AEROSPACE DEPARTMENT

HANDBOOK

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Welcome to the Department

Prof. AM Pradeep

HoD, Aerospace Engineering

The Department of Aerospace Engineering extends a warm welcome to all of you. Thank you for choosing Aerospace Engineering at IIT Bombay as your choice. Aerospace engineering is indeed a multi-disciplinary department offering exciting opportunities for learning. The department offers a carefully curated curriculum developed keeping in mind the needs of the aerospace industry and research labs of the country.

The curriculum offers the right mix of core and elective courses to enable you to gain a strong foundation in aerospace engineering as well as develop breadth in your respective specialisation. You will have opportunities to carry out exploratory projects or supervised learning projects, more detailed projects in the form of BTech project stages 1 and 2.

These projects could enable you to apply the theory taught in these courses to actual use. These also gives you a perspective for carrying out research in cutting-edge areas in various specialisations of the department.

Being in a batch of students from diverse backgrounds and from across the country gives you good networking opportunities. We strongly encourage you to make the best use of this. Besides academics, there are several activities at the department as well as Institute level where you can contribute and use your skillsets. A judicious mix of academics and co-curricular activities is essential in overall personality development.

We wish you all the best, and we are hopeful that you will make the most of your stay at the institute!

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Department Facilities

Labs

The Aerospace department has a wide variety of labs that allow students to conduct research on topics such as aerodynamics, propulsion, materials testing, and many more.

Cardio-Vascular Lab

Prof: Prof. Arnab Maity & Prof. Dhwanil Shukla
Location: Basement, Aerospace Annex Building
Description: Focuses on manufacturing drones, including the assembly of drone hardware and custom-made landing platforms, algorithm development, testing and deplyoment
Facilities: All modern software, flight simulators & controllers, 3D printers, and other essential hardware

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Experimental Aerodynamics Lab

Prof: Prof. Dhwanil Shukla
Location: Basement, Aerospace Annex Building
Description: Equipped with experimental facilities for UG & PG students to study aerodynamics of various flows.
Facilities: 2-D Jet setup, Wind Tunnel, Digital Manometers, Pressure measurement instrumentation
Link:- https://www.aero.iitb.ac.in/exp_aero_lab/

Hypersonic CFD Lab

Prof: Prof. Krishnendu Sinha
Location: Ground Floor, Aerospace Annex Building
Description: Studies high-speed flows in aerospace applications, covering theoretical analysis, numerical modelling, and practical simulations.
Facilities: GRIDGEN, TECPLOT, High-end graphics workstations, Full power backup
Research Areas: Shock-boundary layer interaction, scramjet intake simulation, hypersonic flows
Link:- https://www.hypersonic-cfd.com/index.html

Lighter Than Air Systems Lab

Prof: Prof. Rajkumar Pant
Location: Ground Floor, Aerospace Main Building
Description: Established in 2004, focuses on R&D and technology development for Lighter-Than-Air (LTA) systems.
Facilities: Helium Compressor, RF Sealing Machine, Hot Air Ovens
Research Areas: Morphing UAV, Venus exploration, Aerostat-based communication system

Link:- https://www.aero.iitb.ac.in/ltasyslab/

Miniature Aerial Vehicle (MAV) Lab

Prof: Prof. Hemendra Arya
Location: Ground Floor, Aero Annex Building
Description: Focuses on different aerial vehicles, hardware, and the effects of wing shapes.
Facilities: Bending Machine, UAVs, Drilling Machine

Control and Instrumentation Lab

Prof: Prof. Arnab Maity
Location: First Floor, Aero Annex Building
Description: Demonstrates the practical application of control theory and basic sensors used in daily life.
Facilities: Inverted Pendulum, Gyroscope, GPS, Sensors
Research Areas: SWARM Optimization, Reinforcement Machine Learning

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Propellant Research Lab

Prof: Prof. Nagendra Kumar
Location: Aero Main Building
Description: This lab is a place where the research regarding various types of propellants like Gel, Slurry, Solid Propellants is carried out by Masters and Doctoral students.

Propulsion Lab

Prof: Propulsion Faculty
Location: Ground Floor, Aerospace Dept. Building
Description: Provides hands-on experience with experiments related to aero engines, turbomachinery, and heat transfer.
Facilities: Gas turbine engine, Nozzle thrust measurement, Heat transfer setup

Gas Turbine Lab (GT)

Prof: Prof. Nagendra Kumar
Location: Behind Hostel 4
Description: This lab consists of dedicated facility Rocket Propulsion where Hybrid and Solid Rocket experiments are carried out.

Combustion Lab

Prof: Prof. Sudarshan Kumar
Location: Ground Floor, Aerospace Annex Building
Description: Develops new combustion techniques to reduce emissions, equipped with state-of-the-art facilities.
Facilities: Nd-YAG Laser, High-speed camera, Gas chromatograph
Research Areas: Microcombustor power generation, Flameless combustion, Spray combustion

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Structures Lab

Prof: Prof. Krishnendu Haldar
Location: Ground Floor, Aerospace Main Building
Description: Focuses on material properties experiments and composite manufacturing, with facilities for high-quality polymer composites processing.
Facilities: Universal Testing Machine, Izod Impact Tester, Laser Doppler Vibrometer
Research Areas: Fatigue failure in composites, Wind turbine load mitigation, Magnetic shape memory alloy

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Shock Tunnel Laboratory

Prof: Prof. Viren Menezes
Location: Ground Floor, Aerospace Main Building
Facilities: Shock Tunnel for Mach 8 hypersonic tests, Shock Tubes
Research Areas: Hypersonic cruise and re-entry models, Hypersonic intake, Blast mitigation techniques

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Turbomachinery Research Laboratory

Prof: Prof. A.M. Pradeep
Location: Besides Aerospace Main Building
Description: Focuses on cascade experimentation, axial compressors, and turbine exhaust diffuser analysis.
Facilities: Cascade Wind Tunnel, Axial Fan Test Rig, Low-speed Wind Tunnel
Research Areas: Tandem bladed compressor, Contra-rotating fan, Wind milling of rotors
Link: https://www.aero.iitb.ac.in/~ampradeep/TRL.pdf

Acoustics and Flow Diagnostic Lab (High-Speed Aerodynamics Lab)

Prof: Prof. Vineeth Nair
Location: Ground Floor, Aero Annex Building
Research Areas: Compressible turbulence, shock waves, aeroacoustics, sound sources in flow fields

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High Velocity Impact Testing Lab

Prof: Prof. Chandra Sekher Yerramalli
Location: Ground Floor, Aerospace Main Building
Description: Focuses on high-stress testing of armors and ballistics.
Facilities: Tension Hopkinson Bar, Ballistics Gun
Research Areas: Armour and ballistics material testing, Hopkinson Bar setup for strain rate data
Link:-
https://www.aero.iitb.ac.in/~nknaik/high_velocity_imp_lab.html

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Tech Teams

Rakshak

Rakshak IITB, the **UAV team** of IIT Bombay, designs robust drones for disaster relief, city surveys, and wildlife conservation. Formed in 2015, the team of **40+** students has developed **five** UAVs, focusing on innovation, cost-effectiveness, and human safety. Link to their website

Focus

Rakshak IITB has focused on **IMAV 2024**, developing a **VTOL** aircraft for advanced tasks. They excelled at **IMechE UAS 2024** and **ACC 2024**. Post-IMAV, they'll focus on national competitions and **ACC 2026,** while **researching advanced UAV materials** beyond balsa wood for improved performance.

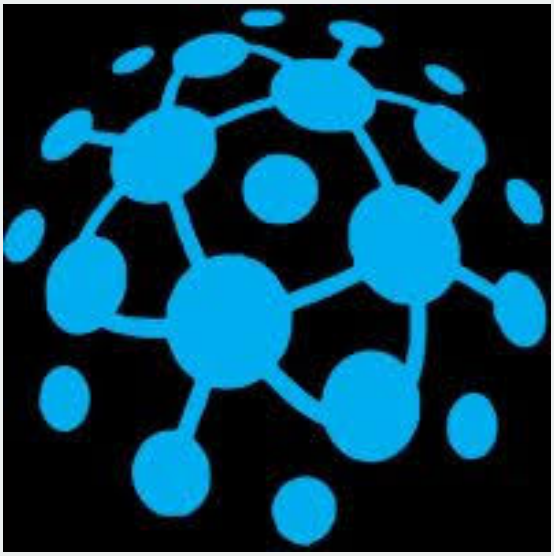
Subsystems

Aerodynamics & Manufacturing
Software
Avionics
Business

Achievements

- **IMechE UAS 2024 (UK)** – **Ranked 12th** internationally, won the **Operational Supportability Award**, **2nd Place** in Simulation, and received special mentions in **Scrutineering and Best Manual Flight Award**.
- **ACC 2024 (Germany)** – Successfully competed, showcasing expertise in aerodynamic design.
- **Ongoing R&D** – Exploring advanced UAV materials beyond balsa wood for enhanced performance.

Tech Teams



UMIC

(Unmesh Mashruwala Innovation Cell)

UMIC is an interdisciplinary student team at IIT Bombay, founded by Prof. C. Amarnath, dedicated to developing **autonomous systems** like **driverless cars** and **rescue drones.** The team competes internationally, winning top awards and solving global challenges.

Link for SeDriCa

Link for AeRoVe

Focus

- **IARC Mission 8** – Develop self-flying drones capable of autonomous navigation in complex environments.
- **Mahindra Rise Driverless Car Challenge** – Build a fully autonomous vehicle using the Mahindra E2O.

Subsystems

SeDriCa: Perception, Motion Planning, controls, mechatronics, communications.

AeRoVe: Aerodynamics, Mechatronics, Controls, Path Planning, Machine Learning, and Localization

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Achievements

- Intelligent Ground Vehicle Competition (**IGVC**, USA) – **World Champions (2017)**, showcasing innovations in robotics and vehicle automation.
- ASME Student Design Competition (USA) – **World Champions (2017).**
- Mahindra Rise Driverless Car Challenge – **Selected among top teams (256)** to develop a fully autonomous vehicle.

Tech Teams

AUV

IIT Bombay's AUV Team designs and builds autonomous underwater vehicles to compete in events like the international RoboSub competition. The team's goal is to develop AUVs capable of navigating underwater environments autonomously, performing tasks such as object detection, localization, and manipulation.

Link to their website

Subsystems

Propulsion System	Sensor Suite
Power Supply	Payload
Navigation & Control	Computations
Communication	Hull & Buoyancy

Competitions

- **RoboSub**: Teams design autonomous submarines for tasks like navigation and manipulation.
- **AUVSI's Underwater Robotics Competition**: Teams develop AUVs for complex underwater tasks.
- **International Robotic Racing Competition:** Focuses on AUV design and racing.
- **IEEE OES AUV Challenge**: Teams build autonomous underwater systems for specific tasks.
- **MATE ROV Competition**: Primarily for ROVs but includes autonomy-focused challenges.
- **ERL Underwater Robotics Challenge:** A European competition for autonomous underwater systems.

Tech Teams

MRT

The Mars Rover Team at IIT Bombay focuses on building rovers designed to explore Martian-like terrain. The team participates in competitions such as the University Rover Challenge (URC) and the European Rover Challenge (ERC).

Their rover is equipped with advanced systems for mobility, manipulation, and scientific exploration, mimicking real-world challenges that future Mars rovers might face. Link to their website

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Subsystems

Mechanical Subsystem
Chassis
Suspension
Manipulators

Electronics & Control
Power Management
Sensors & Camera
Control Systems

Software & Autonomy
Navigation
Task Automation
User Interface

Communications
Telecommunications
Data Transmisison

Achievements

- 19th overall in **URC '23** among 100+ international teams and the top Indian team
- 6th internationally in the science mission in **URC '23**
- Autonomous Excellence Award in **IRC '23**

Tech Teams

IITB Rocket Team

The Rocket Team at IIT Bombay is dedicated to designing and launching rockets for educational and research purposes. The team aims to develop rocketry skills among students and advance knowledge in propulsion, aerodynamics, and systems integration.

They participate in competitions like the Spaceport America Cup and work on various rocket projects from sounding rockets to high-power rockets. Link to their website

Subsystems

Propulsion Subsystem
Solid Rocket Motors
Combustion Analysis
Fuel Composition

Structures Subsystem
Material & Analysis
Integration & Assembly

Recovery Subsystems
Parachute Deployment
Landing Impact Analysis

Aerodynamics Subsystem
Body Design
Stability Control
Wind Tunnel Testing

Avionics Subsystem
Flight Computers
Sensors & Telemetry
Communications

Achievements

- **Top Ranks at SA Cup**: The team has consistently ranked among the top teams in their category at the Spaceport America Cup, showcasing their prowess in rocket engineering and innovation.

Tech Teams

IITB Racing Team

The IIT Bombay Racing Team specializes in building Formula Student electric race cars. Focussed on optimizing performance. safety and sustainability, they compete annually in the Formula Student competitions held in the UK, they have consistently excelled. Link to their website

Subsystems

Mechanical: Chassis and System Integration, Composites, Aerodynamics, Vehicle Dynamics, Accumulator, Steering, Brakes, Wheel Assembly, Suspension

Electrical: ESI, CCD, AMS

Achievements

- **Overall Competition Awards:** IITB Racing has received high rankings and podium finishes in various categories such as design, cost, and endurance at Formula Student India and other international events.
- **Design Awards:** The team has been recognized for their innovative design solutions and engineering excellence in their race car components.

Academic Calendar

A year on campus is filled with loads of events ranging from orientations, key festivals to flagship events at the end of the academic year. The complete academic calendar can be found at: Academic Calender.

Academic Years

Setting the Course: Year I

Welcome to IIT Bombay! As a fresh face in the Aerospace Engineering department, you're stepping into an exciting new phase of life. Your first year is all about meeting new people, exploring clubs, and adapting to college life, especially if this is your first time living away from home. Take this time to get comfortable, try different activities, and figure out what excites you.

Academically, the first-year courses bridge the gap between what you had prepared for JEE with more engineering oriented concepts, easing you into this transition. You'll also be taking Department Introductory Courses (DICs), which offer a glimpse into the history and scope of aerospace engineering. Since you won't be diving deep just yet, there's no need to worry about specialization or even about choosing core aerospace as your primary focus. There's plenty of time to explore and make informed decisions.

A key memory for most students is building a model of the Wright Brothers' plane: First of many cute hands-on projects you will be involved in for your time as an IITB student.

Beyond academics, the first year is full of opportunities; volunteering for clubs, attending tech team orientations, and participating in student activities. Plus, you'll have student mentors (ISMPs) to guide you through this transition. By the end of the year, you'll have a better sense of your interests, a new routine, and a growing sense of belonging at IIT Bombay.

Academic Years

Gearing up for Flight: Year II

Your second year is when things start feeling more structured. You will now get a taste of all major specialisations: Propulsion, Structures, Controls, and Aerodynamics through core courses and labs. These will help you figure out what interests you, but you don't need to have everything decided just yet. This year is also a great time to explore electives, including interdisciplinary ones, and even pick a minor if you wish.

Alongside academics, many of you will take on positions of responsibility (PoRs) in clubs, technical teams, or student bodies. Managing multiple commitments alongside coursework becomes important, so finding a balance is key. If research interests you, now is a good time to reach out to professors for projects—some may require relevant coursework, while others are open to early-stage students. Checking lab pages and talking to seniors can help.

Recruitments for major PoRs, like department bodies and student organisations, happen in the second half of the year and can be hectic. Make sure that you have academics as a priority, as this is a smaller batch and a good time to maintain or improve your standing. You can also start building your resume and exploring internship opportunities, though second-year internships are optional. The transition to third year often feels like a blur, so pace yourself and stay organised.

Academic Years

Taking off into the unknown: Year III

Now is when things get intense. The internship season kicks in, with students applying for research internships, core internships, and non-core roles both on and off campus. Many of you will start preparing for this during the second-year summer, and guidance is available through UGAC and department-specific sessions. Resume building and networking become crucial, so take advantage of these resources.

Academically, third-year courses build upon the fundamentals from the previous year, and you have more flexibility in choosing electives. You may also start credited projects like Self-Learning Projects (SLPs), though BTech Projects (BTPs) are usually taken up later. If you're pursuing an Honors degree, this is when you can begin taking those courses. Choose electives wisely based on what you have enjoyed so far, as they will shape your future academic and career decisions.

There are plenty of opportunities for mentorship, such as being a DAMP mentor or a TA for first-year courses. You can also get involved in Inter IIT competitions, including technical events. The second half of the year brings election season, which can get intense, so be prepared for a shift in campus dynamics; but don't lose yourself in the process.

Academic Years

Cruising towards the Horizon: Year IV

Your final year at IIT Bombay is here, and with it comes the most flexible academic experience yet. Whether you're diving deeper into aerospace through department electives, exploring interdisciplinary courses from other departments, or finishing up your minor or honors requirements, this is the time to tailor your coursework to your future plans. Just be sure to keep track of your credits, complete all requirements, and retag courses if needed.

For those heading into placements, the process is intense—resume building, mock interviews, and apping can be overwhelming. If you're still undecided between core and non-core career paths, don't stress—many people make that decision well into their fourth year. Many students also begin preparing for higher studies, whether that means taking the GRE, GMAT, GATE, CAT, TOEFL, or other relevant exams.

Outside of academics, this year is about making the most of your time with friends. Single rooms bring a newfound sense of independence, but they also mark the beginning of a more reflective phase—your last fests, last inter-hostel events, and possibly your last time living on campus. Whether you're applying for jobs, research positions, or graduate schools, it's a whirlwind of deadlines and decisions. But amid all this, take a step back and appreciate the journey. These four years have shaped you, challenged you, and prepared you for whatever comes next. Now, it's time to fly.

Guide to projects

1) Perks of getting into one

Before we deep dive into the details of all the projects, a question generally arises as to what purpose or perks do these projects provide, why should someone even spend their time into one if they are already occupied with their curriculum/extracurriculars in the institute. But it turns out that whatever career path one follows, projects become an utmost necessity or add up a lot of importance in research or even the industry/corporate world, since they add up to your hands-on skillset and provide a practical experience of all the theory which we study through our courses. It is one of the most standing out factor reflecting in your C.V/resume. Moreover availing the research related Letter of Recommendation from the professor/guide also adds another benefit for internships/higher studies

2) Identifying areas of interest/research

- Apart from the core courses which are compulsory for all students to accomplish, IIT Bombay provides a lot of flexibility to its students in taking up other extra courses as per their interest either as electives or as additional learning courses
- One can always get to know what his/her areas of interest are by taking up a variety of courses, be it in core engineering, finance, management or data science
- One can also participate in the club events/competitions/activities of the seeming area of interest to know further and gain some practical knowledge of that field
- After this stage is when a student gets eligible to make a decision of what project he/she wants to get involved in as a long term committment

3) How to get into a project?

Depending on the type of a project, the procedures for taking them up have been listed separately

- Credited projects (SLP, BTP, RnD Projects)
- Non-credited projects (SURP/WURP/Self)

a) Credited projects

This category of projects is the one which will be reflected on the ASC portal as an equivalent to a 6 or 12 credit course and would be evaluated by the guide under whom the project was done. This is common to both the Supervised Learning Project (SLP) and the B-Tech Project (BTP). However, the requirements/guidelines for each of the category differ slightly:-

• Supervised Learning Project (SLP)

A student can take up a maximum of 2 SLPs (each being an equivalent of a 6 credit course), and before taking up one, he/she has to find a suitable guide from the department under whom he/she wishes to undertake the project

- The student selects a project topic aligning with the guide's research interests through mutual agreement
- The guide provides an SLP form, which must be filled and signed by both parties and submitted to the department office for registration.
- The student must register for AE219 (1st SLP) or AE419 (2nd SLP) on the ASC portal under any category (e.g., Department Elective, ALC).

- The guide holds periodic meetings to review progress and address challenges.
- Evaluation is based on the final report submission and a presentation before an external examiner.

<u>NOTE</u>: Generally recommended from 4th semester onwards. Project completion within a single SLP (one semester) is not mandatory. Grading is based on effort, enthusiasm, and sincerity. A student may continue the same project as a 2nd SLP or switch to a new topic under the same or a different guide.

a) Credited projects (continued)

• B-Tech Project (BTP)

A student can take up this project in the 3rd or 4th year, completing both BTPs in consecutive semesters. BTP-1 is 6 credits, BTP-2 is 12 credits, and both are mandatory for an honors degree in Aerospace Engineering.

- Register BTP-1 (AE 493) and BTP-2 (AE 494) on ASC and complete formalities with the guide.
- Both BTPs must be under the same guide; continuation to BTP-2 requires guide's approval.
- Exceptional performance in BTPs can qualify a student for the Undergraduate Research Award (URA-02) with guide's consent.

• RnD Projects

Various departments like Electrical Engineering, IEOR, Koita Center of Digital Health runs their own RnD project courses which can be registered through ASC. One just needs to register to the respective course code for RnD project for the department on ASC and complete formalities with the guide. Following are some of the courses:

- Koita Center of Digital Health: DH307 - RnD Project
- Industrial Engineering and Operational Research (IEOR): IE688 - RnD Project
- Electrical Engineering - EE691 - RnD Project

b) Non-Credited projects

These category of projects are those which should be undertaken if a student is interested in a particular domain and desires to strengthen his/her profile in an research domain. Following are the diffenrent sub-categories of these projects:-

• SURP/WURP

SURP/WURP are research projects lasting around 3 months, managed by EnPoWER. The Department Research Committees (DRCs) coordinate with professors to bring these projects to their respective departments. The process of undertaking these projects is straightforward.

• The registration portal opens every Summer/Winter, during the semester breaks and a number of projects are offered under several departments
• A student may apply to any of the project irrespective of his/her department purely based on his/her research interests. Generally a priority order is required to be filled on the portal

• Based on the assignment done, a student gets shortlisted for an interview to be taken by the respective professor
• Based on the interview performance, the professor selects the required number of students (which is priorly mentioned alongside the project)

<u>NOTE</u>: A student is expected to dedicatedly work upon the project once selected, to be able to get appreciated by a professor at the end of the project, so that a student gets eligible for URA-01 and also may get an LoR from that professor.

c) Self/Interdisciplinary projects

These projects are flexible and not strictly structured. Students can secure them by directly approaching professors, joining technical teams (with faculty approval), Summer programs or finding opportunities online (e.g., LinkedIn). They can also collaborate with professors from other departments if interested.

• Summer of Science (SoS)

SoS is a research program lasting around 2–3 months, conducted by the Maths and Physics Club (MnP). It provides students with opportunities to explore research-oriented projects in mathematics, physics, and related interdisciplinary areas under the guidance of professors, PhD students, or senior mentors. The process of undertaking these projects is though their website

- The registration portal opens every Summer, during the semester break, and a number of projects are offered across diverse topics.
- Students are selected on the basis of their interest and motivation, and the projects generally emphasize learning new concepts, exploring problem-solving approaches

• Season of Code (SoC)

SoC is a coding program lasting around 3 months, managed by WnCC. It provides students an opportunity to work on open-source, research-oriented, and development projects under the mentorship of senior students. The process of undertaking these projects is through the SoC portal, whose link will be in your mail once the registrations starts.

- The registration portal opens every Summer, during the semester break, and a number of projects are offered across various domains such as AI/ML, systems, and software development.
- A student may apply to any of the projects irrespective of his/her department purely based on his/her interests. Generally, a priority order is required to be filled on the portal.

***For detailed reviews of projects, internships, courses & more head over to the Aerospace DAMP Blog**

Internship & Placement Opportunities

There are diverse internship and placement opportunities available across both core and non-core sectors. Recruiters represent a wide range of industries, including core engineering, data science, finance (banking), healthcare, retail, technology startups, information technology, automotive and manufacturing, machine learning, and supply chain management, among others.

Core Opportunities

Gulfstream Aerospace, based in Savannah, USA, is a top recruiter, selecting 4 students annually. Startups like Kalam Labs also participate through the placement cell. Students secure roles at prestigious firms like Jaguar Land Rover (JLR), Bajaj Auto, and Siemens, while core engineering companies such as Ideaforge, SLB, and SINE actively recruit. through the placement process.

Tech Opportunities

Leading tech companies actively recruit for internships/placements, including Google, Microsoft, Amazon, Adobe, Sprinklr and Nvidia for a variety of roles. Startups like Ola and Abacus.ai also participate through the placement cell. Additionally, banking firms such as American Express, Deustche Bank offer opportunities in Data Analyst role.

Non-Tech Opportunities

A variety of non-tech opportunities are available across consulting, finance, and FMCG sectors. Top consulting firms like BCG, Bain, and McKinsey recruit actively, while FMCG giants such as P&G, HUL offer exciting roles. Finance and analytics roles are available at companies like Goldman Sachs and AMEX. Additionally, startups and firms like Meesho and Flipkart offer product management roles.

External Opportunities

Apart from the placement cell, many students secure internships through independent applications via LinkedIn, networking, and direct outreach. Several funded programs, such as MITACS, Charpak, Think Swiss, and Caltech SURF, provide international research opportunities. Additionally, students can apply for internships at premier Indian research organizations like DRDO labs, HAL, NAL, IIST, and ISRO.

Opportunities for Higher Studies

1) Exams & Application Process

- In India, M.Tech/MS and Dual Degree programs require GATE, with <100 rank for core IIT Aerospace. Apply via COAP or institute portals.
- In the USA, MS/PhD admissions need TOEFL/IELTS (some require GRE), strong SOP, LORs, and projects, with deadlines from September to December.
- Europe requires IELTS/TOEFL (GRE rare) with funded options via Erasmus and DAAD; deadlines are December–March. Canada offers research-focused MASc/MS programs (IELTS/TOEFL, GRE mostly optional).
- Singapore (NUS, NTU) and Australia have strong aerospace hubs requiring TOEFL/IELTS (GRE optional); UK offers 1-year MSc (expensive, no GRE). Japan/South Korea require language skills, TOEFL/IELTS, and sometimes GRE.
- Funding options include DAAD, Erasmus, Fulbright, MEXT, and Commonwealth, plus RA/TA roles in the US/Canada. Tip: Start prep in 3rd year, track deadlines, and email professors early for research MS/PhD.

2) Popular Choices Amongst IITB Seniors

Aerospace engineering graduates from IIT Bombay commonly pursue higher studies at top global institutions renowned for their programs and research. For master's degrees, popular destinations include leading US universities such as Caltech (which offers combined PhD and master's tracks), MIT, Stanford, Georgia Tech, and the University of Michigan, as well as ETH Zurich, where master's admission is accessible but PhD spots are highly competitive. Those interested in professorial careers often target US PhD programs, while students aspiring to become engineers or research scientists in industry favor EU PhDs due to their industry-oriented focus.

2) Popular Choices Amongst IITB Seniors (Ctd.)

Reputed Australian institutions like the University of Queensland and Monash University (noted for research collaborations with IIT Bombay), as well as TU Delft in the Netherlands, are also top choices—particularly for their strong aerospace offerings. NUS in Singapore is preferred for its structured PhD programs, and KAIST in Korea attracts students aiming for turbulence research. Other notable universities include RWTH Aachen (Germany), HKUST and CUHK (Hong Kong), and KAUST (Saudi Arabia) for its excellent experimental research and funding. Overall, graduates tend to prioritize prestigious universities for master's degrees, while for PhDs, the choice of research advisor often outweighs the university's name.

3) Foreign Universities in Partnership

IIT Bombay has established extensive international collaborations for advanced research and dual/joint PhD programs across several countries. In Australia, it partners with Monash University through the IITB-Monash Research Academy (Joint PhD), Curtin University and The University of Newcastle (Cotutelle/Joint PhD programs), the University of Wollongong (Dual PhD), and the University of Sydney (PhD Co-Supervision). In Singapore, joint doctoral programs are available with the National University of Singapore (in Advanced Engineering Materials) and Nanyang Technological University. U.S. partnerships include joint and cotutelle doctoral and master’s programs with Washington University in St. Louis, The Ohio State University, and Rensselaer Polytechnic Institute. Canadian collaborations exist with Université du Québec à Trois-Rivières and the University of Alberta. In the UK, there is a Cotutelle PhD arrangement with Nottingham Trent University, while Germany's Technische Universität Braunschweig, Italy's ICTP (Trieste), and Japan’s Tohoku and Hiroshima Universities offer PhD co-supervision and joint/dual PhD opportunities. Further partnerships exist with Samara National Research University (Russia), three leading universities in Taiwan, and the United Arab Emirates University, all supporting co-supervision or Cotutelle PhD programs. These partnerships provide IIT Bombay students with significant international exposure, joint degrees, and collaborative research opportunities at prestigious global institutions.

Guide to Sem-Ex

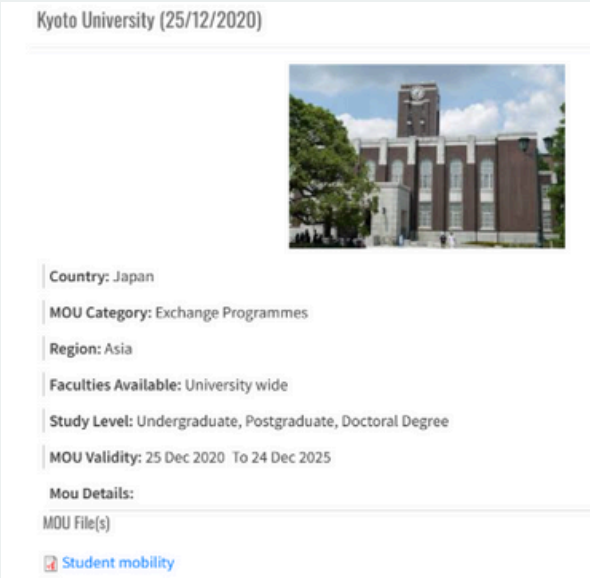
What Sem-Ex is

A Semester Exchange at IIT Bombay is an academic program that allows students to spend one semester at a partner university abroad, while continuing to be enrolled at IITB.

During the exchange, students take courses that can be credited toward their degree at IIT Bombay, gaining exposure to different teaching methods, research environments, and cultural experiences. The program is designed to broaden students' academic horizons, build international networks, and provide valuable global exposure, all while maintaining progress in their home degree program.

MOUs

Students at IIT Bombay have the opportunity to engage in coursework and research projects at partner institutions with which IIT Bombay has a Memorandum of Understanding (MOU). The details of these collaborations, including available schemes for student exchanges and research work, are accessible via the International Relations (IR) website. Students can log in through their LDAP on the following website https://www.ir.iitb.ac.in/en/all-mou-s-login



Kyoto University (25/12/2020)

Country: Japan

MOU Category: Exchange Programmes

Region: Asia

Faculties Available: University wide

Study Level: Undergraduate, Postgraduate, Doctoral Degree

MOU Validity: 25 Dec 2020 To 24 Dec 2025

Mou Details:

MOU File(s)

Student mobility

Process of Applying

Step 1: Check MoUs: See the list of IIT Bombay's MoUs with international universities (IR website).
Step 2: Plan Academic Calendar: Ensure your visit aligns with IIT Bombay's academic schedule.

For Coursework

- Identify host university and list the IITB courses you would otherwise take in that semester.
- Match them with equivalent host courses (prepare a table).
- Mention SPI/CPI, attach transcript (ASC).
- Get prior permissions if courses are:
  Minor-related: Approval from the concerned department.
  Honors-related: Approval from your HoD.
- Select 2–3 backup courses in case primary ones aren't offered.

For Project/Research Work

- Plan project/research with your IITB BTP/DDP/MTP guide.
- Contact a host university professor for acceptance (guides may help via their contacts).
- Once accepted, follow the same remaining steps as coursework students.

Step 3: Write to Dean IR

- Address a letter to Dean IR via HoD requesting approval.
- Mention courses/project plan abroad (to substitute IITB courses/projects).
- Attach latest grade sheet (CPI included).
- Department approval must reach Dean IR ≥15 days before host deadline.

Step 4: Nomination & Application

- After HoD approval, Dean IR connects you to the host university's international office.
- Complete online application; also send signed physical forms (countersigned by Dean IR) to host.
- If applications > seats → students shortlisted by CPI.
- Dean IR forwards approved applications to UGAPEC/PGAPEC convener.

Step 5: **Admission Decision**

- Final admission decision rests with the host university.
- You may proceed only after receiving Academic Office permission letter.

Step 6: Finances

- Usually borne by students; IIT Bombay has no funding mechanism.
- Some MoUs include financial support (check IR website).
- Some host universities provide free accommodation or have scholarships/awards.
- Some allow part-time on-campus work (including research projects).
- Students must find such positions independently.

Before Proceeding for exchange

- Sign and submit the Declaration Form (PDF/DOC) to Dean IR office.
- Submit a photocopy of offer letter from the host university to Dean IR office.
- Discuss with Hostel Hall Manager whether you wish to retain or vacate your hostel room.
- Pay semester fees at IIT Bombay.
- Complete additional Academic Office formalities (leave application, semester registrations, etc.).

While at host University

- Any changes in the approved course plan must be cleared with your faculty advisor and approved by your department, then sent to Academic Office.
- Ensure timely payment of IIT Bombay fees, even while abroad.
- Share the Dean IR office address to receive a copy of your grade card, or submit a copy later for records.

After returning to IIT Bombay

- Write to your HOD requesting credit transfer, attaching:
  - Grade card from host university.
  - Copy of earlier HOD approval.
- Department forwards the Grade Conversion Form to UGAPEC/PGAPEC convener.

For PhD Research Scholar Exchanges

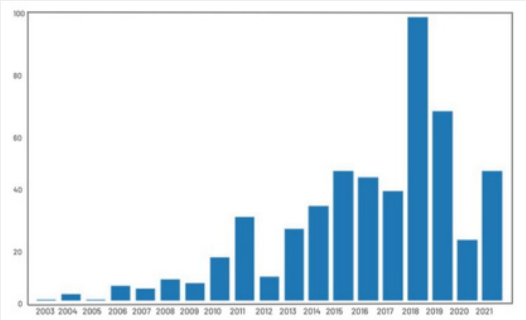
- Most MoUs allow exchange of PhD research scholars, though some are restricted to specific research areas.
- Some MoUs include financial support, which can be availed with HOD and PhD guide approval via Dean IR.
- Research plan must be approved by PhD guide.
- PhD students must find a co-guide at the host institution, with IITB PhD guide's approval.
- If host faculty is to be included as co-guide, formal approval from Dean AP is required.

Trends and Statistics

- Over the past few years, around 20 students from the Aerospace Department have participated in semester-long exchange programs across reputed universities worldwide.

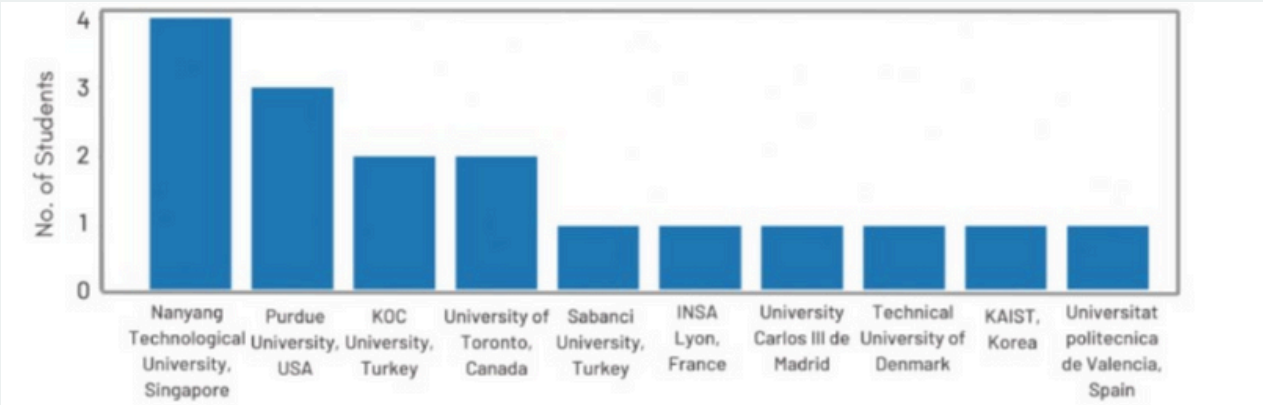
- The most popular destination has been Nanyang Technological University (NTU), Singapore, owing to its proximity, strong academic reputation, and relatively straightforward visa process. Other partner institutions include the University of Toronto (Canada), Koç University (Turkey), and Purdue University (USA), among others.

- While the COVID-19 pandemic caused a temporary decline in participation from 2019 onwards, the number of students opting for exchange has been steadily rising again in recent years



No. of Students outgoing each year

- On average, 1–2 students per year opt for the exchange program. Participation is most common during the 3rd year Spring semester and the 4th year, since these periods have fewer mandatory courses, providing greater academic flexibility.



Final Note :)

It goes without saying: enjoy your exchange experience! For any queries not covered here, students are encouraged to contact the Dean IR office. We wish you Good Luck on your exchange journey!

Department Celebrations

The Aerospace Department is also known for its formal as well as informal celebrations/events for the benefit of the department and its students. These events make the department more united and foster student-student as well as student-professor interactions, as the professors also join in for these events. The events which happen every year in the department as a part of the celebrations are as listed (approximately in a chronological order):-

1) Department formal orientation

This event, typically held at the start of the semester, serves to introduce freshers to key aspects of the department. The Head of Department (HoD), along with several faculty members, attends the event, and a special guest invited by the HoD shares their experiences. Students are provided with a broader understanding of the department, followed by lab visits where they can explore various testing facilities. The event is a collaborative effort between the department council and the DAMP team, with strong involvement from the HoD, and is supported by PhD students and lab in-charges who help facilitate the lab tours.

2) Convocation ceremony

This event is organized for the graduating batch, featuring the Head of Department (HoD), a Chief Guest, and several faculty members, who together preside over the degree distribution ceremony. The event has a formal tone, with much of the time dedicated to speeches by the HoD and Chief Guest, offering their best wishes to the graduating students for their future endeavors. Following the degree distribution, refreshments, including tea and snacks, are provided to conclude the event.

3) UG/PG freshers Informal Night

This informal gathering, organized by the department council, aims to bring the new batch together in a fun and relaxed setting. Featuring refreshments, unique games, performances, group photos, and prize giveaways, it fosters bonding and interaction within the batch. Held on weekends after quizzes, separate events are arranged for UG and PG freshers to ensure a tailored experience, making it an evening of entertainment and connection.

4) Intra Department Sports Meet

The department-wide sports event brings together UG, PG, and PhD students for friendly competition in cricket, badminton, volleyball, basketball, table tennis, and more. Teams, typically formed by batchmates, compete against juniors or seniors. Winners receive medals or trophies from the department council, which organizes venues and equipment. The event runs in two phases for smooth management, with new sports like Tug of War introduced based on student interest.

5) Department Traditional Day

This is the department's most anticipated event, held in the spring semester, where students and professors gather for an informal celebration. Organized by the department council, it features traditional attire, student performances, games involving students and professors, and plenty of entertainment. The evening concludes with batch photos and a council-arranged dinner, with fun brochures adding a special touch to this cherished event.

6) Informal Valedictory Function

This event is specifically organized for the graduating batch and is held by the department council before their official graduation. It serves as a final gathering for students to celebrate and bring a meaningful close to their journey together in the department. While the attire is formal, the event itself is filled with fun and informal activities, such as the presentation of humorous and informal awards based on different traits or achievements, as nominated by their peers. In addition to the awards, various games and performances are arranged to keep the atmosphere lively and engaging. Toward the end, each student receives a special gift from the council as a memento of their time in the department. The event typically begins with a cake-cutting ceremony and a group photo, setting the tone for an evening of celebration and memories.

Recent Department Achievements

IIT Bombay Aerospace Engineers Develop Needle-Free Shock Syringe

December 26th, 2024

Prof. Viren Menezes' team from IIT Bombay's Aerospace Engineering Department has created a shockwave-based needle-free syringe for painless drug delivery. Using aerospace principles, the device generates shock waves to propel a microjet of medication through the skin. Tested on rats, it showed effective drug absorption, minimal tissue damage, and faster healing, demonstrating aerospace engineering's potential in medical innovation

IIT Bombay Aerospace Engineers Lead National and Maharashtra Drone Initiatives

March 5th, 2024

Prof. Arnab Maity from IIT Bombay's Aerospace Engineering Department, along with faculty from IIT Bombay and other Indian institutes, is leading major government-funded drone projects. These initiatives focus on developing and deploying advanced drone technologies for various applications, fostering. industry collaboration, and enhancing critical infrastructure. They also include training programs to improve proficiency and public awareness of drone technology.

IIT Bombay Aerospace Teams Excel in NACDeC Competitions

August 31st, 2025

IIT Bombay's aerospace engineering teams have consistently excelled in the National Aerospace Conceptual Design Competition (NACDeC), securing first place in NACDeC VII & V, and second place in NACDeC VI & IV. Their success highlights the institute's strong expertise in aerospace design & innovation, reinforcing its leadership in cutting-edge aviation and space technologies.

Follow us on our Insta Page:
https://www.instagram.com/aero_damp_iitb/

A huge shoutout to the Aerospace DAMP Team 2024-25 for having laid the foundation of this handbook!

Disclaimer & Feedback

We have made every effort to ensure that the information presented in this handbook is accurate and up to date. However, some details may be subject to change or contain inadvertent errors. We recommend verifying critical information through official sources.

We welcome your feedback and suggestions to help us improve the content and presentation of this handbook. Please feel free to share your thoughts with us directly through the contact numbers provided below.

Aerospacae DAMP Team 2025-26

Please reach out to either of us for any queries/suggestions!
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