1 Challenge Introduction

The International Space Challenge (ISC) is an annual technical design competition organised by the Space Faculty Pte Ltd. It challenges university students and youths from 13 years old to design complex space-related, high-technology projects that are largely graded based on creative engineering. ISC captures the imagination of youths and directs their creative enthusiasm towards developing innovative science and engineering solutions across many fields.

The challenge is split into two tracks: Starter and Advanced to better engage youths of all ages, educational backgrounds, and skill level. The starter track focuses on youths aged 13 to 18 years old and is designed to raise awareness about the diversity of the Space Tech Industry and spark their curiosity to explore more. The advanced track, on the other hand, is structured to hone the skills of youths who are already interested in the field and aim to pursue a career in the space and related high technology industries. Advanced category proposals are highly innovative with potential for further development after the challenge to increase their TRL.

1.1 Categories

	Starter Category	Advanced Category
Age	13 – 18 years old	15 – 25 years old
Objective	Design a practical engineering solution that leverages small-scale in-space manufacturing (ISM) capabilities to improve the daily life, efficiency, or safety of a human-crewed habitat in Low Earth Orbit (LEO) or a future cis-lunar outpost.	Develop an integrated, high-fidelity In-Space Servicing, Assembly, and Manufacturing (ISAM) system and mission architecture optimized for the construction, assembly, or repair of high-performance, high-specification space infrastructure.
Prizes		
Grand Prize	SGD 2,000 (x1)	SGD 10,000 (x1)
Distinction	SGD 1,000 (up to 2)	SGD 1,000 (up to 2)
Merit	SGD 500 (up to 3)	SGD 500 (up to 3)

* All ISC participants will get **free entry** to Expand Space

1.2 Eligibility

- Age as of 31st December 2026:
  - Starter: 13 to 18 years old
  - Advanced: 15 to 25 years old
- Teams: 2 to 4 members
- Any educational background, STEM or non-STEM
- Any nationality and based anywhere in the world
- Open to students and early career professionals
- Valid e-mail address

1.3 Timeline

The 19th ISC will run from March 2026 and conclude with the Awards Ceremony to be held around October to November 2026.

The tentative schedule is as follows:

Dates (2026)	Activity	Mode
2nd February 2026	ISC Opens	Singapore & Online
March to 1 September	Registration	Hybrid
1 July to 1 September	Webinars, talks, expert sessions, hang outs	Singapore & Online
September	Mentoring Sessions	Online
October	Project Submissions	Online
October - November	Awards Ceremony	Singapore & Online

1.4 Communication Channels

All official communication related to the competition will be conducted through the following primary channels:

1. Official website
2. Email addresses provided during registration
3. Space Faculty Learning Portal
4. Discord Server

Website

Participants are encouraged to regularly check the official competition website at www.spacefaculty.asia for important announcements, updates, and notifications.

Email Communication

Important information will be sent to the email addresses provided during registration. Participants must ensure that the email address provided during registration is accurate and regularly monitored. The organizing committee will not be responsible for any consequences arising from participants not receiving important communications due to wrong addresses, unchecked or wrongly filtered emails.

Space Faculty Learning Portal

Participants are required to join the official Space Faculty Learning Portal at www.spacefaculty.co using the provided invitation link you will receive upon registration. Recordings of the webinars as well as mission brief documents and other relevant slides or data will only be available on our learning portal.

Discord Communication

A dedicated Discord server will be set up for the competition, serving as a platform for real-time communication, community interaction, and updates. Participants will be able to join the official Discord server using the *provided invitation link upon registration*. Important announcements and clarifications may be made through Discord, and participants are expected to check the relevant channels regularly.

2 Challenge Overview

In-Space Servicing, Assembly, and Manufacturing (ISAM) is a transformative field that involves the **fabrication, assembly, or integration of tangible goods beyond Earth's atmosphere**. By leveraging the unique conditions of space—such as microgravity and a high vacuum—ISAM enables the production of components for satellites, space stations, and deep-space habitats that would be impossible or inefficient to produce on the ground.

This **19th edition of the International Space Challenge** invites participants to push the boundaries of their engineering knowledge by exploring applications in ISAM for the benefit of Earth's orbital infrastructure and the advancement of deep-space exploration. The challenge encourages teams to look past traditional ground-based manufacturing and design solutions centered on four key industrial pillars:

- **Bypassing Launch Constraints:** Manufacturing in orbit decouples spacecraft design from the extreme structural stresses and volume limitations of a rocket fairing. This eliminates the **"structural mass penalty"**—where a significant portion of a satellite's mass is dedicated solely to surviving launch vibrations—allowing for ultra-lightweight, high-performance systems optimized purely for the space environment. It enables the deployment of **unconstrained infrastructure**, such as massive telescope apertures or solar arrays, that far exceed the stowage dimensions of any existing launch vehicle.
- **Mission Agility and On-Demand Logistics:** Traditional space operations are hindered by rigid and infrequent launch schedules. ISAM enables a shift toward a **"just-in-time" manufacturing** paradigm, allowing for the immediate production of tools, replacement components, or mission upgrades in response to real-time operational needs. By eliminating the months-long wait for the next available launch window, on-demand manufacturing significantly increases mission resilience and reduces the downtime of critical orbital infrastructure.
- **Resource Circularity and ISRU:** This pillar focuses on a sustainable "Circular Space Economy" by recovering and recycling materials from orbital debris or utilizing **In-Situ Resource Utilization (ISRU)**. By converting raw lunar or asteroidal regolith into functional infrastructure, missions can significantly reduce their "Earth-dependency." This is critical for long-duration human presence on the Moon and Mars, where transporting every kilogram of material from Earth is economically prohibitive.
- **Gravity-Independent Advanced Manufacturing:** Participants are encouraged to leverage microgravity to produce high-value materials that are physically impossible to create on Earth. Without gravity-induced convection or sedimentation, space

factories can achieve near-perfect purity in semiconductors, specialized alloys, and high-bandwidth optical fibers like **ZBLAN**. These space-manufactured products offer capabilities that far exceed their terrestrial counterparts, opening new commercial markets for Earth-bound applications.

Throughout the challenge, participants will move beyond fundamentals to derive theoretical models, design prototypes, and create simulations/mock-ups of their creative solutions. A series of webinars, mentoring sessions, and technical resources will guide teams through the engineering requirements, material science, and regulatory considerations necessary to thrive in this demanding environment.

19TH ISC THEME

In-Space Servicing, Assembly and Manufacturing

2.1 Challenge Statement

Teams are tasked with designing an In-Space Servicing, Assembly and Manufacturing (ISAM) system / solution that addresses a key aspect in space technology. Ultimately, the goal of the proposed solution is to improve the mission outcome, optimize resources, or provide optimized system for Space performance rather than launch survivability.

2.2 Starter Category: Orbital Outpost Innovators 🚀

Target Audience: Secondary School, Junior College (Ages 13-18)

Challenge Statement:

Design a practical engineering solution that leverages small-scale in-space manufacturing (ISM) capabilities to improve the daily life, efficiency, or safety of a human-crewed habitat in Low Earth Orbit (LEO) or a future cis-lunar outpost. Your solution must demonstrate how on-demand production can reduce reliance on Earth-based resupply.

2.2.1 Focus Tracks (Select One)

Focus Track	Challenge Objective	Key Considerations
Track 1: On-Demand Crew Tools & Spares	Design a **simple, yet useful tool or replacement part** (e.g., a specialized wrench, a drawer handle, a small camera mount, a valve adapter) that could be 3D-printed inside a habitat.	Justify the need for the part, select a space-ready polymer material (like ABS or PLA), and provide a basic design file (e.g., a 2D drawing or a simple 3D model sketch) with printing parameters.

Track 2: Waste-to-Resource Cycling	Develop a **conceptual process** for converting a common waste material generated by the crew (e.g., plastic food packaging, used textiles, CO2 filters) into a usable feedstock for an on-board 3D printer.	Diagram the recycling process flow (collection, cleaning, breakdown, extrusion), identify the new material (filament) produced, and suggest one new product that can be manufactured from this recycled material.
Track 3: Microgravity Utility Design	Design a small, modular utility component (e.g., cable clip, experiment fixture, protective cover) that takes **direct advantage of microgravity** (e.g., relies on surface tension, unique fluid dynamics, or reduced stress) for its functionality or manufacturing.	Explain the microgravity principle you are leveraging and how the part's design or production method would be superior to or impossible with terrestrial manufacturing.

2.3 Advanced Category: High-Specification Space Infrastructure 🛠️

Target Audience: Polytechnic, University (Ages 15+)

Challenge Statement:

Develop an integrated, high-fidelity In-Space Servicing, Assembly, and Manufacturing (ISAM) system and mission architecture optimized for the construction, assembly, or repair of **high-performance, high-specification space component or infrastructure**. Space infrastructure may include next-generation Earth Observation satellites, advanced orbital platforms, or long-term habitats located in any operational environment (LEO, cis-lunar space, Lunar/Martian surface).

The solution must address the unique challenges of manufacturing complex, precision components outside of terrestrial constraints.

2.3.1 Focus Tracks (Select One)

Focus Track	Challenge Objective	Key Considerations
Track 1: Autonomous Infrastructure Assembly (AIA)	Design a **robotic fabrication and assembly system** capable of constructing a large, pre-designed space structure (e.g., a 100-meter communication antenna, a solar power satellite truss, or a deep-space habitat shield) from pre-launched modules or in-situ manufactured components.	**System Architecture:** Detail the robotic platform(s) (e.g., manipulators, free-flyers), the joining technology (e.g., welding, mechanical fasteners), the modular design of the structure, and the autonomous control/deployment sequence.
Track 2: Extraterrestrial Resource Utilization & Materials (ERUM)	Develop a **complete process for mining, refining, and manufacturing** a critical component (e.g., radiation shielding tiles, optical glass, structural beams) using simulated **lunar or asteroidal regolith** as the primary feedstock.	**Process & Output:** Detail the refining steps (e.g., melting, electrolysis, chemical reduction), the manufacturing technique (e.g., selective laser sintering, casting), and provide an engineering analysis of the resulting material's mechanical, thermal, or radiation-shielding properties.
Track 3: **Open Innovation in ISAM**	Propose a novel and technically ambitious ISAM project not covered by the other tracks. This could involve an entirely new fabrication method, material handling concept, or robotics system (e.g., autonomous recycling of complex space debris into new spacecraft components).	**Novelty and Technical Depth:** Clearly define the specific space problem solved and the unique technology employed. Your submission must include a **detailed technical feasibility study** that covers theoretical justification, a risk assessment, and a preliminary technology readiness level (TRL) evaluation.

2.4 Deliverables

- **Written concept proposal report**:
    - Number of pages (excluding Cover Page, Content Page, References and Annex):
        - **Starter:** no longer than 10 pages
        - **Advanced:** no longer than 40 pages
    - The report should contain:

- Abstract
- Introduction including:
    - Problem statement
    - Literature review related to the selected problem statement
    - Clearly defined objectives of the proposed solution
    - Value proposition and impact
- System Proposal
    - Design
    - Technical challenges
    - Evaluation of current Technical Readiness Level (TRL)
    - (For Advanced category) Preliminary engineering calculations (e.g., mass/power budgets, structural load analysis, or thermal gradient modeling), simulation, and/or prototyping of design and solutions to technical challenges, and propose a pathway for TRL advancement
- Ethical and regulatory considerations (if applicable)
- Preliminary results (if available)**:** Findings from simulations, digital twins, or physical mock-ups.
- AI usage disclosure to develop the proposal project (writing, images, etc)
- Conclusions

- **Starter: A0 Research poster** explaining your project
- **Advanced: Video presentation** explaining your proposal (no longer than 8 minutes)
- *Optional:* a demonstration of the solution or mock-up

2.5 Judging Rubrics

Criteria & Assessment	Max Points
Technical Relevance and Feasibility The proposal is technically sound, feasible for space and clearly explained. Technical challenges and solutions are carefully considered.	**40**
Innovation and Creativity The proposal concept and design are novel, technical innovation and creativity are apparent. The innovation and use of selected technologies is well understood and justified.	**40**

Technical Depth, Sophistication or Thoroughness The proposal design and solution are judged by technical depth of the relevant analysis, sophistication in system architecture, or thoroughness of engineering considerations (including ethical or regulatory where applicable).	**10**
Submission Quality **Report**: The report is easy to read, submission is well-structured and organized, using headings and sub-headings, relevant figures and it's proofread. Report adheres to challenge statement deliverables guidelines. **Starter Poster**: Submission of A0 research poster **Advanced Video**: Submission of video presentation of up to 8 minutes.	**10**
Total	**100**

Bonus Points	Up to
Mock Up or Simulation (10 points) - Team has prepared a mock up or a simulation of the project. Mock up can be presented in person during **Expand Space** (10 points) or over a video recording (5 points) (up to 3 minutes)	**15**
Social Media (up to 5 points) - Social media posts (1 point per post) on one of the following platforms: Instagram, LinkedIn. Space Faculty's account must be tagged, and these hashtags must be used in the post: #SpaceFaculty, #ISC #ISC19 #19thISC, #InternationalSpaceChallenge, #ExpandSpace **(include post screenshots in the submission Annexes!)**	

Rules and Regulations

Teams

- Size: 2 to 4 members
    - we can help you connect with other participants
- Ages (as of 31 December 2026):
    - Starter:13 to 18
    - Advanced: 15 to 25
- Located anywhere in the world
- Any nationality
- From a specific institution or “Independent” if the members are from different institutions
- Participants can join from any educational background (STEM or non-STEM), teams with mixed backgrounds are encouraged.
- Team Name: make sure you **choose a good name and remember it!** If you win, your team’s name will be called!

Plagiarism

- Reports will be checked for plagiarism, and teams with plagiarised content and ideas will be penalized.

Generative AI

- The use of generative AI (e.g. ChatGPT, Gemini, Copilot, DALL-E, Deepseek, Manus, etc.) is allowed for content, image, or video creation within reason, however participants **must include** a section detailing **which parts of the report have benefited from Generative AI** and the **prompts used** to this end.
- Note that **this is mandatory** if you have used GenAI, failure to do include this statement will be penalized when use of Generative AI is detected by the review committee.
- Extensive and non-critical use of such tools (even if reported) will be penalized.

Submission

- We will be sending out a submission form for each team to upload their projects when the submission deadline is approaching.

- Late submissions will not be considered.
- Report should not exceed 10 MB
- Poster should not exceed 1 GB
- Video shall be submitted via URL of your choice through the submission form (Drive storage, YouTube, Vimeo,...) – make sure we have access to it!

Language

- Reports, posters and presentations must be submitted in English.

Participation Certificates

- Digital participation certificates will be sent to all members of teams who submit the proposal and complete the feedback form at the end of the challenge.

Intellectual Property

- Space Faculty will not retain the intellectual property rights of the submitted ideas; however, Space Faculty reserves the right to use certain materials for marketing purposes.

Prizes

- Prizes worth up to SGD 25,000 distributed amongst the winners of the different categories.
- Participation Certificates by Space Faculty and supporting organizations.
- Winners of any cash prize/award may select one of the following modes of collection: a) Collection of a cheque in person during the award ceremony; or b) Bank transfer to the winner's nominated bank account.
- Winners who opt for bank transfer acknowledge and agree that any bank charges, administrative fees, or transfer fees will be determined by the relevant bank and shall be borne by the winner. **Such charges may be deducted from the prize amount where applicable.**
- The organiser reserves the right to request necessary banking details and supporting documents for verification purposes.

Failure to adhere to ISC's Rules & Regulations can result in team disqualification.