भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र

Bharat Space Education Research Centre

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No. 05-15(ADW)/BSERC/IND/2025/062

Date: 04/09/2025

Subject: "Kindly disseminate or upload this announcement via website/ Letter/ official channels to all the Institutions faculty, students, and officials, inviting their active participation in the Advanced Aircraft Design Workshop & forthcoming sessions dedicated to an Advanced Drone (Air Taxi) Technology, in alignment with the vision of Viksit Bharat @2047."- Reg.

आदरणीय महोदया /महोदय,

This is in continuation of our previous communication in July, 2025 regarding the initiatives by Bharat Space Education Research Centre (भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र) to advance space science and technology.

The Government of India, under the visionary leadership of Hon'ble PM Shri Narendra Modi, has initiated groundbreaking reforms in the space sector. These initiatives are designed to enhance and promote space education, research, and development across the nation. A key highlight is the celebration of National Space Day on August 23, which underscores India's commitment to fostering innovation and scientific excellence in space exploration. In alignment with the Viksit Bharat Abhiyan 2047, the Bharat Space Education Research Centre is conducting a Aircraft Design Workshop and an Advanced Drone (Air Taxi) workshop.

- विद्यार्थियों में वैज्ञानिक सोच एवं नवाचार को प्रोत्साहित करना।
- अंतरिक्ष विज्ञान एवं तकनीकी शिक्षा को ग्रामीण और शहरी क्षेत्रों तक पहुँचाना।
- भारत सरकार के "विज्ञान भारत" एवं "आत्मनिर्भर भारत" दृष्टिकोण के अनुरूप कार्य करना।

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AIRCRAFT DESIGN WORKSHOP (वायुयान डिजाइन कार्यशाला)

"Aryabhatta to Gaganyaan: Ancient Wisdom to Infinite Possibilities"

Note:

The workshop date will be set as per the students' schedule, either on a Saturday or Sunday, to avoid disrupting the students' schedules, If some students cannot attend on this date, The department will organize an additional workshop to accommodate them. We aim to ensure minimal disruption to the students' schedules, so the adjustments will be made based on the students' preferences (Sunday).

Medium: English

We look forward to your participation and engagement in our Advanced Drone Workshop (Air Taxi).

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AIRCRAFT DESIGN WORKSHOP (वायुयान डिजाइन कार्यशाला)

01> Workshop: One-day session covering core content: 14th September, 2025

Time	Topic	Objectives
0 – 10 min	Introduction to Aircraft Design & Design Process	1. Understand the purpose and scope of aircraft design. 2. Learn step-by-step design methodology. 3. Identify trade-offs between performance, cost, and safety.
10 – 20 min	Velocity of Flight & Standard Atmosphere	Differentiate true, indicated and equivalent air speed & Mach number
20 – 30 min	Anatomy of the Aircraft	Identify major components (fuselage, wings, tail, landing gear, engines).
30 – 40 min	Nomenclature of Airfoil	Familiarize with standard terminology of the airfoil.
40 – 60 min	Aerodynamics of Airfoils (Velocity of Flow, Flow Pressure Distribution, Lift, Drag, Aerodynamic Centre and Centre of pressure.	1. Relate pressure distribution to lift & drag generation. 2. Define and locate aerodynamic center and center of pressure.
60 – 75 min	Wing Geometry	Define aspect ratio, taper ratio, sweep, dihedral, twist.

75 – 90 min	External Forces on Aircraft	Understand force balance in steady and accelerated flight and equations of motion.
90 – 110 min	Thrust Required Minimum & Power Required Minimum	Derive conditions for minimum thrust & power requirement.
110 – 125 min	Engine Sizing	Estimate engine thrust/power with aircraft mission needs.
125 – 140 min	Weight Estimation	Break down weights into empty, payload, fuel and structural weights
140 – 155 min	Range & Endurance	Derive the equations for range and endurance (Time of flight). Engage participants in Q&A
155 – 170 min	Flight Equilibrium & Stability Wing alone configuration Wing and tail combination	Understand about static and dynamic stability. Derive equations for longitudinal, lateral, and directional stability for wing alone and wing tail combination
170 – 180 min	Flight Demonstration & Special Topics (Flat plate & Similar Wing-Tail flight) Question and answers	Apply theory to practical demonstration. Preparation of flat plate wing to test glide performance and test glide performance of similar wing –Tail combination) Engage participants in Q&A and wrap-up.

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02 > Advanced Drone Technology (उन्नत ड्रोन प्रौद्योगिकी)

- ISR Drones – Intelligence, Surveillance & Reconnaissance drones like IAI Heron & IAI Searcher
- Kamikaze Drones – Suicide drones like Harpy, Harop, and SkyStriker used in Operation Sindoor
- UCAVs – Unmanned Combat Aerial Vehicles capable of both surveillance and missile/bomb attacks
- Swarm Drones – AI-powered drone groups that coordinate like birds or bees

01 INTRODUCTION
Advanced Drone Technology

02 U.A.V PRINCIPLES
Engineering Principles of UAV Design & Aerodynamics

03 REGULATIONS
Regulatory and Ethical Considerations

04 PROGRAMMING
Hands-on Drone Programming and Simulation

05 REAL-WORLD
Real-World Applications and Case Studies

06 DRONES IN AI
Future of Drones in AI and Automation

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Advanced Drone Technology (उन्नत ड्रोन प्रौद्योगिकी)

03› Workshop: Three-day session covering in-depth content- 3rd , 4th & 5h October, 2025.

Day	Session	Lecture Title	Topics Covered	Learning Outcome
1	1	Drone Technology Fundamentals & Aerodynamics Basics	a) UAV classifications (fixed-wing, multirotor, VTOL) b) Fundamental forces: lift, drag, thrust, weight c) Airfoil theory and pressure distribution	• Identify major UAV types and their mission envelopes • Explain how airfoil geometry generates lift and influences performance
	2	Basic Flight Stability & PID Control Introduction	a) Angle of attack, stall behavior, stability axes b) PID control fundamentals: P, I, D terms and tuning basics	• Recognize stall and recovery techniques • Configure and tune a basic PID loop to stabilize hover
2	1	UAV Structures, Propulsion & Power Systems	a) Drone frame materials and stress considerations b) Electric motors, propeller selection, ESCs c) Battery technologies and power budgeting	• Assess structural trade-offs for weight vs. strength • Size propulsion and battery systems to meet flight-time requirements
	2	Sensor Suite & Inertial Navigation	a) IMU components: accelerometer, gyroscope, magnetometer b) GNSS integration and error sources c) Complementary vs. Kalman filtering basics	• Integrate sensor data to produce stable attitude estimates • Calibrate IMU/GNSS to achieve reliable position and heading

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3	1	Autonomous Mission Planning & Advanced Control	a) Path-planning algorithms (A*, RRT) b) LQR controller design for trajectory tracking c) Real-time obstacle avoidance strategies	• Generate and optimize waypoint sequences for dynamic environments • Implement an LQR controller to follow complex flight paths
	2	Real-World Applications, Certification & Case Studies	a) Industry use-cases: AAM, logistics, agriculture, healthcare, disaster relief b) DGCA/EASA certification process and airspace integration standards c) System-level testing and validation protocols	• Map technical requirements to specific industry applications • Outline roadmap for regulatory approval and field deployment

Workshop: 3-day training program on October 3rd , 4th & 5th, 2025 (Friday–Sunday), focusing on advanced Drone Technology (Air Taxi).

Three- Day (03) Registration: https://forms.gle/weWogv1VzqJqgQKp7

Date: October 3rd , 4th & 5th , 2025 (Friday–Sunday), 2025 at 2 PM.

सादर

राहुल सिंह,
संबद्धता विनियामक प्राधिकारी
भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र, नई दिल्ली।
ईमेल : info@bserc.org/ workshop@bserc.org
दूरभाष: 7303048646 / 7042880241

निदेशक / Director
भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र
Bharat Space Education Research Centre

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Notice/ Important Update:

Who can participate: Anyone with a background in science and technology, including students and faculty, is welcome to join the Advanced Drone Technology workshop.

01> **Workshop: One-day session covering core content**

Date : 14th September, 21st September & 3rd, 4th and 5th October, 2025

Mode : Online , **Duration:** 180 minutes (3 Hrs)

Timing: 2 PM- 5pm

Register for the AIRCRAFT DESIGN WORKSHOP (वायुयान डिजाइन कार्यशाला) on ASeptember 14th, 2025: https://forms.gle/scpPq9h4bJMY5T6e6

Register for the Advanced Drone (Air Taxi)Technology Workshop on September 21st, 2025: https://forms.gle/tR2txBy5eSgr7ztE7

New Initiative: Advanced Drone(Air Taxi) Technology 3- Day Programme on 3rd, 4th & 5th October: https://forms.gle/jgoqcMuve77LVYjZA

सेवा में,

विभागों/ कार्यालियों / संस्थान
सूक्ष्म, लघु और मध्यम उद्यम (एमएसएमई)।
विश्वविद्यालयों के छात्र एवं शिक्षक

भवदीय,

निदेशक / Director
भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र
Bharat Space Education Research Centre