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## Guest Lecture on “Aircraft Propulsion Systems”

The Department of **Aeronautical and Aerospace Engineering** organised a **Guest Lecture** titled **Aircraft Propulsion Systems** to provide students with essential insights into the mechanisms that power modern aircraft. The session focused on the fundamentals of propulsion, including principles of thrust generation, performance characteristics of turbojet, turbofan, turboprop, and ramjet engines, as well as emerging technologies in sustainable aviation. Through detailed discussions on engine design, efficiency, and environmental considerations, students gained a deeper understanding of the critical role propulsion systems play in advancing aeronautical engineering and ensuring safe, efficient, and eco-friendly flight operations.

### Schedule of the Event

- **Date:** March 31, 2026
- **Time:** 10:00 AM – 13:00 PM
- **Venue** Seminar Hall 01, M V J College of Engineering
- **Organised by:** Department of Aeronautical and Aerospace Engineering
- **Speaker:** Dr. Aditya Kumar Mishra,  
Scientist F, Directorate of Propulsion, CEMILAC-DRDO

Dr. Aditya Kumar Mishra delivered an enlightening session by sharing his extensive expertise in aircraft propulsion and advanced aerospace applications. He began by highlighting the fundamental principles of thrust generation and the critical role propulsion systems play in modern aviation. He explained the performance characteristics of turbojet, turbofan, turboprop, and ramjet engines, while also addressing emerging technologies aimed at sustainable flight. His insights provided students with a deeper appreciation of how propulsion systems ensure efficiency, reliability, and innovation in aerospace engineering.

### Introduction:

Aircraft propulsion systems are the cornerstone of aviation, providing the thrust and

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Figure 1: The Guest Speaker was felicitated by Dr. Ganapathi Manickam

reliability required for safe and efficient flight. Modern gas turbine engines, which dominate both civil and military aviation, undergo rigorous airworthiness verification to ensure compliance with safety and performance standards. Key aspects include prognostics verification to predict and prevent failures, rotordynamics verification to guarantee stability of rotating assemblies, and structural vibration limits to protect against fatigue and resonance. Aerodynamic stability and combustion stability are equally critical, as they directly influence efficiency, emissions, and operational safety.

In addition, system Line Replaceable Unit (LRU) verification ensures modular components meet reliability and maintainability requirements. A transformative advancement in this domain is the integration of digital twin technology, which creates a virtual replica of propulsion systems to continuously simulate, monitor, and predict engine behavior under real operating conditions. By combining sensor data, computational models, and machine learning, digital twins enable engineers to validate airworthiness, optimise performance, and conduct predictive maintenance with unprecedented accuracy. This convergence of classical propulsion principles with advanced verification methods and digital innovation highlights the evolving role of propulsion systems in achieving safe, efficient, and sustainable aviation.

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Figure 2: Speaker delivering lecture on Aircraft Propulsion Systems

This is where Digital Twin Technology marks a revolutionary shift. A digital twin creates a high-fidelity virtual replica of an engine or propulsion component, enabling engineers to simulate performance, predict failures before they occur, optimise fuel efficiency, and support data-driven decision-making throughout an aircraft's life cycle. From gas turbine engines to hybrid electric propulsion systems, the integration of digital twins is shaping the future of design, monitoring, and sustainable aviation.

The session gave insights into the:

- Fundamentals and evolution of aircraft propulsion systems.
- Recent advancements in gas turbine, electric, and hybrid propulsion.
- Concept, architecture, and applications of digital twin models.

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- Details of how digital twins enable predictive maintenance, cost reduction, and improved engine reliability.
- Future trends transforming aerospace propulsion.

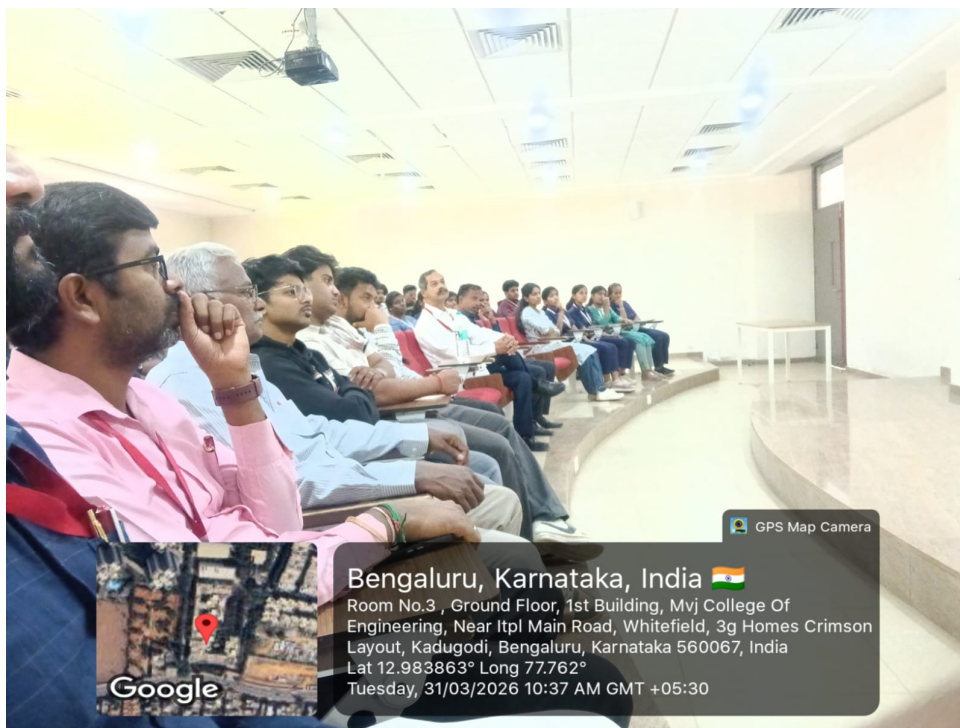


Figure 3: Participants for the session

### **Outcome of the event:**

The guest lecture on "Aircraft Propulsions Systems" successfully achieved its objectives of enhancing students' understanding of Digital Twin Technologies. It helped:

- Understand the fundamentals and architecture of modern aircraft propulsion systems, including key components and performance parameters.
- Learn the core concepts and structure of Digital Twin technology, including data acquisition, simulation, and real-time monitoring.
- Understand how digital twins are applied to aircraft engines for predictive maintenance, fault detection, and performance optimisation.

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- Develop awareness of industry practices and tools used in propulsion modelling, engine health monitoring, and lifecycle management.
- Identify potential research areas in propulsion and digital twin integration for advanced aerospace applications.

## **Conclusion:**

The guest lecture provided a comprehensive understanding of modern propulsion technologies and the transformative impact of digital twin systems in aerospace engineering. The session successfully enhanced the participants' technical knowledge, encouraged analytical thinking, and introduced advanced concepts relevant to both academic research and industry practices. Overall, the lecture inspired students to explore innovative approaches to engine performance, monitoring, and future propulsion development.

**Report by:** Prof. Gooty Rohan and Prof. Chikateri Sushmitha

Affiliation: Faculty in the Department of Aeronautical Engineering, MVJ College of Engineering