भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र

Bharat Space Education Research Centre

नई दिल्ली, भारत

दूरभाष : +91 7303048646

ईमेल : info@bserc.org

वेबसाइट : www.bserc.org

New Delhi, India

Telephone : +91 7303048646

Email : info@bserc.org

web: www.bserc.org

पत्रांक: 5-15(डब्ल्यू.आई.)/बी.एस.ई.आर.सी./2025/191

दिनांकः दिसंबर 5, 2025

About Def-Space Tech Winter Training

Undergraduate and postgraduate students, Faculty and Research scholars in recognized Universities or Institutions in India can apply for the Bharat Space Education Research Centre Winter Internship. Participants will work closely with various verticals, divisions, and cells of Space/ Defence and receive training in 3 - Day Advanced Drone Technology (Air Taxi), 3- Day Aircraft Design Technology, 3- Day Rocketry, 3-Day Space Entrepreneurship and 7-Day Project based on the given technology.

Registration for the Def-Space Winter training program will open on October 10th at 5 pm. The online application link is open from 10th October - December 16th till 11:00 pm and Those who wish to learn only their respective field can also register for any 3-day session.

Lateral Entry

Registration for Lateral Entry: Does not involve an examination process. Bharat Space Education Research Centre is pleased to announce an opportunity for officials, faculty, research scholars, and students to engage in lateral entry into their preferred technology areas. This initiative does not involve an examination process. Participants will receive a training certificate upon completion rather than an internship certificate.

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Bharat Space Education Research Centre: Def-Space Tech Winter Internship Technical Training Program भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र: शीतकालीन इंटर्नशिप एवं तकनीकी प्रशिक्षण कार्यक्रम |

Lateral Entry	**Apply here** https://forms.gle/edfj9rGcnbny5id3A
End Date to Apply	16th December, 2025, Till 5:00 PM
Offer Letter	17th December, 2025
Training Date	19th Dec 2025 - 19th Jan, 2026
Certification	**25th January, 2026**

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Winter Internship Program - शीतकालीन इंटर्नशिप

One Month Internship : 19th December - 19th January

One Month Def-Space Training Module :

. 3-Day Advanced Drone Technology (Friday, Saturday & Sunday), 19th , 20th & 21st December

. 3-Day Aircraft Design (Designing & Application), 26th , 27th & 28th December

. 3-Day Advanced Rocketry 2nd, 3rd and 4th January

. 3-Space Entrepreneurship (Business opportunities, Drive economic growth, and develop innovative solutions)., 9th, 10th & 11th January

. 3-Day Robotics (17th - 18th Jan)

. Project : 25th Dec - 18th Jan

Mode: Online, Duration : 3 - 4 hours each day.

Evaluation: 19th, Jan & Certification 25th January 2026.

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3-Day Advanced Drone Technology (उन्नत ड्रोन प्रौद्योगिकी)

Workshop: 3-Day session covering in-depth content- 19th , 20th & 21st December, 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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No. 05-15(ADW)/BSERC/IND/2025/191 दिसंबर 5, 2025

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

3-day training program on December 19th , 20th & 21st, 2025 (Friday–Sunday), focusing on advanced Drone Technology (Air Taxi).

Date: December 19th , 20th & 21st , 2025 (Friday–Sunday), 2025 at 2 PM.

Registration Link for 3-Day Drone : https://forms.gle/weWogv1VzqJqgQKp7

Participants opting for a single technology may register via the provided link. For access to all technologies, apply through lateral entry.

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AIRCRAFT DESIGN WORKSHOP (वायुयान डिजाइन कार्यशाला)

3-day session covering core content: 26th, 27th & 28th December, 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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Day2 140– 180 min	1. Range & Endurance. 2. Numerical problems.	Derive the equations for range and endurance (Time of flight). Engage participants in Q&A Interpret how aerodynamic efficiency and fuel consumption influence range and endurance values.
Day3 0 – 90 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
Day3 90 – 180 min	Flight Demonstration & Special Topics (Flat plate & Similar Wing-Tail flight)	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.

Participants opting for a single technology may register via the provided link. For access to all technologies, apply through lateral entry

3-Day Aircraft Design Session: https://forms.gle/Mg9UHWZ98RMfmKhR6

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ROCKETRY DESIGN WORKSHOP

3-day session covering core content: 2nd , 3rd & 4th January, 2026

Session 1: (3 Hours)	Duration	Topics Covered
0:00 – 0:10	10 min	**Introduction & Workshop Overview** — Goals, expectations, icebreaker, and structure overview.
0:10 – 0:30	20 min	**Rocketry Fundamentals and History** — Basics of rockets, historical context, and applications; Newton's Third Law.
0:30 – 1:00	30 min	**Physics of Rocket Flight** — Application of Newton's laws, thrust vs. weight, and conceptual introduction to the rocket equation.
1:00 – 1:30	30 min	**Propulsion Basics** — Types of rocket engines (solid, liquid, hybrid), thrust generation, total impulse, and specific impulse (Isp).
1:30 – 2:00	30 min	**Aerodynamics & Stability** — Forces on a rocket, CG vs. CP, fin and nose cone design, and stability margin.
2:00 – 2:30	30 min	**Rocket Design Parameters** — Mission objectives, mass breakdown, thrust-to-weight ratio, and introduction to multi-stage designs.
2:30 – 3:00	30 min	**Q&A / Recap Discussion**

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Session 2 (3 Hours)	Duration	Topics Covered
0:00 – 0:30	30 min	**Advanced Rocket Physics** — Tsiolkovsky rocket equation, multi-stage rockets, and performance implications.
0:30 – 1:00	30 min	**Propulsion Details** — Model rocket motor classification (A, B, C, etc.), thrust curve analysis, and propellant comparisons.
1:00 – 1:30	30 min	**Aerodynamics Deep Dive** — Drag factors, drag coefficient, flight phases, and recovery systems (e.g., parachutes).
1:30 – 2:00	30 min	**Rocket Assembly & Launch Readiness** — Hands-on overview of rocket structure, fin alignment, engine mounting, and safety checks before simulated launch.
2:00 – 2:30	30 min	**Simulation Software Tutorial** — Introduction to OpenRocket, defining rocket parts, running simulations, analyzing altitude and stability results.
2:30 – 3:00	30 min	**Q&A**

Participants opting for a single technology may register via the provided link. For access to all technologies, apply through lateral entry only

3-Day Rocketry Design Session: https://forms.gle/zXMKbpjncP8vPiyi7

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3-Day Robotics Design

16th, 17th & 18th January

MILESTONE DAY WISE:

DAY 1 — Robotics Foundations & Hardware Layer
Duration: 3 Hours
Milestone: Build foundational understanding of robotics systems and hardware.

Time	Duration	Topics Covered
0:00 – 0:15	15 min	Introduction & Workshop Overview
0:15 – 0:45	30 min	What are Robotics? Definition, Laws, Applications
0:45 – 1:30	45 min	Robot Types (Arms, Bipeds, Quadrupeds, Wheeled)
1:30 – 2:00	30 min	Sensors Overview – IMUs, Encoders, Ultrasonic, Cameras
2:00 – 2:45	45 min	Actuators – DC, Servo, Stepper, Advanced Actuation
2:45 – 3:15	30 min	Computing Systems – MCU vs SBC, protocols
3:15 – 3:45	30 min	Hands-On: Sensor Interfacing & Motor Control
3:45 – 4:00	15 min	Q&A / Recap

DAY 2 — Software, Control & Project Development
Milestone: Develop ability to work with algorithms, perception & navigation.

Time	Duration	Topics Covered
0:00 – 0:30	30 min	Navigation: Path & Motion Planning
0:30 – 1:00	30 min	Perception: Object Detection, Tracking, Features
1:00 – 1:30	30 min	Mapping & SLAM Introduction
1:30 – 2:00	30 min	Real-Time Systems & Control Loops
2:00 – 2:45	45 min	ROS Basics – Nodes, Topics, Services
2:45 – 3:45	60 min	**Start Project 1 Build:** Obstacle-Avoiding Robot
3:45 – 4:00	15 min	Q&A

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DAY 3 — ROS Practice, System Integration & Final Projects
Milestone: Complete two robotics projects and demonstrate autonomous behavior.

Time	Duration	Topics Covered
0:00 – 0:30	30 min	Integration Techniques & System Testing
0:30 – 1:30	60 min	**Complete Project 1 – Testing & Optimization**
1:30 – 2:45	75 min	**Project 2 – Line-Follower Build & PID Tuning**
2:45 – 3:30	45 min	Field Testing of Both Projects
3:30 – 4:00	30 min	Closing Feedback, Demonstrations & Certification

Participants opting for a single technology may register via the provided link. For access to all technologies, apply through lateral entry only.

Apply : 3-Day Robotics Workshop : https://forms.gle/km9ubGb27UAMRn8i6

सादर | Regards,

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

सेवा में,
विश्विद्यालय / महाविद्यालय के शिक्षक एवं छात्र ।

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To,

All the Institutions,

We are pleased to announce an important update regarding the Def-Space Tech Winter Internship Technical Training Program. The primary aim of this Winter Internship is to enhance Space education and the Defence technological advancement. We kindly request all Institutions to disseminate this information widely among their Faculty/ Research Scholars and students. We are pleased to invite all students and research scholars to participate in the Winter Internship program. Bharat Space Education Research Centre has implemented various nationwide initiatives to promote space education at grassroots level.

सादर | Regards,

निदेशक / Director
भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र
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सेवा में,

सभी विश्विद्यालय के कुलपति ।
सभी महाविद्यालय के प्राचार्य ।
विश्विद्यालय / महाविद्यालय के शिक्षक एवं छात्र ।

भवदीय