Dear Primary Addressee,

Greetings from IIT Bombay!

Hope you are faring well during these testing times.

Adeptly maneuvering through the hurdles of online proctoring, the Institute successfully conducted the mid semester examinations for undergraduate students during the first week of October. With the clearly laid out instructions released by the Institute for smoothly conducting exams in the online mode, complemented by ample support from the faculty members, teaching assistants, and students, the Institute managed to efficiently conduct the mid semester exams in remote proctoring format.

Labs have restarted, and senior Ph.D. students have been allowed to return, along with students staying in remote areas with poor net/power connectivity, etc. Currently, around 550 students are residing on campus, plus around 100 students who reside in Mumbai and commute to labs on campus.

On a slightly gloomier note, our campus has had a significant number of people contracting Covid. For the last couple of months, there have been almost 2 cases per day. The increased number of cases may be partly because of increased testing and partly reflecting an increase in Mumbai following the relaxation of lockdown measures. The total cases on campus have crossed 100. However, while we had some serious cases on campus early in the pandemic, in recent times most cases have been mild, and people have recovered relatively quickly. A few of the students have contracted Covid with mild or no symptoms but thankfully, no student has been severely affected. The dedicated facility created by the IIT Bombay hospital for Covid patients has been invaluable to those who needed it. Some hostel wings have also been identified to house students who test positive but are asymptomatic. The role of the hospital has been greatly appreciated by students as well as staff and faculty. With an efficient task force toiling consistently to ensure the safety of campus inmates, we hope to “flatten the curve” of Covid cases in the Institute.

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**News from IIT Bombay**

**Silver Jubilee Batch Initiatives - Travel Grants for UG students (by Class of 92’)**

The Class of 92’ wanted to encourage UG students to pursue quality research projects and give them the experience of going overseas and presenting their work in reputed conferences. The travel funds have often been a constraint in attending such events, as much of the Institute funds get consumed in supporting increase in the number of Ph. D. students undertaking advanced research. This is what led to an idea of establishing the Travel Grants fund for UG students.
There is no ideal student – professor relationship. Being sincere helps.

Prof. U. K. Anandavardhanan, Department of Mathematics is one of the recipients of the prestigious Shanti Swarup Bhatnagar Prize for the year 2020. IIT Bombay is extremely proud of his achievements.

We are truly honored to interview him for our newsletter and present his research work to the alumni community.

Student Research activities at IIT Bombay

Processing Xylan Rich Residue to Produce Prebiotic - Xylooligosaccharides

**Name:** Ramkrishna Singh  |  **Guide:** Prof. Amit Arora  |  **Department:** CTARA (Ph.D.)

The human gastrointestinal tract hosts an army of billions in the form of microbes in the gut. These "good bacteria" uses undigested protein, non-digestible carbohydrates, and other undigested fraction of food reaching the distal part of the gut as an energy source. Non-digestible carbohydrates such as xylooligosaccharides, termed as prebiotics, can be as an energy source by gut bacteria. In this work, underutilized sources such as arecanut husk and almond shell were used for their potential valorization into prebiotic xylooligosaccharides.
Continuous Flow Chemistry and Chemical manufacturing: A Contemporary Solution for a Conventional Problem

Name: Karuna Veeramani | Guide: Prof. Anil Kumar (Chemistry) & Prof. Neil Cameron (Department of Materials Science and Engineering, Monash University, Australia) | Department: Chemistry (Ph.D.)

Right from polymers that build our cell phone cover, cotton that helps weave our garments, aromatic substances that constitute our cosmetics, to pharmaceutical molecules that form our cholesterol tablets; chemistry forms an indispensable part of our lives. The broad aim of our research is to enable the very balance that has intrigued industrial manufacturing for centuries – achieving both speed and control, and thus make it safer, faster and efficient.

Inverse-Voltage Controlled Magnetic Anisotropy effect: a new phenomenon for generation of charge current from oscillating magnetization

Name: Ambika Shukla | Guide: Prof Ashwin Tulapurkar | Department: Electrical Engineering (Ph.D.)

When we think beyond Moore's law we find Spintronic technology is the most promising one and have potential to dominate entire consumer electronics market. Contemporary CMOS devices works on electron charge whereas spintronic devices exploit quantum mechanical property of electrons called spin. This technology helps in getting devices faster and consume ultra-low power. In this new study we have shown generation of charge current from oscillating magnetization.
The total annual cost of corrosion in India was estimated to be INR 4.27 lakh crore (70.3USD billion) for the year 2011-12 which is nearly 4.21% of country’s total Gross Domestic Product (GDP) for that year. Cost of corrosion (CoC) is significant, and strategies for corrosion mitigation and its study is necessary to reduce the cost. The developed system has tremendous potential to be commercialised.

Unusual size effects in Barium Titanate and their implications for improved damage tolerance

Our research deals with multi-ferroic materials that exhibit piezoelectric and ferroelectric properties and are hence used in various micro-electro-mechanical devices as actuators and sensors. The project looks at lead free functional oxide Barium Titanate (BaTiO3) in the form of single crystal and thin film, in terms of their size and interface effects on their mechanical behaviour and resistance to fracture.
Energy efficient manufacturing of piston by sheet metal forming process

Name: Kanhu Charan Nayak | Guide: Prof. P. P. Date | Department: Mechanical Engineering (Ph.D.)

The light-weighting of automotive parts, especially engine components, is challenging in recent times. Design modification, implementation of new manufacturing techniques and advanced material design are the different approaches for weight reduction of automotive engine components. Therefore, the novelty in this study is about the innovative use of conventional manufacturing processes. The product is manufactured using a conventional press and tooling.

More Crop per Drop!

Name: Rahul Raj | Guide: Prof. J. Adinarayana (IITB) & Prof. Jeffrey Walker (Monash University) | Department: CSRE (Ph.D.)

Agriculture has been an essential factor of the Indian GDP as well as employment. While India marks the pinnacle globally in the production of pulses, rice, wheat, spices and spice products, ironically Indian agriculture’s operational efficiency has not been able to mark an international stand. In this research, a model has been developed for identification of crop water and nitrogen stress, using UAV based high-resolution RGB, and hyperspectral reflectance data in the VIS and NIR regions.