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Buoyancy Engineering for Sustainable Aviation

The Department of **Aerospace Engineering** organised a guest lecture titled **"Buoyancy Engineering for Sustainable Aviation"** delivered by Prof. Rajkumar S. Pant, Professor at IIT Bombay, on 25 August 2025.

The event began with an informal interview with Prof. Pant, in which he spoke about his academic journey and ongoing research. This was followed by a one-and-a-half-hour lecture on Lighter-Than-Air (LTA) systems, where he outlined the current state of the technology and encouraged students to take up projects on building aerostats and airships at the institute. The session concluded with an engaging Q&A, during which students raised thoughtful questions about the future scope of LTA systems and the technical challenges in implementing such technologies.

Objectives of the Event

- To introduce Buoyancy Engineering to students.
- To instil values of sustainable aviation.
- To motivate students to pursue academic projects and career paths in the research and development of Lighter-Than-Air systems.

Event Overview

Prof. Pant was introduced by Kavya (AS-V semester) and Deekshit (AE-V semester, A section). Prof. Mishra, faculty in the Aeronautical Engineering Department, MVJ College of Engineering, felicitated him on behalf of the Department of Aeronautical and Aerospace Engineering by presenting a book. Following this, Vaishnavi (AS-VII semester) and Pranav (AE-V semester, B section) conducted a half-hour interview with Prof. Pant. The discussion covered his academic and professional journey, career advice for aspiring aerospace engineers, and his experiences at IIT Bombay. The hosts then invited Professor to deliver his lecture on "Buoyancy Engineering for Sustainable Aviation".

Figure 1: Informal interview of Prof. Pant

Engaging directly with the audience, Prof. Pant elicited their perspectives on engineering, buoyancy, and sustainability. He emphasised the importance of clearly understanding these concepts and how they can shape the future of engineering.

To make the discussion more interactive, he posed thought-provoking questions to the students, encouraging them to connect classroom learning with real-world applications. He highlighted that buoyancy engineering not only offers innovative solutions for sustainable aviation but also contributes to addressing broader environmental challenges, such as reducing carbon emissions and promoting energy efficiency. By drawing from practical examples and ongoing research projects, he demonstrated how foundational principles, when applied creatively, can lead to impactful technological advances.

Figure 2: Q&A on LTA Systems

He showcased several projects in the design and development of aerostats and airships undertaken at the Lighter-Than-Air Systems Laboratory at IIT Bombay. He also recalled that over a decade ago, a group of students from MVJ College had joined the lab as interns and fabricated an aerostat named the MVJ College Outdoor Tethered Aerostat System (MOTAS), which they successfully demonstrated in 2012 using an iPhone camera as its payload. He encouraged students to draw inspiration from such initiatives and to take up academic projects in this field.

Prof. Pant then explained the fundamentals of LTA systems and buoyancy engineering, emphasising why LTA systems can serve as a sustainable alternative not only to aviation but also to other modes of transportation. The session concluded with an engaging question-and-answer segment, in which the students explored the technical and future prospects of the technology.

Outcomes and Impact

- Participants gained deeper insight into the Lighter-Than-Air Systems, Aerostatics and sustainable aviation, which is only partly covered in the curriculum.
- Students received guidance on career and R&D path in the field.
- Students were inspired by the speaker's journey and achievements in Aerospace Engineering, and were encouraged to pursue higher studies, research, and entrepreneurship.

Conclusions

The lecture systematically explored the role of Buoyancy Engineering in achieving sustainable air transport. Students gained valuable exposure to the niche field of LTA systems and were motivated to pursue higher studies and academic projects in related domains.

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