INTERNATIONAL® SPACE UNIVERSITY

35th SPACE STUDIES PROGRAM

26 June - 25 August

2023

São José dos Campos - SP - Brazil

RETROSPECTIVE REPORT

NATIONAL INSTITUTE FOR SPACE RESEARCH (INPE)

AERONAUTICS INSTITUTE OF TECHNOLOGY (ITA)

PREFEITURA SÃO JOSÉ DOS CAMPOS

INDEX

DIRECTOR'S RETROSPECTIVE

We have wrapped up another historic Space Studies Program from Sao Jose dos Campos, a smart city, in the beautiful Sao Paolo region of Brazil. The host site for this year's program was the joint campus of National Institute for Space Research (INPE) and Technological Institute of Aeronautics (ITA); and with significant support by the Sao Jose dos Campus Municipality. This year's program hosted 85 in-person (and 10 online) from 30 countries around the world, including first ever participant from Uganda. This year's participant class include 40% of females; and is represented by 66% with Masters, 13% with a PdD, and various professions.

SSP23 showcased (4) Team Projects which included topics related to Space Situation Awareness, Smart Cities, the Metaverse, and Water Security.

As in previous years, the SSP was possible thanks to the voluntary contribution of many of our faculty members, visiting and local lecturers who have generously invested their time and shared their knowledge, and significant support by the municipality of Sao Jose dos Campos. The International Space University (ISU) is very thankful for those who were with us, in person or virtually, and we really believe that, together, we are building the new generation of space leaders that will work to bring benefits of space all humankind. We also hope that the local community has benefitted from the public events we have conducted throughout the summer and enjoyed the discussions with our Distinguished Lecture series as well as the movie in the park. This year there even was an Astronaut public event that was the largest event ever for any ISU activity attended by 5000 STEM students. ISU Alumni Conference once again reunited not only to see the old friends, but also offering a perfect environment for networking and connecting to potential collaborators.

It is important to take the opportunity to thank our hosts, INPE, ITA, and SJdC, for making our staff and participants feel very welcome during their stay.

I would also like to extend our thanks to Team Project Metavisionaries for their generous support, as well as, The Aerospace Corporation, sponsoring several events.

To conclude, I would like to highlight that the SSP aims to give its participants the opportunity to take advantage of many resources, which are the core of this program. One of the most important outcomes of this nine-week journey is the friendships that were created which will allow participants to work in collaboration on many other projects in the future, knowing the importance of culture, diversity, and mutual respect.

As this year's session ends, we thank you for being with us on this journey and we look forward to seeing you for SSP24 in Houston.

Mr. James Lewis
Director of Space Studies Program2023

INTERNATIONAL SPACE UNIVERSITY

The International Space University (ISU) was founded in 1987 by Peter H. Diamandis, Todd B. Hawley, and Robert D. Richards, with the vision to study, explore, and develop space for the benefit of humanity. ISU provides a distinctive brand of space education that is sought after by space agencies, the private sector, and research institutions around the world. True to its founding principles, ISU's education focuses on the three "I"s — International, Interdisciplinary, and Intercultural. Over the past 36 years, ISU has graduated more than 5,400 students from 110 countries. Please note that there were no apparent typos in the provided text.

SPACE STUDIES PROGRAM (SSP)

ISU provides several programs for distinct demographics, ranging from short-term executive programs to one- to two-year Master's programs. However, the Space Studies Program (SSP) is the university's longstanding, pioneering program. It is a graduate-level professional development program conducted since 1988 that offers an intensive 9-week course from June to August in different locations worldwide. The curriculum includes both technical and non-technical space-related fields: physical sciences, engineering, policy, law, business, management, humanities, life sciences, and space applications. It provides hands-on education through workshops and professionals, building a solid platform for individuals starting or changing directions in their space careers.

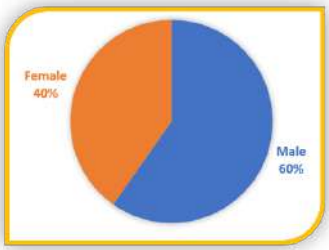
The year 2023 marks the 35th anniversary of the Space Studies Program (SSP), and the International Space University takes great pride in bringing the well-wishes of ISU's founder, Peter H. Diamandis, back to the Space Studies Program (SSP) opening ceremony. This event once again reaches the South American continent and specifically São José dos Campos, officially the first smart city in Brazil. The program was hosted by the National Institute for Space Research (INPE), the Aeronautics Institute of Technology (ITA), and the Municipality of São José dos Campos, with the support of the Brazilian Space Agency (AEB), the Brazilian Department of Science and Aerospace Technology (DCTA), Força Aérea Brasileira, Ministry of Science, Technology, and Innovations. Combined, these organizations represent the best in South American space research, engineering, technology, operations, and policy.

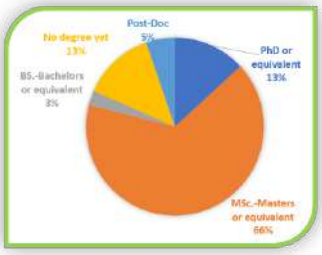


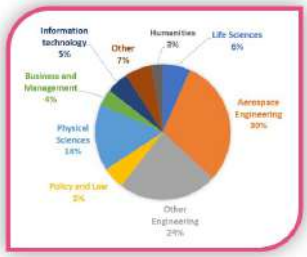
PARTICIPANTS RETROSPECTIVE

The class of SSP23 was composed of 93 participants representing 30 countries from all continents. It was great to have 40% female participants and 60% male participants.

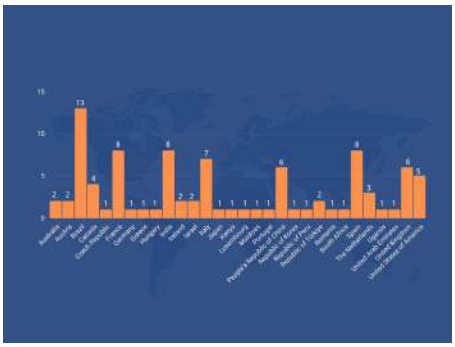
Among our participants, 66% held MSc degrees, 13% were PhDs or equivalent, and 5% were Post-PhDs. They formed an amazing class that delivered high-quality work and exchanged a wealth of knowledge.







Countries Where the Space Studies Program has taken place-Map



FACULTY & STAFF RETROSPECTIVE

The Staff Liaison role is a first for SSP, essentially ensuring that communications flow smoothly between staff and that resources are balanced when tasks are allocated. Bringing together more than 30 people from over 20 nationalities, some with ISU experience and some without, to operate as one family, has been essential since our arrival several weeks before the beginning of the program right through to a week after the participants depart.

It takes a dedicated team to run a SSP. The Teaching Associates are participant-facing and interact almost daily with their Departments or Team Projects. Other critical roles include Academics to plan the curriculum, Logistics to keep everyone housed, fed and moved, External Relations to communicate what we do and coordinate public events, IT to keep us all connected, Finance to spend our budget wisely, and a new Accessibility and Inclusion role this year to look after those who require special attention. And not forgetting the Participant Liaison who engages with the people at the heart of the program, and the Faculty Liaison who is the critical link between the Teaching Associates and the instructors. Last but not least, we have been warmly hosted by the Local Organising Committee, who have committed so much time and energy to support our program.

Almost all staff are volunteers who have given up their time, and some cases salaries, to be part of the special team running SSP23. We have had our fair share of ups and downs, long days and late nights, tears and hugs, but we are all united by our passion for space and for creating the unique ISU experience for our participants. There is no SSP without you, so a heartfelt appreciation to each and every one of you!

WHAT ARE THE BENEFITS OF DOING AN SSP?

International exposure

SSP offers participants the opportunity to meet with the space industry's top experts, leading scientists, and administrators from space agencies, private companies, nonprofits, and research institutions from around the globe. While this gives them unprecedented access and exposure unlike any other, participants also gain personal connections with the space industry's world leaders.

International, Interdisciplinary teams

SSP groups and teams combine participants from all national, professional, and educational backgrounds to develop the skills required to work in global teams. Bringing together these diverse perspectives creates a rich environment in which peers can learn from one another to accomplish common goals.

Knowledge in all fields of the space sector

For nine weeks, participants are exposed not only to their field of expertise but also to other related subjects that impact their area of interest. These subjects encompass engineering, sciences, applications, policies, economics, law, management, business, arts, human sciences, and space performance.

Cultural exchange

Living and collaborating with participants worldwide fosters cultural understanding crucial for today's industry built on global teamwork. SSP goes beyond technical aspects, encompassing cultural learning through daily interactions, fostering respect and appreciation for diverse backgrounds — a vital skill in the increasingly international space sector.

Networking for life

The SSP experience doesn't stop after SSP ends. Years, even decades after their SSP, participants acquire a wealth of opportunities through a network of alumni scattered across the globe. This provides SSP participants with better opportunities within the space sector.



ACADEMIC RETROSPECTIVE

The Space Studies Program (SSP23) was held in person in São José dos Campos, Brazil, and we are extremely grateful to our wonderful hosts for welcoming us to their facilities and for supporting the delivery of the SSP23 Academic Curriculum. The SSP23 program was organized both for onsite participants and for online participants, as follows:

For the onsite participants, from a total of nine weeks of the SSP23 program, the first six weeks were held at the Aeronautics Institute of Technology (Instituto Tecnológico de Aeronáutica – ITA), where the SSP participants attended activities such as: (i) **Core Lecture Series**; (ii) **Departmental Activities**; (iii) **Team Projects**, but also (iv) **Fundamental Workshops** and (v) **Elective Workshops**. As highlights of the first six weeks, we can remind the Program Introduction held on Monday, 26 June 2023, where the participants received detailed information about the SSP program from the SSP23 Directors and SSP23 Academic Coordinator. Also, the Department Introductions were organized on Monday, 3 July 2023, when the Teaching Associates presented to the participants the Department activities in more detail, giving the opportunity to the participants to interact with the Departmental Chairs and to submit their department preferences. Also, as in every SSP, the Astronaut Panel held on Wednesday, 5 July 2023 was a key activity for the program, giving the participants and the local public the opportunity to interact and learn more about space activities directly from the invited astronauts. The Core Lectures Midterm Quiz was scheduled on Monday, 10 July 2023, the participants being tested disciplinarily on the first 32 Core Lectures. The Robotics Competition was held on Friday, 14 July 2023, where different teams competed, including a local team, under the supervision of a world leader in robotics. The Final Exam of the Core Lectures was held on Friday, 21 July 2023, comprising of a disciplinary quiz and interdisciplinary essay questions. Finally, the participants attended the academic visit organized in coordination with the Local Organizing Team in Rio de Janeiro, from Saturday, 22 July to Tuesday, 25 July 2023. While the participants took advantage of the professional visits in Rio de Janeiro, they also had time to visit the city as organized by the local team, making the most of it and returning to São José dos Campos full of energy and hype about the SSP23 program. Professional visits as part of the Departmental activities included visits to EMBRAER, CEMADEN, PqTecSJC, AKAER, DCTA-IAE, DCTA-IEAV, CEDEMP and Brazilian Decimetric Array, just to name a few.

For the online participants, the program comprised of attending and contributing to the fifty-five (55) Core Lecture Series. The participants joined daily the Core Lecture sessions by using a Zoom link and contributed by asking questions to the instructors invited.

The last three weeks of the program for the onsite participants were held at National Institute for Space Research, the participants dedicating their time mainly to the Team Projects. As a highlight, we can remind here the TP Internal Review on Friday, 11 August 2023, when the participants presented the status of their work to the ISU team, including to the TP Chairs, SSP Director and SSP Academic Coordinator. The SSP23 participants had to respect several TP deadlines, such as: Preliminary Research and Gap Analysis Report - PRaGAR, Executive Summary and Final Report. The Final Presentations were held successfully on Thursday, 24 August 2023, livestreamed on YouTube, the participants presenting to an international audience their findings in each of the four Team Projects:

- From Slums to Smart Cities, Bringing space-based technology to favelas in Latin America: Pathways to Smart and Inclusive Development.
- Space Situational Awareness, On-Orbit Collision Avoidance.
- SAFEWATERS: Space Applications for Emergencies, Water Assessment, Technological Enhancement, Response, and Security.
- The Role of the METAVERSE in the Future of the Space Sector

CORE LECTURES

The SSP23 Core Lecture Series was comprised of 55 lectures designed to provide all participants with an interdisciplinary, intercultural and international perspective on space activities. The scope of the Core Lecture phase is to provide a baseline of understanding across a range of seven disciplines, covering major areas of the Space sector, as follows:

- 6 Core Lectures dedicated to Space Humanities (HUM)
- 6 Core Lectures dedicated to Policy, Economics and Law (PEL)
- 7 Core Lectures dedicated to Space Applications (APP)
- 8 Core Lectures dedicated to Management and Business (MGB)
- 8 Core Lectures dedicated to Human Performance in Space (HPS)
- 9 Core Lectures dedicated to Space Sciences (SCI)
- 11 Core Lectures dedicated to Space Engineering (ENG)

In summary:

The onsite SSP was divided into three phases:

- **(i) Phase I - Core Lectures**
- **(ii) Phase II - Departmental Activities**
- **(iii) Phase III - Team Projects.**

There were **55 Core Lectures**; 14 Departmental Sessions; and 7 TP Sessions from Week 1 to Week 6. From Week 7 to Week 9, the participants had mainly Team Project Working Sessions. In total, there were **276 contact hours** with the participants, during the 9 weeks of the SSP23 program.

Core lectures were provided both to onsite and online participants, live streamed from the onsite lecture hall, with the online Q&A platform allowing those online to get their questions answered too.

All phases of the program were delivered in English by experts from around the world, coming from Space Agencies, Government, Academia, Space Industry etc., while many of the experts are also alumni of previous programs, offering a variety of international perspectives and insights.

In addition to classroom activities, professionals and experts from industry and academia lead practical activities and took participants on professional visits to a range of space-related locations.

With each SSP being held in a different country, every year brings new opportunities and experts, ensuring every SSP program is unique.

DEPARTMENTS

Space Applications (APP)

Chair: Su-Yin Tan
Teaching Associate: Gauravsingh Cheekhooree

The fundamental objective of the Space Applications department was to unveil the tangible impacts of space technology on our daily lives, transcending theoretical boundaries through immersive, hands-on experiences. Our exploration extended across a spectrum of dynamic activities, offering us insights into the transformative potentials of satellite communication, remote sensing, and geographic information systems (GIS).

A pivotal component of our journey encompassed an introduction to the core concepts of Geographic Information Systems (GIS), which immersed us in the intricacies of spatial data analysis and visualization. Bridging theory with practical application, we seamlessly transitioned by harnessing real-world data, a vital step that empowered us to grasp and utilize spatial insights for addressing real-world challenges. Furthermore, our engagements with prominent Brazilian companies and unprecedented access to segments of military research and development spotlighted the intricate nexus between technology and national security. These immersive insights were supplemented by practical skills acquired in hardware-software image processing and the conceptualization and execution of research projects rooted in the expansive realm of space technology. The amalgamation of industry interactions, enlightening field excursions, and interactive workshops formed a rich tapestry of experiences, collectively contributing to a profoundly enriching and professionally enlightening expedition, enhancing our comprehension of the extensive spectrum of space applications.




1. Ground truth field trip looking at high resolution imagery and comparing them with the visible features from Sugarloaf mountain, one of the best lookout places in Rio.
2. Professional visit at Telepazio Brazil new satellite port for the OneWeb constellation, built only a few months prior.
3. Professional visit at INPE Combustion and Propulsion Laboratory, with the photo taken in front of their propulsion testing equipment.
4. Professional visit at the assembly lines of Embraer, the 3rd biggest civil aircraft producers in the world.

Space Engineering (ENG)
Chair: Todd Mosher
Teaching Associate: Jedrzej Gorski

The Space Engineering department focuses on system engineering and provides interactive workshops which provides the participants to gain experience in all aspects of a space mission life-cycle (from conceptual design to mission operations). The participants will have an opportunity to apply the principals presented in the core lectures. The participants will design, evaluate, build and launch large model rockets. This is a competition based on reaching a target altitude and protecting the payload. The participants will have the opportunity to configure full size lunar rovers (located in Canada). The participants will operate the rovers in a simulated lunar environment to perform a scientific exploration mission. The participants will design and build planetary landers. This landers will be dropped from a high altitude and evaluated on their ability to protect the payload (a raw egg). The participants will train for extravehicular activities (EVA)the same way NASA does, in a pool. The participants will have the opportunity to SCUBA dive and perform an EVA activity. The participants will get to work with and launch high altitude balloons. The final activity of the department is the presentation of the individual projects.




Human Performance In Space (HPS)

Co-Chairs: Farhan Asrar and Judith Hayes
Teaching Associate: Casey Domingo

In the years to come, the world will see a growing number of humans enter the off-Earth domain as we witness the resurgence of space related activities and exploration. Some of those people will be career astronauts and some space tourists, yet all experiencing the impacts of human space flight. With a team of industry experts, this department tackles what those impacts are, psychological, physiological, performative and more.
Human Performance in Space explores the risks and stress factors of spaceflight for both short-term and long-term missions. Looking at not only the in-space effects and their countermeasures, but every step of the spaceflight journey. From analog missions and their importance to both mission operations and life sciences research, to astronaut selection and their training, to the medical support received on the ISS and post flight. Sessions covered the most pressing space bioethics topics of today, such as astronaut bodily autonomy and space colonization.
This department involved both hands-on activities as well as in-depth learning.

- Participants visited Brazil's Paralympic Training Center to learn about how sports medicine is used in space medicine whilst meeting professional para-atheletes and addressing the emergence of parastronauts.
- They heard first-hand accounts from CSA astronaut David-Saint Jacques and NASA astronaut and fellow ISU Alum Jessica Meir.
- HPS took their learning off campus to Campos Do Jordão where participants split into groups and completed team building activities in nature, simulating expeditionary style astronaut training.
- Together with the ENG Department participants experienced a simulation of Extravehicular Activity (EVA) training, performing repair tasks underwater SCUBA diving!




1. Participants Hiking in Campos Do Jordão for their Analog Mission and Team Building Day.
2. Professional Visit to Brazilian Paralympic Training Center
3 & 4. EVA SCUBA training simulation with ENG department.

Space Humanities (HUM)
Chair: Niamh Shaw
Teaching Associate: Harriet Hurley

For as long as humans have existed, we have had a relationship to space, a social and cultural connection that has influenced and driven our curiosity and space exploration. The Space Humanities Department explores this connection, encouraging people to reflect on their own relationship with space and as well the social factors that shape the space industry. In this department we explore the importance of embedding art into STEM to create STEAM. In doing so, highlighting the artistic and human aspects of technological and scientific development, encouraging participants to be creative in order to recognize and solve problems. A big focus of this department is learning how to effectively communicate and engage in outreach projects. By analyzing the interaction between space, science and society, participants learn how to communicate with the general public, tell a story, and help inspire other people.

The participants took part in a 'Zero-Gravity' Acrobatic workshop where they learnt about early astronaut training using harnesses and acrobatic equipment and techniques to simulate micro-gravity conditions. Participants were exposed to the connection between art and space.

We had the opportunity to visit local schools and education centers here in Sao Jose dos Campos that focus on innovative, practical, and creative learning. At CEDEMP, FUNDHAS and CEPHAS, we learnt about the importance of outreach and education that focuses on STEAM, the different ways of implementing this into education and the exceptional results that arise.

We enjoyed learning about communication and storytelling. Practicing telling stories to build confidence and support outreach activities.



1. "Zero-Gravity" Acrobatic workshop
2 & 3. Professional Visit to local schools and education centers in Sao Jose dos Campos
4. Group photo.

Space Management And Business (MGB)

Chair: Gongling Sun
Teaching Associate: Lisa Kucher

Space was previously solely within the purview of governmental bodies. However, now times are changing, and the current space business landscape is characterized by an expanding and diverse array of activities, fueled by technological breakthroughs, entrepreneurial spirit, and international partnerships. Several space companies have emerged in recent years, covering various areas of space exploration, including commercial human spaceflight, satellite services, space tourism, space data and analytics, space cybersecurity, and more. The emerging space sector is now a central component of the space economy, drawing substantial investments and generating great interest. The ISU's Space Management and Business Department (MGB) is shaped by these trends and developments, aimed at preparing space entrepreneurs and successful managers of the future.

Throughout the program, a wide range of topics was covered, including entrepreneurship, business plans, business intelligence, financing and investment, space marketing, communication, legal aspects, and management skills. This comprehensive curriculum ensured that participants were equipped with a well-rounded skill set that goes beyond the usual boundaries of business knowledge.

In total, the department successfully organized 14 different activities, with the added distinction of including two professional visits. Additionally, two activities were jointly carried out in collaboration with the PEL (Policy, Economics, and Law) department, highlighting the program's dedication to interdisciplinary learning and promoting collaboration across diverse fields.

In conclusion, the department's objectives were achieved with notable success. Participants graduated from the program not only knowledgeable about the complexities of the space business sector and its trends but also armed with the practical abilities and insights needed to navigate the intricate landscape of entrepreneurship. The combination of hands-on experiences, networking opportunities, competitive exposure, and interaction with industry professionals culminated in a comprehensive and enriching learning journey.

Participants during the Startup Canvas and Workshop, led by Joerg Kreisel. This workshop focused on the skills and fundamentals necessary to transform a business idea into a viable business model. The participants were divided into two groups, with each team selecting a company topic and creating an initial startup canvas.

During our professional visit to Embraer's production and assembly lines, participants had the opportunity to explore impressive facilities and witness the scale of the Embraer's civil aircraft. Additionally, they had the pleasure of attending presentations by Embraer employees, who shared insights about the company and elucidated its business strategy, marketing techniques, and asset management practices.

Fun times during the Basic Management Skill Workshop, organized by Neta Vizel. Everyone was amazed to learn about effective entry into managerial roles, efficient goal setting, performance management, delegation of authority, and strategies for providing constructive feedback though games and hands-on activities.

Dive into the snapshot from the immersive group workshop led by Jurandir Pistch, Vice President Sales, Latin America & Caribbean at SES. With a specially crafted software, participants delved into a business simulation, encountering lifelike scenarios that held the power to shape the company's strategy and assets. As a rewarding touch, the winning team walked away with delightful presents courtesy of SES.

As we wrapped up our time together in the department, we marked the occasion with the culminating event – the final business competition. It was a day of excitement as each participant showcased their well-prepared business pitches. As a reward for their hard work and dedication, everyone received participation certificates to commemorate this memorable experience.

1. Participants during the Startup Canvas and Workshop, led by Joerg Kreisel.
2. Professional Visit to Embraer's production and assembly lines.
3. Participants during the Basic Management Skill Workshop, organized by Neta Vizel.
4. Participants during immersive group workshop led by Jurandir Pistch.

Space Policy, Economics And Law (PEL)

Co-Chairs: Nicolas Peter and Catherine Doldirina
Teaching Associate: Márcia Luiza Mignone

The Space Policy, Economics and Law (PEL) Department focuses on the why and how behind the development of space policy, regulation, and growing space economy. Participants were involved in a range of lectures, debates and interactions designed to provide an in-depth understanding of what policy and economic developments shape current and future space activities around the world and the international and national legal framework within which space activities are conducted. The Participants became familiar with the drivers of the changing space context.

Experts from space companies, international organizations, space agencies, law firms and academia worked with the participants on topics that included:

- The emergence of new public and private actors in space.
- The political and economic drivers that incentivize countries to invest in space and private actors, including New Space actors to get involved in space projects.
- The Space Economy.
- The drivers and process of adopting domestic space legislation and the differences among different national frameworks.

The final project was a trial simulation of a dispute between two companies in the space sector, in the Chamber of Arbitration. The participants were divided into 3 groups-parties to the dispute and arbitrators. At the end, expert guests commented on the participation of the group and the individual. Suggesting what should have been done, what could be improved and praising what went best. Considering that all the participants were engineers.

Participants during the final project, a trial simulation of a dispute between two companies in the space sector, in the Chamber of Arbitration.

Space Sciences (SCI)

Co-Chairs: Michaela Musilova and Reut Sorek Abramovich
Teaching Associate: Shirrel Assis

The Space Sciences Department is designed to give the participants a thorough overview of the different disciplines and areas of research relevant to space science. This includes everything from biology, chemistry, geology, astronomy and all the way to computer science and engineering, which nowadays go hand in hand with performing space science research. Most of the activities have a hands-on element, in order to acquire some practical experience, such as:

- Celestial photography workshop.
- GIS and water resources database workshop.
- Microbiology and sediments workshop.

A couple of professional field trips were carried out throughout the department activity:

- A visit to "Humanitas" medical school and university in Sao Jose Dos Campos.
- A visit to DBA, LNA and OPD (Brazilian Decimetric Array, and the National laboratory and observatory of Brazil).

The department's goal is to encourage conversations and collaborations among participants from different departments and within the SCI department, and create an environment that enables openminded exploration and inquiry. Therefore, two inter-departmental activities were carried out with the Humanities and the Engineering departments: The joint SCI-HUM activity is focused on science communication so that the participants can learn how to talk about science in an accessible way for the public and refine their presentation skills. The joint SCI-ENG activity is focused on scientists and engineers working together to operate a rover remotely with a scientific payload in a simulated lunar environment.





1. Social department activity in the "Chronos" escape room at Sao Jose Dos Campos.
2. System engineering and requirement validation workshop with Jeremy Mayer.
3. Professional visit at OPD – the national astronomical observatory of Brazil.
4. Astrobiology workshop simulating sediment collection on a different planter.
5. Astrobiology workshop – preparation of samples to incubate and inspect at the Humanitas university.

TEAM PROJECT

WATER SECURITY

Chair: François Spiero
Associate Chair: Lincoln ALves
Teaching Associate: Tirso Velasco

Abstract
Water security is a pressing challenge worldwide, exacerbated by climate change impacts. In Brazil natural disasters like droughts and floods threaten water security, disproportionately affecting disadvantaged communities. This paper investigates Brazil's use of space capabilities for water security, focusing on disaster monitoring, preparedness, response, and recovery. Following an overview of relevant water security concepts and the status of water security in Brazil, this report examines the use of space applications across three specific water security domains. First, remote sensing technologies are examined as a means to track environmental indicators related to droughts, floods, pollution, and landslides for monitoring and preparedness. Secondly, the use of satellite communications, emergency mapping, and navigation satellites are examined for use during disaster response efforts to coordinate and guide relief work. Finally, opportunities to strengthen policies, infrastructure, data capabilities, and community outreach are proposed.

As a result of the work detailed in this report, seven key recommendations to the global space community and engineers and policy makers in Brazil were developed:

- Integrate resilient water regulations with green infrastructure and coordination for agencies and policymakers.
- Combine Green Infrastructure with gray systems; use remote sensing for planning. Target planners, agencies, and disaster management.
- Acquire advanced remote sensing, refine analysis for disaster forecasting. Aim at research, meteorological, and response.
- Study the Earth observation's Value of Information for Brazil, collaborate internationally. Focus on research, trade, and platforms.
- Share radar satellite data, training, exchange knowledge. Target agencies, networks, platforms.
- Engage communities, use satellite for communication and mapping. Focus on education, disaster, Geographic Information Systems.
- Highlight Space Life Support for water security.

While Brazil has made strides in recent years for utilizing space applications for water security, harnessing emerging technologies, improving governance, and enhancing community preparedness can build resilience against intensifying disasters. With strategic improvements across policy, technical, and social domains, Brazil can transition from vulnerability to stability in securing this vital resource.


Space
Applications
For
Emergencies,
Water
Assessment,
Technological
Enhancement,
Response, and
Security
Executive Summary
SSP2023

SPACE SITUATIONAL AWARENESS AND ON-ORBIT COLLISION AVOIDANCE

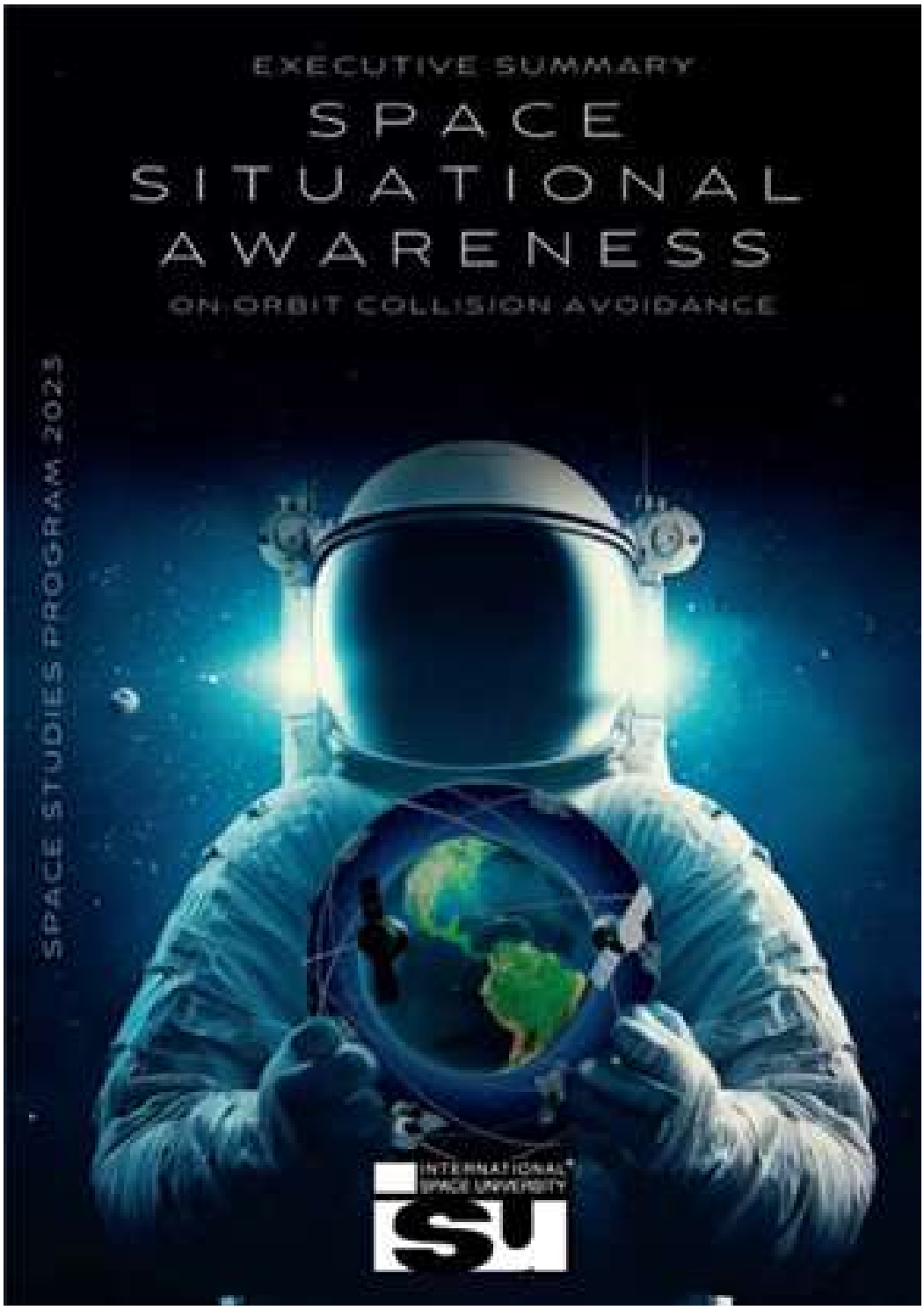
Chair: Eric Dahlstrom
Associate Chair: Carlos Eduardo Amaral
Teaching Associate: Kirils Bistrovs

Abstract
In an age where satellite technology underpins global connectivity, navigation, climate monitoring, and more, ensuring the safety and sustainability of space activities is of paramount importance. The orbital environment is witnessing rapid transformations with the launch of thousands of active satellites, including ambitious large constellation projects like Starlink and OneWeb. This expansion, however, brings forth a significant challenge: the escalating risk of collision of satellites with one another or space debris. Current data suggests that over 7,000 active satellites share orbital space with at least 36,500 medium-sized debris pieces, elevating the risk of potential collisions. The need for a transparent Space Traffic Management (STM) system is evident, and global cooperation is pivotal for the sustainable use of space.

This document presents a novel framework from the study (Murakami et al., 2019) to address the challenges of STM, focusing on accurate data sharing, direct communication, and international collaboration. Furthermore, this report examines the evolution of international space law and policy and identifies an urgent need for harmonization from the establishment of international treaties to the emergence of national legislations.

The ever-evolving challenges of space debris, STM, and Space Situational Awareness (SSA) need future policy adaptations by nations. The report underscores the importance of crafting and enforcing effective national laws and policies to enhance global space governance under the proposed international STM framework. The proposed framework is expected to act as a reference point in subsequent debates around the conceptualization and implementation of international STM.

Overall, this report is a testament to the collaborative efforts of an international and interdisciplinary team, representing a collective vision to ensure that space remains secure and sustainable for all.


EXECUTIVE SUMMARY
SPACE SITUATIONAL AWARENESS
ON-ORBIT COLLISION AVOIDANCE
SPACE STUDIES PROGRAM 2023
INTERNATIONAL SPACE UNIVERSITY
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SMART CITIES IN THE CONTEXT OF LATIN AMERICA: SPACE-BASED SOLUTIONS

Chair: Remco Timmermans
Associate Chair: Kleber Pinheiro Naccarato
Teaching Associate: Anisha Rajmane

With the concept of Smart Cities as a starting point, our study explores the potential of space-based solutions to create intelligent, inclusive, and sustainable favelas. We chose to focus on favelas as they represent a central development challenge in Brazilian cities which can benefit from space-based solutions.

Through an extensive literature review and talks with various local experts in the state of São Paulo the team delved into specific challenges currently faced by favelas, while also considering future directions. The study includes in-situ data to grasp the structural nature of the favelas, while considering difficulties in urban planning, and environmental protection. Furthermore, a review of social resources and census data, or lack there-of, and security concerns were considered. This provides a multifaceted perspective on the living conditions within these areas and highlights some of the complex characteristics of favelas which impact the everyday life of residents.

Our analysis identifies significant gaps that space-based technologies could help to fill while highlighting opportunities where these could be effectively implemented. Using these insights, a roadmap has been developed by the team, categorizing solutions into short-term, mid-term, and long-term strategies. This roadmap outlines a comprehensive plan that considers not only immediate necessities but also focuses on sustainable growth and community development for the future.

Implementation of these recommendations in emerging markets faces many challenges. We discuss ethical and privacy concerns as data would be collected, most likely, without consent. Stakeholder awareness, regulatory issues, infrastructure challenges and financial barriers are also addressed and a risk matrix is provided on how these challenges could impact the implementation of the recommendations.

The main goal of the research carried out is to provide recommendations to enhance the quality of life in favelas through the innovative use of space-based technologies. Combining an understanding of slums with innovative space technology enables a vision of smarter and more inclusive cities. Moreover, this study is not limited to Brazilian favelas but provides solutions that can be applied to slums globally.


FROM SLUMS TO
SMART CITIES
BRINGING SPACE-BASED TECHNOLOGY TO FAVELAS
IN LATIN AMERICA: PATHWAYS TO SMART AND
INCLUSIVE DEVELOPMENT
FINAL REPORT
SPACE STUDIES PROGRAM 2023
ISU

THE METAVERSE ROLE IN THE FUTURE OF THE SPACE SECTOR

Co-Chairs: Jacob Cohen and James Green
Associate Chair: Maria Cecilia Pereira
Teaching Associate: Aashish Sarode

Abstract
The Metaverse is the convergence of the physical and digital worlds utilising technology thereby bringing people together. Technology like Extended Reality (XR), which comprises of Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR), with Artificial Intelligence (AI), are used to create rendered 3D virtual environments where individuals can interact, play games, and learn. XR is a transformative technology that has many applications.

Broadly, XR aims to enhance human functions, and as space exploration continues to rapidly expand, the Metaverse offers creative solutions that can complement existing technology and revolutionize the space sector. This team project analyzed and proposed uses of the Metaverse in the space sector and addresses its major applications in (1) Space Operations (2) Mission Design and Planning (3) Healthcare (4) Astronaut Training (5) Space Tourism (6) Outreach & Space-Based Education and (7) Earth Sustainability.

As advancements in AI, the Internet of Things (IoT), Big Data, Blockchain, and other technologies improve, the benefits for these sectors are unprecedented. However, to increase its user adoption, lingering challenges must be addressed. The system design must be improved to enhance the user experience, such as making the headsets more comfortable to wear, along with enhanced graphics. Additionally, technical standards must be developed and employed, and IT challenges such as network latency, Wi-Fi, and Graphics Processing Unit (GPU) constraints must be met. Further, legal and policy concerns for matters such as digital theft, virtual crime, intelligent property infringement, privacy, and liability must be addressed.

Ultimately, this project demonstrates how, despite existing challenges, the use of the Metaverse can revolutionize and enhance our capabilities for space exploration. We also propose a roadmap that encompasses past, present, and projected future uses of the Metaverse, as it applies to space.


SPACE STUDIES PROGRAM 2021
EXECUTIVE SUMMARY
The Role of the
METAVERSE
in the Future of the
Space Sector

WORKSHOPS

Fundamental and elective workshops are offered during the Core Lecture and Department Activity phases. The workshops cover all 7 disciplinary departments, and it provides participants with the opportunity to branch out or specialize further. This year, there were 4 mandatory fundamental workshops and 4 sessions elective workshops. Over 12 visiting experts instructed across 18 activities. Participants utilize elective workshops in various ways: some expand their departmental knowledge, while others explore new space fields or enhance team project understanding. These workshops offer insights, allowing deep dives into subjects of interest, potentially enriching team projects through shared optional knowledge.

LIST OF ELECTIVE WORKSHOPS

SESSION #1

- Introduction to Spaceflight Verification Justin Karl and Validation Processes, Justin Karl.
- Engaging Communities in Space Communication, Kamila Garcia.
- Robotics - Part 1, Kazuya Yoshida.

SESSION #2

- Mission Planning and Basics of Spaceflight Safety, Justin Karl.
- ISUcast, Kamila Garcia.
- Robotics - Part 2, Kazuya Yoshida

SESSION #3

- Crisis Communications in the Space Sector: A hands-on workshop, Juan de Dalmau & Ana Montaner Pizà .
- Leadership and followership: skills and values for mastering future space, Roberta Gregori.
- Space & the Arts: Launch Your Creativity to New Heights! Steven Brody.
- Imagery Systems for Lunar Exploration, Jeremy Myers.
- Hands-on Introduction to Machine Learning, Nuno Carvalho.
- Future Cities - Underground Infrastructure, Madhu Thangavelu.

SESSION #4

- Ethically Informed Risk Management for the space sector, Roberta Gregori.
- Artificial Intelligence and Space Robotics, Rodrigo Ventura.
- Hands-on Introduction to Earth Observation Applications, Nuno Carvalho.
- Lessons-Learned from Selected NASA Human & Robotic Missions, Steven Brody.
- Inventive Problem Solving using the TRIZ methodology, Marlo Graves.
- Media training – how to make the best out of a media interview: A hands-on workshop, Juan de Dalmau & Ana Montaner Pizà.

Robotics Workshops

The participants are divided into multiple teams to develop an autonomous robot to accomplish the given tasks of navigation, sample collection and return to a home position in a simulated planetary field.

Team 2, consisting of Erez Yehezkel, Diego Guerra, Jaime Augusto Da Silva, Dorottya Milankovich, and Lucas Novelino Abdala, secured the final victory with their robot named "Gems Bond!".

Scan the QR code to watch on YouTube!




Media training – how to make the best out of a media interview

This workshop is led by Ana Montaner-Pizà, PhD, Head of Communications at the Institute of Space Studies of Catalonia (IEEC) and by Juan de Dalmau (ISU SSP89), former Head of Communications at ESA's Technology Centre in the Netherlands and former ISU President.

Media training offers participants an opportunity to gain an in-depth understanding of news media coverage, simulating interviews to personally experience how scientists can interact with the public. It will showcase the right methods for leveraging media platforms to lead the dissemination and advancement of scientific knowledge.




PUBLIC EVENTS

This year's SSP featured a wide variety of evening events from distinguished space lecturers from around the world. These events were held at Centro de Formação do Educador (Educator Training Center), Technology Park São José dos Campos (Techno Park Central Auditorium), Museu Interativo de Ciências (Interactive Science Museum) and Universidad do Vale do Paraíba (University of Paraíba Valley). This was a great way to enhance creativity, science communication, local participation and public engagement.

OPENING CEREMONY

SSP23 opening ceremony was a cause for a very big historic celebration as 2023 kicked off the 35th International Space University Space Studies Program.

The opening ceremony was held at the Techno Park Central Auditorium, Representatives from 30 countries, a total of 85 participants, paraded across the stage holding their respective national flags, all under the gaze of the ISU flag. This display showcased the international, intercultural, and interdisciplinary essence of ISU.

During the opening ceremony, the organizers presented a lively and vibrant samba dance and musical performance with distinct Brazilian characteristics, bringing the entire audience to a climactic moment.

An audience of 800 people attended the opening ceremony at Techno Park Central Auditorium.

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35th | SPACE STUDIES PROGRAM
SSP23
OPENING CEREMONY


CONVERSA DE CORDAS
Cassiano Ricardo
Cultural Foundation

SPACE TRAVEL ACROSS THE DECADES AND BEYOND

Speakers: James Green & Mikhail Marov

This lecture, presented by James Green, NASA's Former Chief Scientist, and Mikhail Marov, Professor and Academician of the Russian Academy of Science and the International Academy of Astronautics, marked the commencement of a series of SSP23 Distinguished Lectures. The two experts guided the 85 participants of SSP23 and the general public through a retrospective of an exciting scientific rivalry that unfolded during the mid-20th century between the United States and the Soviet Union. This lecture underscored the significance of international collaboration and constructive competition in today's aerospace technology advancement.

Mikhail participated in the lecture remotely, while James addressed and engaged with the audience present in the auditorium. The venue was occupied by a crowd of 200 individuals, including both SSP participants and local attendees.

Scan the QR code to watch on YouTube!



ASTRONAUT PANEL: LIVING AND WORKING IN SPACE

Speakers: Robert Thirsk, Sian Proctor & Marcos Pontes

The International Astronaut panel is a yearly highlight of each ISU session. This year's astronaut panel brought together three astronauts from the United States, Canada, and Brazil. Sian Proctor, an American commercial astronaut, geology professor, artist, author, and science communicator, made her inaugural appearance on the Astronaut Panel, significantly contributing to the recognition of women's contributions in space development. Additionally, the China Space Station sent a video featuring three in-orbit astronauts (Jing Haipeng, Gui Haichao, Zhu Yangzhu) to congratulate the successful 35th anniversary of the SSP program.

Astronauts from various countries around the world shared details and anecdotes of their work and life on space stations with over 3,000 Brazilian youths. This ignited the spirit and dreams of the next generation of young minds to engage in space exploration and scientific research.

During a daytime Astronaut Panel, 4,000 Brazilian teenagers engaged in the event. Later in the evening, the astronauts engaged in further professional discussions with participants of SSP23.

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THE HUMAN SIDE OF THE COLUMBIA MISSION

Speakers: Jonathan Clark & John Connolly

Space shuttle Columbia's STS-107 mission was a milestone for space life science. However, every flight mission carries immense risks and unknown challenges. The live audience was deeply moved and inspired by the stories behind the tragedy brought by Jon Clark and John Connolly. Once again, they paid their heartfelt respect and remembrance to the seven crew members who lost their lives in this disaster.

Turning the pages of history to confront the loss of loved ones and colleagues is a heartbreaking endeavor, and we forever hold them dear in our hearts. Each person present deeply appreciates Jonathan and John for sharing the story of Columbia, and we are profoundly inspired and uplifted by their presence.

Scan the QR code to watch on YouTube!




FUTURE OF SPACE

Speaker: Nelson Pedreiro

As people immerse themselves in the rapid advancements of aerospace technology, some pioneering scientists and companies have set their sights on the future. In this lecture, the head of Lockheed Martin's Space Innovation Labs delves into a vision for the future of space and examines our proximity to realizing this vision. We extend our gratitude to Nelson for his engaging and informative presentation, which has sparked contemplation among the attendees and the local Brazilian populace about space exploration.

Scan the QR code to watch on YouTube!



IMPORTANCE OF OUTREACH (IN HONOR OF MAJOR KENN RODZINYAK, ROYAL CANADIAN AIR FORCE)

Speaker: Niamh Shaw

The event was led by Niamh Shaw, who holds the title of "ESA Education Champion" awarded by the European Space Agency. She moderated a panel discussion centered around STEM education. The panel featured Space Anthropologist Deana Weibel, "Rocket Scientist" and Board Member of The American Leader (a nonprofit news and knowledge center) Steve Brody, as well as local educator Milton de Sousa from the Entrepreneurial Education Center. They served as panelists to share stories about science and education with the general public who are currently undergoing or planning to pursue STEM education. The event focused on exploring the present state of communicating and educating the public about space science and exploration.

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BALLOON LAUNCH

Experts: Christopher Shneider Cerqueira,
Carlos Eduardo Amaral & Todd Mosher.

Facilitator: Jedrzej Gorski.

Stratospheric balloon launch was led by Aerospace Engineer with specialization in Analysis of the Electromagnetic Spectrum, Carlos Eduardo Oliveira from Instituto Tecnológico de Aeronáutica (ITA). Students had the opportunity to experience inflating the balloon, attaching payloads, releasing the balloon, and tracking it as it ascended to an altitude of 35km before bursting.

ROCKET LAUNCH COMPETITION

Launch Director: John Connolly.
Facilitator: Jedrzej Gorski.

International Space University conducts an annual rocketry launch competition during Space Studies Program. Participants from Engineering department are divided into international teams of 4 to design, construct, and fly a rocket that will meet a set of difficult requirements for altitude, payload, data capture, and design style. Each team designs a unique rocket from a limited selection of body tubes, nose cones, rocket motors, and other components, aided by computer design and simulation programs.

The participation of 5 faculty members and students from the local Universidad do Vale do Paraíba (University of Paraíba Valley), along with two 5-member SSP23 Staff teams, added an extra level of excitement to this year's rocket competition.

CLOSING CEREMONY

The 2023 Space Studies Program of the International Space University officially ended during the Closing Ceremony that took place at Instituto Nacional de Pesquisas Espaciais, INPE (National Institute for Space Research) at auditorium in Integration and Testing Laboratory (LIT) on Friday, August 25.

Under the guidance of the ISU flag, the 85 participants made their entrance into the auditorium, symbolizing the formal culmination of their two months of study and their successful graduation. Now, they have finally become part of the ISU alumni community. Claudia Medeiros, Georgina Riu, Marie Lambert, Mercè Cuixart Segundo and Vedant Paul Moghawere the chosen as the class representatives of SSP23. They will now lead the effort to help keep the participants closely connected into their future endeavors. The class speakers, Claudia Medeiros, gave the final reflection on behalf of the SSP23 participants.

The host country of SSP24, the United States, was introduced by the local host representative, Douglas Terrier. He officially took over the ISU flag from the Brazilian local host representative, Clezio Marcos De Nardin, marking the beginning of the journey for SSP24! Houston, we are coming!

Scan the QR code to watch on YouTube!




RIO TRIPS

HPS IN RIO– PROFESSIONAL VISIT

The Human Performance in Space department had the honor of joining forces with the Space Management and Business department to visit two of Rio De Janeiro's significant institutions, Museu Aeroespacial (MUSAL) and Instituto de Medicina Aeroespacial (IMAE).

MUSAL is Brazil's largest military and civil aviation museum. During our time there, our welcoming guides showed us a vast array of preserved flight craft from throughout the ages, telling us of their stories and names. We learnt about the significant life and work of the Brazilian father of aviation, Alberto Santos-Dumont, and spent time being lead through other on-going exhibitions, such as 'So others can live' showing search and rescue efforts in Brazil and 'Woman in Aviation'.

At IMAE participants were able to engage with some of the Brazilian Air Forces leading practices in Aerospace Medicine and Operational Health research. Following an insightful presentation about the history and functions of IMEA, both departments were guided through the Acceleration Laboratory, Night Vision Room and Spatial Disorientation Laboratory accompanied by captivating demonstrations. This included participant Alejandro Guerra experiencing the effects of vertigo and disorientation during a demonstration in the facilities Bárány chair.

1. Participant Flavia Fayet-Moore in the flight turbulence and G-force simulator in IMEA's Acceleration Laboratory.
2. A combination of HPS and MGB participants, SSP23 staff and MUSAL staff, appreciating the 'Woman in Aviation' exhibit.

MGB IN RIO– PROFESSIONAL VISIT

During the Rio trip, the participants of the MGB department were delighted to visit the Museu Aeroespacial, a national aviation museum located on the West Side of Rio de Janeiro. The place is renowned as "the Cradle of Brazilian Aviation."

Upon arriving at the museum, the participants were warmly greeted by the knowledgeable staff, who expertly guided them through the impressive historical collections. Alongside the captivating display of over 140 aircraft and their corresponding exhibitions, everyone had the fortunate opportunity to observe a fraction of the museum's vast collection, totaling approximately 15,000 aviation-related objects. These encompassed aviation instruments, uniforms, decorations, plastic arts, and more.

Furthermore, the participants had the privilege of delving into the biography of Santos Dumont, rightfully hailed as the Father of Aviation from the Brazilian perspective. As the exhibition drew to a close, each participant received valuable gifts - books detailing the rich history of Brazilian aviation and chronicling the extraordinary life of Santos Dumont.

SCI, HUM, PEL IN RIO– PROFESSIONAL VISIT

The professional visit of the SCI, HUM and PEL department in Rio was held in 2 locations: "The Time Through Time" workshop at the National Observatory (ON), a research institute linked to the Ministry of Science, Technology and Innovation, which operates in three major areas of knowledge: Astronomy, Geophysics and Metrology in Time and Frequency, in which it carries out research, technological development and innovation. In its 195 years of life, one of the missions of the National Observatory is to generate and disseminate the legal time throughout Brazil. In this activity we observed the meridian telescopes, which for many years were the astronomical instruments used to determine the time. Then we observed the Time Service Laboratories that were used in the past and those that are used in the present for the determination of the time.

A visit in the laboratory of High Energy Physics at the Brazilian Center for Physics Research (CBPF) and an academic Tour at the Aerospace Museum (MUSAL) . The laboratory develops a large part of its research in collaboration with international research centers, such as CERN and Fermilab. During the visit, the participants observed the museum exhibitions related to the laboratory work, for instance, the LHCb experiment, which contributes to the construction of the largest and most precise Tracking System based on scintillators ever built. We also observed scintillator-based detectors developed at CBPF which were installed in the Antartic continent and Amazonia, aiming to study the possible relationship between cosmic rays and cloud formation.

SOCIAL ACTIVITIES

CULTURE NIGHTS

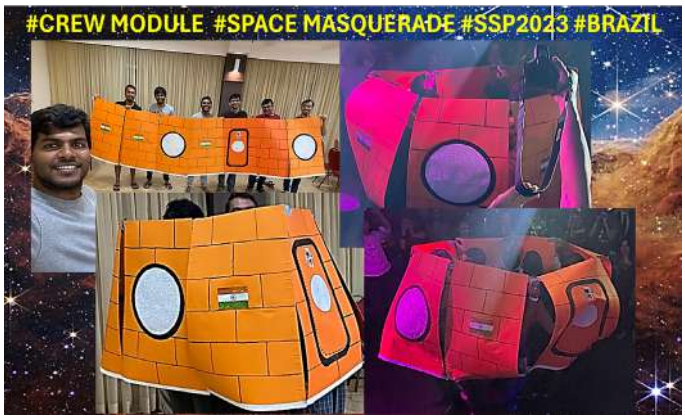
A long-standing SSP tradition, culture nights are every Friday and offer participants a chance to present their countries and cultures to the rest of the cohort. Presentations generally highlight their country's space industry, amazing geographical, language, and cultural facts, songs, trivia games, and delicious food which are just some of the many unique engagements activities that bring different cultures together on these special nights.

TALENT NIGHT

Another long SSP tradition is the talent night on the last Friday of the program which offers a unique opportunity for participants to showcase hidden skills not generally known about. Singing in multiple languages, ballet dancing, martial arts, and even magic performance were all part of this amazing night, which allow the participants to present themselves to the rest of the class, and to receive the highest appreciation in return.

ALUMNI WEEKEND AND SPACE MASQUERADE CONTEST

SSP offers more than just an excellent learning environment – it's also a hub for forging friendships and expanding your professional network. An occasion not to be missed is the alumni weekend, a prime opportunity to reconnect with old friends and engage with individuals from all over the space industry! The weekend features an array of activities, including presentations, speeches, gatherings, culminating in the Gala Dinner and a Space Masquerade ball. This year was especially remarkable as participants not only enjoyed these customary events but also came together to sing Happy Birthday to ISU, celebrating its 36th year of existence.



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National Institute for Space Research (INPE)
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PARTICIPANTS TESTIMONIALS

Britt Wiseman (Canada)

I was motivated to participant in the International Space Universities Space Studies Program to expand my knowledge about some of the major disciplines that contribute to space exploration and technology, outside of my academic background of medicine and molecular & cellular biology. I was so impressed by the range of topics that was covered, and by the quality of the instructors and speakers that we had access to in this program. Every phase of the program was extremely beneficial and pushed me to think about things from different perspectives. Being able to work with professionals from around the world, both as instructors and as my team members in projects, was an honor that I am very grateful for. I am so excited to see where everyone's career takes them, and to follow along with the amazing people that I met at this program. I am grateful for the friends that I made, and plan to stay connected in the ISU community for years to come.

Linda Martina Maier (Austria)

As a student in my second Master´s degree I wanted to learn more on the topic of space, which is exactly what I did here in SSP23. Coming here I did not have a clear idea of what I wanted to do with my academic career. Being surrounded by like-minded people that are this passionate about space as I am, I felt like I was in the right place from the very beginning. The experience and determination from everyone involved inspired me and gave me new motivation to pursue my dream of a career in the space sector. Being able to join the Space Application department (best department ever) and learn from Su-Yin Tan was amazing.

The best part is the interdisciplinarity, with everyone having a different background. I am proud to represent science here in SSP23 in Brazil, as we had a large number of engineers. I am so grateful to be here and get to experience the work in an intercultural team. If I take one thing away from this is, that all the incredible smart people I met are also human and that it is totally ok to ask for advice.

Marie Lambert (France)

I found everything I was looking for during the Space Studies Program 2023: space courses, friends, and adventures! SSP helped me gain invaluable knowledge in every discipline of the space sector while allowing me to meet and exchange with renowned experts from all over the world. I had the chance to attend lectures on Human Spaceflight and talk to astronauts, a dream come true! But if the education provided by ISU is excellent, what makes this experience one of the best of my life is the people. You don't get so often the chance to spend 9 weeks with about a hundred space passionate and open-minded individuals coming from more than 30 countries. The diversity in cultures, backgrounds, and studies is a beautiful and enchanting opportunity to learn so much more about the world, others, and eventually yourself. SSP is an exceptional human adventure that changes your perception of life and helps you discover what truly matters to you while being supported by an amazing community. Let's not forget to mention it is also an incredible chance to travel! Discovering Brazil was a highlight of my time here and every weekend spent with my space friends travelling created memories for a lifetime.

Sreejith Sreekuma (India)

Over the past two months, SSP-23 has been an absolutely captivating journey for me. As someone who enjoys traveling, meeting participants from around the globe was truly exhilarating. Learning about the diverse customs of over 80 participants from various nations was a remarkable experience. Playing football with players from different countries in Brazil stands out as the highlight of my time at SSP. The most significant insight I gained from the program was witnessing the impressive maturity and courage displayed by the young participants when confronting life's challenges. Exploring different parts of Brazil, including Rio, Campos Do Jordao, and Ubatuba, has been engaging. The generosity of gifts from ISU, ITA, INPE, and other agencies, along with the warm hospitality, greatly enhanced the trip's enjoyment.

Mercè Cuixart Segundo (Spain)

As an Aerospace Engineer working in space-related market analysis and outreach, I arrived in Brazil with a desire to broaden my horizons. Two months later, I am grateful to say that it has exceeded my expectations. Not only have I been awed by the program's diverse fields, but I have also had the privilege of being surrounded by extraordinary minds daily, from lecturers to peers. Participating in SSP23 has been transformative: an inspired and empowered Mercè heads back home, carrying priceless extra weight in her backpack!

Stephane Bellocine (France)

As an already experienced participant from France, with a long career in IT Networking and absolutely no background in Space, I was somehow different from most of my SSP 23 fellow colleagues who have had an experience in the Space new ecosystem or within the space educational sector.

But this is exactly what makes ISU so powerful, its values being Interdisciplinary, International and Intercultural! I would add a 4th one: "Inclusive". Yes, all differences can meet and produce great results within the ISU program.

As expected, we have been able to receive some great knowledge on a wide range of technical, business and ethical topics from distinguished lecturers who were both competent and inspiring.

For some of them, the lectures were more than a conference in front of students, it was an enthusiastic life experience transmission to help us build the future.

On top of that, we have had many social activities which brought all participants from 30 different nationalities together, creating a wonderful strong network which will remain so.

And to make it all even better, all staff members are really dedicated to make of our 9 weeks program a memorable one, they keep caring about all of us every single day.

I will recommend the program to anyone willing to move into the challenging new era of Space.

CHAIRS TESTIMONIALS

Madhu Thangavelu (SSP 1988)

I am an ISU SSP alumnus from 1988 SSP at MIT. I have followed the evolution of this institution since then. As part of the faculty lectures, I was invited to share some thoughts on a team project. I found the 3Is alive and well among the participants at this Brazil SSP. The cultural activities were especially delightful and staff were very professional, kind and helpful. NETWORKING(all caps) is the best part of this global institution that promotes leadership in Space activities. I stay in contact with many friends I made who where participants in the MIT session. The alumni and networking have grown much larger and more effective since then. I am sure that each of you will lead space activity projects through what the ISU and SSP experience really instills – peaceful global cooperation among nations(interdisciplinary) and their vibrant cultures(intercultural) through the intense, firehose delivery of lectures and the exchange of ideas from diverse disciplines that make space activity unique.(Interdisciplinary).

Godspeed ISU colleagues, the best is yet to be!

STAFF TESTIMONIALS

Cin Brennan (Australia)

As an SHSSP23 alumni, I was very excited to be invited to the SSP23 program in Brazil as a member of the Mission Control team. As an Academic Assistant there's always lots to do, but I was also fortunate to be able to attend core and distinguished lectures, participate in Department activities, join professional visits, and meet an awesome variety of lecturers, experts, hosts, participants, and other staff from all around the world. As well as adding people to my professional network, I've made friends I would otherwise never have had the opportunity to meet.

Natalia Rosa de Oliveira (Brazil)

Being part of the mission control team at SSP23 provided me with a unique experience. I had the opportunity to meet individuals from various parts of the globe, each with distinct backgrounds. This undoubtedly contributed to my personal and professional growth. The work was demanding, but equally filled with opportunities. Contributing to the logistics allowed me to understand the importance of organization and teamwork collaboration, as well as fostering the formation of lasting friendships. It was definitely a unique experience that shaped me.

Aashish Sarode(India)

My participation as a Teaching Associate in Team Project Metaverse in the Space Studies Program (SSP23) in Sao Jose dos Campos, Brazil, was an extraordinary journey. Guiding a project team and collaborating with global space enthusiasts expanded my expertise. The program's multidisciplinary curriculum, coupled with the vibrant cultural backdrop of Brazil, provided a transformative experience. SSP23 enriched my perspective, cultivating a passion for space exploration. The connections made and knowledge gained are invaluable assets, propelling my future in the field. I wholeheartedly recommend SSP23 to those seeking an immersive adventure in advancing space sciences and technology.

Thaís Zandoná (Brazil)

Working with the Mission Control Team I had the chance to dive into the exciting world of the space sector and connect with people from diverse backgrounds around the globe. It was fascinating to see different cultures and perspectives come together all united by a shared interest in space. As a member of the Logistics team, I had the chance to develop my skills in event planning and execution and I am excited to apply the lessons I have learned to future endeavors.

Shafei Li (China)

With a background in news media and marketing operations, I consider myself extremely fortunate to have the opportunity to serve as a Public Events Coordinator for SSP. This role offers more than just the chance to make new acquaintances through event planning; it encompasses delving into the cultures, etiquettes, languages, and cuisines that underlie these gatherings from various countries. Witnessing participants enter while proudly holding their national flags evokes a profound sense of admiration and pride. Participating in SSP is undoubtedly an enriching supplement to one's life journey!

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