# भारत अंतरिक्ष शिक्षा अनुसंधान केंद्र

**Bharat Space Education Research Centre**

नई दिल्ली, भारत
दूरभाष : +917303048646
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## ROCKETRY DESIGN WORKSHOP

**2-day session covering core content: 11th & 12th April, 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

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

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## 2-Day Defence Drone Workshop: 18th & 19th April

Day - 1

### DAY 1: AERODYNAMICS & CORE HARDWARE SYSTEMS

*Focus: Engineering Fundamentals and Tactical Design*

| Time Slot | Module | Key Sub-topics |
|---|---|---|
| 00:00 - 00:45 | The UAV Ecosystem | Defense classifications (HALE/MALE), Fixed-wing vs. VTOL, Global & Domestic UAV trends. |
| 00:45 - 02:00 | Propulsion & Avionic Suites | BLDC motor dynamics, ESC protocols, Li-Po/Li-Ion energy density, Flight Controller architectures (SoC). |
| 02:00 - 03:00 | Aerodynamics & Control | Bernoulli's principle in UAVs, PID tuning, Vibration isolation, and RF Telemetry links (2.4GHz / 5.8GHz / LoRa). |

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Day - 2

### DAY 2: TACTICAL INTELLIGENCE & AUTONOMY

*Focus: Mission Planning, AI, and Regulatory Compliance*

| Time Slot | Module | Key Sub-topics |
|---|---|---|
| 00:00 - 01:00 | Payload & ISR Systems | Electro-Optical (EO) & Infra-Red (IR) sensors, Photogrammetry, and LiDAR integration for terrain mapping. |

Day - 2

| | | |
|---|---|---|
| 01:00 - 02:00 | AI & Edge Computing | Computer Vision for target tracking, Autonomous Waypoint Navigation, and Swarm Intelligence basics. |
| 02:00 - 03:00 | Policy & Career Roadmap | DGCA Drone Rules 2021, Digital Sky, National Security Ethics, and Defense R&D career pathways. |

Participants opting for a single technology may register via the provided link.

**2-DAY DEFENCE DRONE TECHNOLOGY : https://forms.gle/6H5tYw56ihsm1Z3S9**

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## 1-Day Artificial Intelligence Workshop: 25th April, 2026

| | | |
|---|---|---|
| **1. Foundations of Generative AI** | 1.4 AI Providers and Models (March 2026) | • OpenAI — GPT-5, GPT-5.2, o3, o4-mini<br>• Anthropic — Claude Sonnet 4.6, Claude Opus 4.6<br>• Google — Gemini 3, Gemini 2.5 Pro<br>• Meta — Llama 4<br>• DeepSeek — DeepSeek V3<br>• xAI — Grok 3<br>• Mistral — Mistral Large 2<br>• Alibaba — Qwen 2.5<br>• Which Model to Use for Which Task |
| **2. Prompting Effectively** | 2.1 Why Most Prompts Fail | • The Search-Engine Habit<br>• How Context Changes Output Quality |
| **2. Prompting Effectively** | 2.2 The Six Elements of a Strong Prompt | • Role<br>• Task<br>• Context<br>• Format<br>• Examples<br>• Constraints |
| **2. Prompting Effectively** | 2.3 Best Practices | • Specificity<br>• Iteration<br>• Providing Raw Material<br>• Verifying AI-Generated Facts<br>• Data Privacy and What Not to Share |
| **2. Prompting Effectively** | 2.4 Advanced Techniques | • Chain of Thought<br>• Few-Shot Prompting<br>• Dual Perspective<br>• Self-Critique Loop<br>• STAR Story Builder<br>• Template Filling |

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## GenAI for Everyone

### 2-Hour Live Webinar Syllabus

| Section | Topic | Sub-Topics |
|---|---|---|
| 1. Foundations of Generative AI | 1.1 What Is Artificial Intelligence | • Traditional AI<br>• Generative AI<br>• Agentic AI |
| 1. Foundations of Generative AI | 1.2 How Generative AI Works | • Tokenization<br>• Embeddings<br>• The Transformer Architecture<br>• How Output Is Generated<br>• Why AI Hallucinates |
| 1. Foundations of Generative AI | 1.3 Key AI Terms | • Context Window<br>• Temperature<br>• Hallucination<br>• RAG — Retrieval-Augmented Generation<br>• Fine-Tuning<br>• AI Agents<br>• Context Engineering<br>• Small Language Models<br>• Multimodal AI |

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| | | |
|---|---|---|
| **3. Live Demonstrations** | 3.1 AI for Job Search and Career Applications | • Decoding a Job Description<br>• Rewriting CV Bullet Points<br>• ATS Optimisation<br>• Writing a Cover Letter<br>• Interview Preparation<br>• Salary Negotiation Script |
| **3. Live Demonstrations** | 3.2 NotebookLM for Study and Research | • How NotebookLM Differs from Other AI Tools<br>• Uploading Sources and Asking Questions<br>• Three-Prompt Exam System<br>• Generating Flashcards<br>• Audio Overview<br>• Teacher Use Case — Building a Study Guide |
| **3. Live Demonstrations** | 3.3 Hands-On Practice | • Students — Notes to Exam Questions<br>• Teachers — Lesson Plan Creation<br>• Professionals — Rewriting a Work Task |
| **4. Next Steps** | 4.1 30-Day Action Plan | • Week 1 — Explore<br>• Week 2 — Build the Habit<br>• Week 3 — Go Deeper<br>• Week 4 — Teach Someone Else |
| **4. Next Steps** | 4.2 Tools to Get Started | • claude.ai<br>• chatgpt.com<br>• gemini.google.com<br>• notebooklm.google.com<br>• perplexity.ai |

**Apply for Artificial Intelligence Workshop:** https://forms.gle/pBAjtvVnxUbc2S9W7

25th April, 2026, Duration : 3 Hours, Timings : 2:30 PM -5:00 PM

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## 1-Day Aircraft Design Workshop

## 26th April, 2026

| Time | Topic | Objectives |
|---|---|---|
| 0 – 10 min | Introduction to Aircraft Design & Design Process | 1. Understand the purpose and scope of aircraft design.<br>2. Learn step-by-step design methodology.<br>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.<br>2. Define and locate aerodynamic center and center of pressure. |
| 60 – 75 min | Wing Geometry | Define aspect ratio, taper ratio, sweep, dihedral, twist. |

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| | | |
|---|---|---|
| 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).<br>Engage participants in Q&A |
| 155 – 170 min | Flight Equilibrium & Stability<br>Wing alone configuration<br>Wing and tail combination | Understand about static and dynamic stability.<br>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)<br>Question and answers | Apply theory to practical demonstration.<br>Preparation of flat plate wing to test glide performance and test glide performance of similar wing –Tail combination)<br>Engage participants in Q&A and wrap-up. |

**Apply for Aircraft Design Workshop**: https://forms.gle/pBAjtvVnxUbc2S9W7

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# 3-Day Robotics Design: 1st, 2nd & 3rd May

## 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/89SwNtsKGQk1ahRF8**

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## 3-Day Advanced Drone Technology (उन्नत ड्रोन प्रौद्योगिकी)

**Workshop: 3-Day session: 8th , 9th & 10th May, 2026**

| Day | Session | Lecture Title | Topics Covered | Learning Outcome |
|---|---|---|---|---|
| 1 | 1 | Drone Technology Fundamentals & Aerodynamics Basics | a) UAV classifications (fixed-wing, multirotor, VTOL)<br><br>b) Fundamental forces: lift, drag, thrust, weight<br><br>c) Airfoil theory and pressure distribution | • Identify major UAV types and their mission envelopes<br><br>• Explain how airfoil geometry generates lift and influences performance |
| | 2 | Basic Flight Stability & PID Control Introduction | a) Angle of attack, stall behavior, stability axes<br><br>b) PID control fundamentals: P, I, D terms and tuning basics | • Recognize stall and recovery techniques<br><br>• Configure and tune a basic PID loop to stabilize hover |
| 2 | 1 | UAV Structures, Propulsion & Power Systems | a) Drone frame materials and stress considerations<br><br>b) Electric motors, propeller selection, ESCs<br><br>c) Battery technologies and power budgeting | • Assess structural trade-offs for weight vs. strength<br><br>• Size propulsion and battery systems to meet flight-time requirements |
| | 2 | Sensor Suite & Inertial Navigation | a) IMU components: accelerometer, gyroscope, magnetometer<br><br>b) GNSS integration and error sources<br><br>c) Complementary vs. Kalman filtering basics | • Integrate sensor data to produce stable attitude estimates<br><br>• 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)<br><br>b) LQR controller design for trajectory tracking<br><br>c) Real-time obstacle avoidance strategies | • Generate and optimize waypoint sequences for dynamic environments<br><br>• 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<br><br>b) DGCA/EASA certification process and airspace integration standards<br><br>c) System-level testing and validation protocols | • Map technical requirements to specific industry applications<br><br>• Outline roadmap for regulatory approval and field deployment |

**3-day training program on December 8th , 9th & 10th , 2026 (Friday–Sunday), focusing on advanced Drone Technology (Air Taxi).**

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

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## AIRCRAFT DESIGN WORKSHOP (वायुयान डिजाइन कार्यशाला)

**3-day session covering core content: 15th, 16th & 17th May, 2026**

| Time | Topic | Objectives |
|---|---|---|
| 0 – 10 min | Introduction to Aircraft Design & Design Process | 1. Understand the purpose and scope of aircraft design.<br>2. Learn step-by-step design methodology.<br>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.<br>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).<br>Engage participants in Q&A |
| 155 – 170 min | Flight Equilibrium & Stability<br><br>Wing alone configuration<br><br>Wing and tail combination | Understand about static and dynamic stability.<br>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)<br><br>Question and answers | Apply theory to practical demonstration.<br>Preparation of flat plate wing to test glide performance and test glide performance of similar wing –Tail combination)<br>Engage participants in Q&A and wrap-up. |

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| | | |
|---|---|---|
| Day2<br><br>140– 180 min | 1. Range & Endurance.<br><br>2. Numerical problems. | Derive the equations for range and endurance (Time of flight).<br>Engage participants in Q&A<br>Interpret how aerodynamic efficiency and fuel consumption influence range and endurance values. |
| Day3<br><br>0 – 90 min | Flight Equilibrium & Stability<br><br>Wing alone configuration<br><br>Wing and tail combination | Understand about static and dynamic stability.<br>Derive equations for longitudinal, lateral, and directional stability for wing alone and wing tail combination |
| Day3<br><br>90 – 180 min | Flight Demonstration & Special Topics (Flat plate & Similar Wing-Tail flight) | Apply theory to practical demonstration.<br>Preparation of flat plate wing to test glide performance and test glide performance of similar wing –Tail combination)<br>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

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