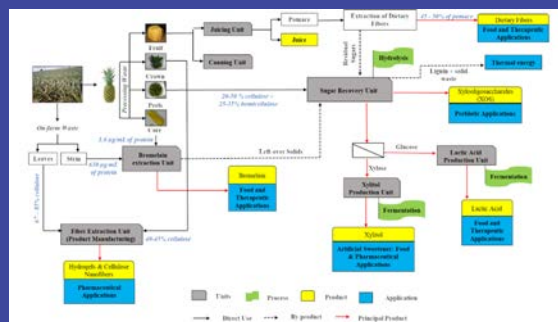


In-situ polarized ultra-thin PVDF film based flexible piezoelectric nanogenerators

Name: Vaibhav Khurana | **Guide:** Prof. Dipti Gupta | **Department:** Metallurgical Engineering & Material Science (Ph.D.)

The self-powered devices (SPDs) have been investigated, over the years, to reduce the dependency of various electronic devices ranging from smart sensors to thin-film transistors. The prefix 'self-powered' conveys that the devices do not need an external power supply, thus reduces the complexity of the device architecture added with reduced consumption of input energy. Notably, the devices based minimum energy input can be effectively integrated with self-powering sub-systems so to make the entire system to run at minimum energy expenditure. Our study step in towards self-powered systems by formulating an easy way to develop an efficient energy harvesting device which can be further used in powering applications.

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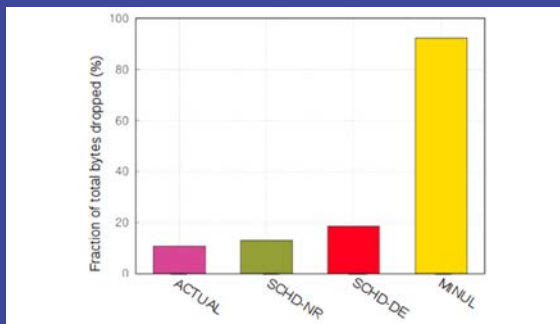


From waste to wealth: Production of bio-based chemicals from pineapple processing wastes

Name: Shivali Banerjee | **Guide:** Prof. Amit Arora (IITB); Prof. Antonio Patti & Dr. R Vijayaraghavan (Monash University) | **Department:** CTARA (Ph.D.)

Pineapple is one of the most popular tropical fruits consumed worldwide, and its global production was estimated to be 28.3 million metric tons in 2018-2019. The fruit is widely processed as canned juice/slices and generates a large quantum of waste (45-60% of the whole weight of fruit) in the form of crown, core, peels and pomace. The disposal of this organic waste requires a large capital investment; transportation costs being the major contributor. My research aims at the valorisation of pineapple processing waste with an integrated biorefinery approach to achieve zero solid wastes. In my research, the peel waste is utilised as an unexplored source of hemicellulose as a value-added product.

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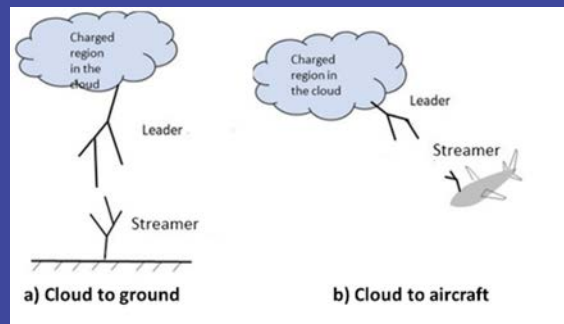


Throughput Optimization and Delay Sensitive Scheduling in Next Generation WiFi

Name: Muhammad Inamullah |
Guide: Prof. Bhaskaran Raman |
Department: CSE (Ph.D.)

Wireless LAN (WLAN or, more popularly, WiFi) is the de facto technology nowadays for wireless internet access in places ranging from homes to large industrial complexes. In spite of its success in consumer internet access, we still cannot use WiFi in such time-critical applications as industrial control and for remote control of vehicles and drones that need time bound packet delivery, because we cannot guarantee such deadlines due to contention based channel access. The novelty of our work lies in enabling the Access Points (APs) estimate the deadlines with the mere knowledge of the queue size that each associated Stations (STAs) reports to the AP.

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Lightning strike damage of fiber-reinforced polymers

Name: Dhanya T M | **Guide:** Prof. Chandra Sekher Yerramalli | **Department:** Aerospace Engineering (Ph.D.)

The electrically charged cumulonimbus thunderclouds are considered as the primary source of lightning. The clouds typically have positive charges accumulated at its top and negative charges collected at its bottom. At some stage in the electrification of the cloud, a collection of negative charges called "step leader" move towards the ground. Meanwhile, the positive charges accumulated at the ground underneath called "streamer" would advance towards the "step leader." Once they meet, conductive path forms, and electricity flow happens from the "step leader" to the "streamer." This is called "cloud to ground lightning."

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