सन्धि/SANDHI

Newsletter of the Department of Mechanical Engineering, IIT Kanpur, Vol.2, No.1, 2025

Visit

We were pleased to welcome our distinguished alumnus, Dr. Rajiv Desai (BT/ME/82), founder and CEO of 3Di Inc. and Kahuna Systems, to our department.

Dr. Desai meeting with the SVAN team.

The department sincerely thanks Dr. Desai for his valuable advice and guidance, which had a lasting impact, and for taking the time to visit his alma mater. We look forward to his next visit.

Student achievement

Dr. Digendranath Swain (PhD/ME/2018), an alumnus has been honored with the prestigious Rashtriya Vigyan Puraskar - Vigyan Yuva (Shanti Swarup Bhatnagar) Award for 2024 in the field of Space Science and Technology.

He has developed and employed specialized experimental and optical tools that are non-invasive, have conducted on-ground qualification and acceptance tests for various structures in launch vehicles (LV). He has contributed significantly to structural qualification of LVM3, SSLV, TV-D1, RLV-TD, PSLV, and GSLV missions.

Dr. Swain is currently working as scientist at Vikram Sarabhai Space Centre structural engineering entity, ISRO. He works in experimental solid mechanics and structural integrity of rocket components.

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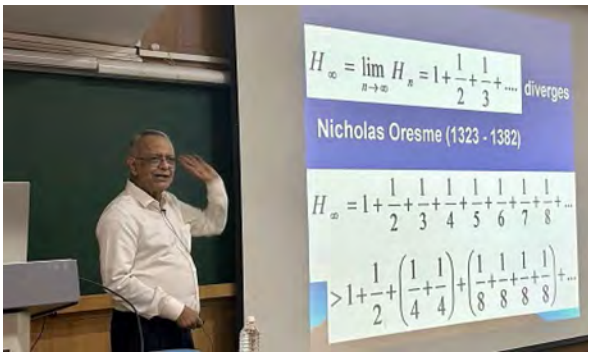
A talk and a walk down memory lane

Prof. Ashok Kumar Mallik, a distinguished former faculty member of the department, delivered a thought-provoking talk titled *"Curious Consequences of Simple Sequences"* on August 8, 2024.



AKM rolled back the years and captivated the audience with an engaging exploration of the intriguing properties and real world applications derived from fundamental mathematical sequences such as the Sîndel sequence, Farey sequence, and Fibonacci-Hemchandra sequence.

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New technology and products

Svan M2 quadruped robot (TRL 6)

Prof.Shakti S Gupta and team have developed a quadruped robot named 'Svan,' which is poised to become India's first industrial quadruped robot.

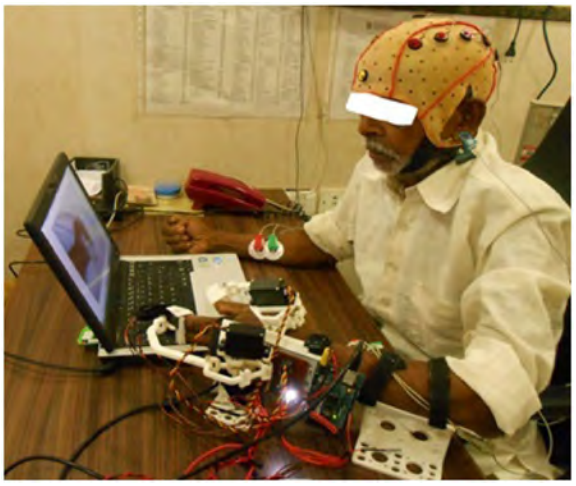
Svan M2 is a four-legged robot. This robot has 3 degrees-of-freedom in each leg that are electronically controlled by an onboard computer. The robot is lightweight, sturdy, and has superior mobility in non-flat terrain. Mounted with sensors, it executes automated inspection and surveillance in industries, assisting in preventive maintenance.

Associated Startup : xTerra Robotics

See the robot

BCI based robotic hand exoskeleton for stroke patients (TRL 7)

Prof. Ashish Dutta and his team have developed the first Brain Computer Interface (BCI) based robotic hand exoskeleton for neurorehabilitation of stroke patients.

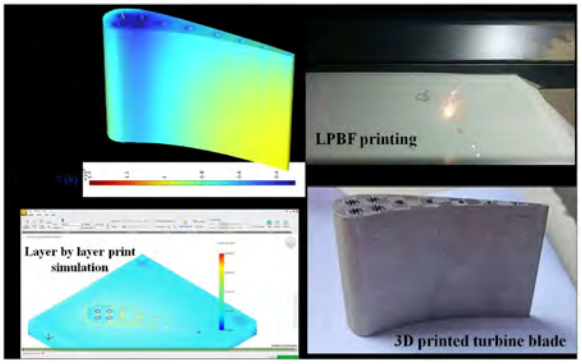


The device uses BCI to engage the brain during therapy and a robotic hand exoskeleton that provides physical exercise. Pilot trails reported 100 % recovery for stroke patients in India and the UK.

See more

3D printed turbine blade (TRL 4)

Prof. Arvind Kumar and his team have successfully developed a 3D printed turbine blade featuring novel conformal cooling channels.



Turbine technology has evolved to operate at higher temperatures to maximize efficiency, which in turn places significant mechanical and thermal stresses on turbine blades. Improved cooling is needed to mitigate these stresses.

Conformal cooling channels in the blade can significantly improve the cooling effectiveness. However, manufacturing such blade is challenging by conventional manufacturing. They have successfully printed a turbine blade having novel conformal cooling channels that showed improved blade thermal performance. Metal 3D printing process based on Laser Powder Bed Fusion (LPBF) has been developed in order to manufacture blade with minimum defects of porosity, residual stress and distortion.

Methanol powered motorcycles (TRL 6)

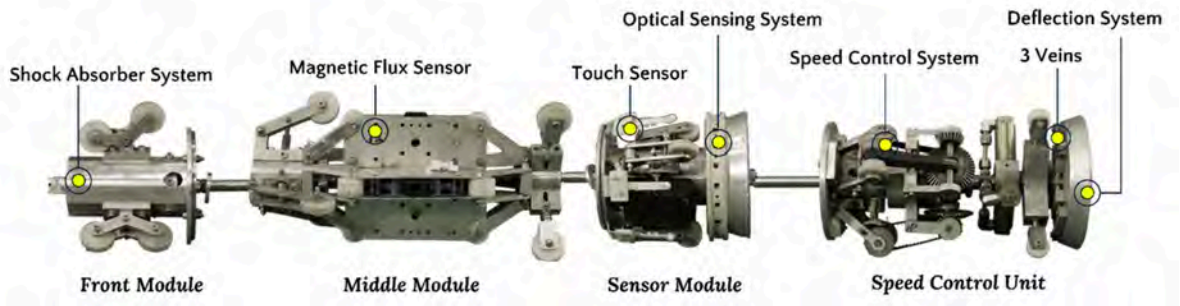
Prof. Avinash Kumar Agarwal and his team have developed innovative "M15" and "M85" motorcycles utilizing methanol-petrol blends that set a new benchmark in eco-friendly solutions for the automotive sector.

The revolutionary “M15” and “M85” motorcycles are engineered for performance and sustainability. The “M15” uses a fuel blend of 15% methanol and 85% petrol, offering enhanced efficiency and affordability, while the “M85” runs on 85% methanol and 15% petrol, making it a greener choice. Methanol, derived from waste, is an eco-friendly fuel that significantly reduces carbon emissions. These environmentally conscious and cost-effective motorcycles provide a pocket-friendly alternative for Indian riders.

See video

Inspection robots (TRL 5)

Prof. Bisakh Bhattacharya and his team have developed two pioneering autonomous robots: the Pipe Inspection Robot (PIR) and the Substation Inspection Robot (SIR).



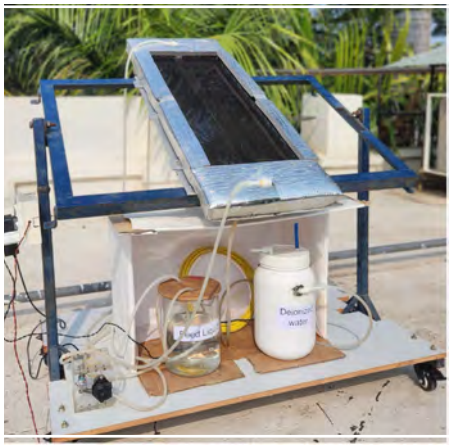
PIR enables autonomous, industry-wide pipeline inspections for seamless maintenance and reduced downtime. PIR navigates complex bends, detects defects with AI-powered sensors, and enables real-time wireless tracking for unmatched pipeline safety and efficiency. SIR has been developed for POWERGRID, a versatile platform that autonomously inspects power substation yards for efficient preventive maintenance of critical equipment.

Associated Startup: Yantror Private Limited

See video

Desalination system (TRL 6)

Prof. Jishnu Bhattacharya and his team have designed a Nanophotonics-Enabled Solar Membrane Desalination (NESMD) prototype for efficient freshwater production and commercial viability.



The NESMD prototype, designed with a set of best suited dimensions to maximize distillate flux, produces 3.4 L/day of freshwater from 35 g/L salinity, with 99.5% salt rejection.

The team has also developed an innovative automated IoT based closed loop heliostat for applications in concentrated solar power systems.

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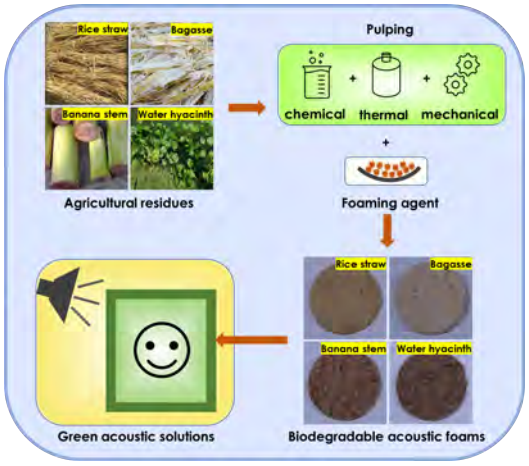
Biodegradable acoustic foams (TRL 4)

Prof. C Chandraprakash and team have developed biodegradable acoustic foams that are sound absorbing, biodegradable, free of carcinogens, and fabricated chemi-thermo-mechanically using green methods.



Noise pollution is known to affect the health of all living beings including humans. Existing sound absorbers in automobiles, houses, and workspaces are made of petroleum products that are neither recyclable nor biodegradable. The team have developed biodegradable foams from residues of agriculture, measured their acoustic performance, and found them to be on-par with industrially available non-biodegradable sound absorbers.

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New faculty

Dr.Tushar Sikroria (PhD U. Melbourne) joined the department of Mechanical Engineering in January 2024.

His research is in the areas of turbulent compressible flows, multiphase flows, turbomachinery and experimental techniques, with the vision of aiding technology development in energy systems and sustainable engineering. Outside of his professional work, he enjoys playing lawn tennis, long-distance running, group fitness activities, and has an interest in photography and music.

Dr. Siddhartha Mukherjee (PhD TU Delft) joined the department in September 2024.

His primary research focuses on the mechanics of living matter, turbulent flows, complex fluids, atmospheric processes, chaos, and data analysis. He also has a passion for scripting, coding, and scientific visualization. Outside of his academic work, he is also a visual artist and photographer.

V K Jain Award

In recognition of the generous contribution by Dr. V.K. Jain who retired from the department of Mechanical Engineering in 2013, a new award has been established—the **V.K. Jain Award for Best M.Tech Thesis in Manufacturing**. This award will be presented during the Convocation, along with a cash prize of Rs. 20,000. By honoring exceptional work in the field, Dr. Jain's initiative seeks to inspire innovation and drive advancements in manufacturing technology.

Giving back

We invite you to reconnect and be part of our journey. Your support, whether through financial support, mentorship, or sharing your expertise, will make a real difference to the department. If you are interested or would like to learn more about how you can contribute, please reach out to us. We would love to have you involved and look forward to hearing from you. Please also check out our latest campaign at

https://iitk.ac.in/dora/givingback/department-of-mechanical-engineering.php

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