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CFD Add-on Course

The Department of Aerospace and Aeronautical Engineering organised a **CFD Add-on Course** on **25 August 2025**.

The department invited **Mr. Ramanjaneyulu Naidu**, Scientist–D at the **Centre for Airborne Systems (CABS)**, a DRDO laboratory in Bengaluru, as the resource person for the session. Mr Naidu is associated with the Aerodynamics Division, where his work involves conducting CFD and multi-physics analyses on surveillance aircraft and avionics components.

The add-on course, of two hours duration, covered topics ranging from the basics of aeronautical engineering and fundamentals of fluid dynamics to the core ideas of computational fluid dynamics (CFD). Special emphasis was given to **Module 4: Grid Generation** in the syllabus of the MVJ22AE72 and MVJ22AS72 courses. The lecture was attended by **36 students** from the 7th semester Aeronautical Engineering program and **31 students** from the 7th semester Aerospace Engineering program.

Objectives of the Event

- To expose students to the industrial practices and workflows involved in CFD-based aerodynamic design.
- To bridge the gap between classroom learning and practical applications of numerical simulation in aerospace systems.
- To introduce students to grid generation techniques used in CFD — including structured, unstructured, and hybrid meshes.
- To enhance conceptual understanding of discretisation, grid quality metrics, and their influence on solution accuracy.

Event Overview

The 7th-semester students of both Aeronautical and Aerospace Engineering study the course Computational Fluid Dynamics (CFD) as part of their curriculum. This add-on course was organised to supplement their academic learning and provide insight into real-world applications. The session covered the following syllabus topics:

- Infinitesimal to finite approximation
- Structured grids
- Unstructured grids
- Grid quality metrics
- CFD grid generation in industry

The lecture began with an introduction of the guest by **Prof. Shantanu Gulawani**, followed by a welcome address and presentation of a memento by **Prof. Krishna Anand**.

Mr Naidu started the session by introducing CABS, its objectives, and its role in DRDO's ecosystem. He discussed the laboratory's focus on the design, integration, and testing of airborne electronic systems for military applications.

Figure 1: Prof. Krishna Anand felicitating Mr Naidu

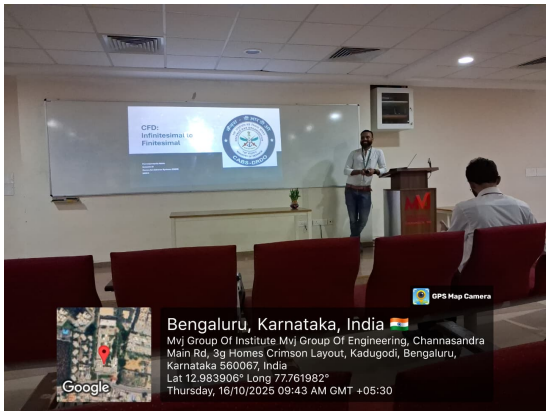
He then gave a brief overview of the principles of flight, lift generation, and the significance of CFD in predicting aerodynamic behaviour. He emphasised how CFD enables engineers to visualise invisible flow fields, and how the governing equations of

Day	Time	Session Details
Thursday, October 16 2025	9:20 - 9:30 am	Welcome Address by Shantanu Gulawani
	9:30 - 11:00 am	Add-on Lecture by Mr. Naidu
	11:00 - 11:30	Q&A with feedback by students

Table 1: Schedule of the Event

fluid dynamics are transformed into solvable algebraic forms using numerical techniques. He even referred to popular Hollywood movies featuring aerodynamics and CFD visuals, inspiring students to appreciate fluid dynamics as it appears in everyday media.

In the technical segment, Mr Naidu elaborated on **grid generation techniques**, explaining how computational domains are discretised into finite elements or control volumes. He discussed the distinction between structured and unstructured grids, along with their respective advantages in industrial CFD workflows. The importance of grid quality — including skewness, orthogonality, and aspect ratio — was highlighted as key to ensuring numerical accuracy and solution stability. Real-world examples of mesh generation around aircraft geometries and complex avionics components were also demonstrated.



(a) Mr. Naidu introducing Grid Generation

(b) Interactive Q&A with the students

Figure 2: CFD Add-on course

The session concluded with an interactive Q&A segment, during which students asked questions about CFD software tools, meshing strategies, and the practical

challenges faced in industrial simulations.

At the end of the lecture, students **Pranav P. D. (USN 1MJ22AS022, 7th AS)** and **Trisha R. (1MJ22AE056, 7th AE)** summarised their key takeaways and delivered a vote of thanks to Mr Naidu on behalf of the audience.

Key Outcomes

- Students gained a practical understanding of how CFD is applied in aerospace research and product development.
- The session reinforced theoretical concepts from their coursework through examples from defence and surveillance aircraft projects.
- Participants developed clarity on the significance of grid generation, grid quality metrics, and numerical stability in CFD simulations.
- The event strengthened students' motivation to explore careers and research in CFD, aerodynamics, and computational modelling.

Figure 3: Student giving feedback on the course

Conclusions

The CFD Add-on Course successfully connected theoretical learning with practical insights from industry. Mr. Ramanjaneyulu Naidu's lecture provided students with a comprehensive understanding of the role of CFD in modern aerospace design, emphasising the critical importance of grid generation and numerical accuracy. The session not only deepened students' conceptual foundation but also inspired them to pursue advanced studies and careers in computational aerodynamics and simulation-based engineering. Overall, the event proved to be an enriching academic experience that complemented the ongoing CFD coursework.

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