CASSINI #EUSpace
Space Camps

CASSINI Space Camps Training Guidelines

February 2025

Implemented by
NOVASPACE
Merger of Euroconsult Group and SpaceTec Partners

The CASSINI Space Camps are committed towards a dynamic camp curriculum as a gateway of EU youth towards a career in space

1st CASSINI Space Camp in **Summer 2025**

5-10 day duration during the period of June - August 2025

Up to 10 locations in EU members states

Young target group of **14 – 18 years old**

20 - 35 participants at each camp

6 training modules as part of an adaptable curriculum

1 concluding event at the end of the camp

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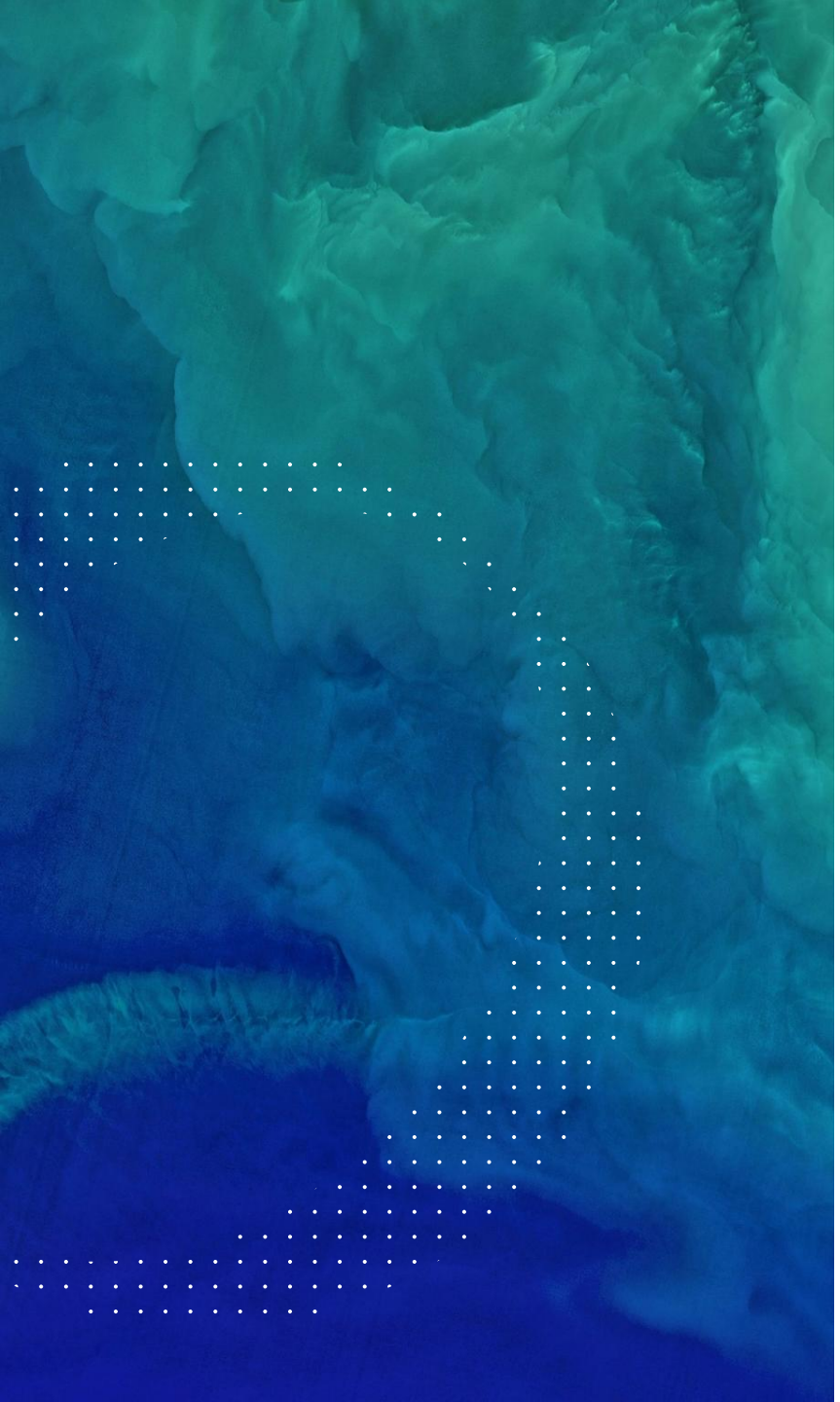

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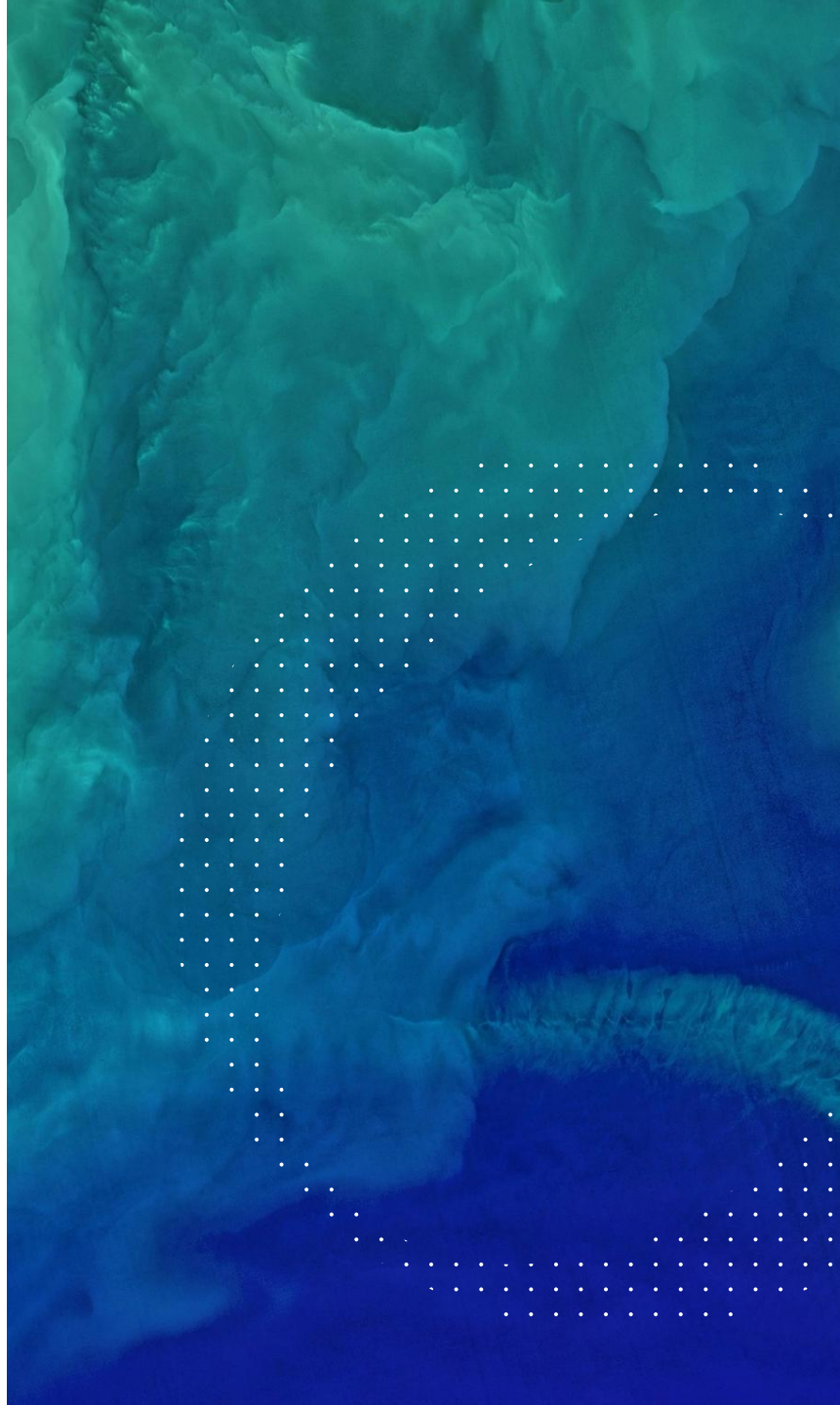
Training Guideline Overview



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The objective of the space camps is to have a comprehensive curriculum comprising of six training modules leading to the final event

1. Introduction to the Space Industry

2. Space-for-Earth

3. Entrepreneurship for Space Solutions

4. Career Guide to Space

5. Space Exploration

6. Space-for-All

7. Final Event

The participants will be working on space-for-earth projects during the camp that will be presented at the final event

Welcome event

- What's ahead during the week
- Foreshadowing final event

2. Space-for-Earth

- Introduction to EU Space data
- Problem definition: Which downstream challenges can be solved?

3. Entrepreneurship for Space Solutions

- Entrepreneurship crash course (Business Model)
- Solving earth challenges with EU Space data
- Solution design (How to build a unique solution as MVP)

Final Event

- Presentation of the space-for-earth projects during **pitching event**

Journey for space-for-earth projects – from basic training to pitching the idea

Background | **Project Development**

2.1	2.2	3.1	3.2	2.3	2.4	3.3	3.4	3.5
Practical space-for-earth use cases	Deep dive on sectoral application	Entrepreneurship crash course	Space entrepreneurship deep dive	Introduction to EU Space Data	Problem definition	What makes a good team	Solving earth challenges with EU Space Data	Solution Design
Students explore real-world applications of space technologies in different sectors	Students choose sectors of interest and regional relevance and learn how space data is applied within it in more detail	Introduction to entrepreneurship basics, business models, and value creation	Case studies on startups or corporates using space data, funding models, and market gaps. Cover sectors from 2.2.	Learn about Copernicus, Galileo, and other EU space data sources and how to access them with hands-on tutorials	Once the students learn about what kind of data exists, they define real-world problems within sectors that could be solved using space data.	Learn about team dynamics, psychology types, and working effectively together	Brainstorm business ideas using space data and structure them with a Business Model Canvas	Learn about Minimum Viable Products (MVPs), Technology Readiness Levels (TRLs), and prototyping
Example outcome								
Learn that Earth Observation (EO) data can improve farming efficiency	Students choose a sectors to deep dive on. Identify precision farming as a promising market for space data	Learn about fundamentals of entrepreneurship using design thinking, rapid prototyping, and user needs assessment.	Drawing from 2.2. Study examples like Planet Labs, Airbus Farmstar, DigiFarm and Copernicus for Agriculture	Learn about Copernicus Sentinel-2 (vegetation monitoring) and Galileo (geolocation for smart tractors).	Formulate a clear problem statement: "How can farmers use satellite data to optimize irrigation and reduce losses?"	Form a team with data analysts, coders, and business-minded students.	Use the BMC to structure the idea: Define AgriSat as a subscription-based mobile app for farmers.	Create a demo web app that shows Sentinel-2 Normalized Difference Vegetation Index crop health maps

The final event will be an inclusive competition where their ideas will be pitched from the teams in front of an audience

The training guidelines gives guidance to the Local Organisers (LO's) while at the same time leaving space for flexibility and innovativeness

01

LO's shall include **mandatory modules** with the option to propose innovative learning methods.

02

From the **optional submodules**, LO's choose the ones that you are willing to deliver.

03

If LO's have further ideas, add **new sub-modules** that fit the learning objectives of the overall module.

04

LO's choose the **experts/ trainers** that are qualified to deliver the programme.

05

LO's shall provide their proposed local curricula by filling in the **provided training curricula template.**

Some mandatory modules are in place for the local organisers to adapt with their own innovative learning methods

1. Introduction to the Space Industry

- Who is who in space?
- Basics of Space economy & NewSpace trends

2. Space-for-Earth

- Presenting practical space-for-earth use cases
- Deep Dive on sectoral applications

3. Entrepreneurship for Space Solutions

- Space entrepreneurship deep dive
- What makes a good team

4. Career Guide to Space

- Space Career Handbook

5. Space Exploration

6. Space-for-All

Mandatory | Final Event | Optional | LO suggestions

The centre of the camp is a series of entrepreneurship-oriented project-based activities that lead to a final event

1. Introduction to the Space Industry

- Who is who in space?
- Basics of Space economy & NewSpace trends

2. Space-for-Earth

- Presenting practical space-for-earth use cases
- Deep Dive on sectoral applications
- Introduction to EU Space data
- Problem Definition: Which challenges can be solved?

3. Entrepreneurship for Space Solutions

- Entrepreneurship crash course
- Space entrepreneurship deep dive
- What makes a good team
- Solving earth challenges with EU Space data
- Solution Design

4. Career Guide to Space

- Space Career Handbook

5. Space Exploration

6. Space-for-All

Mandatory | Final Event | Optional | LO suggestions

To guide the local organisers, there is a series of optional modules that can be included by choice

1. Introduction to the Space Industry

- Who is who in space?
- Basics of Space economy & NewSpace trends
- NewSpace Startup game
- Icebreaker: What do you actually know about space?
- Science Slam

2. Space-for-Earth

- Presenting practical space-for-earth use cases
- Deep Dive on sectoral applications
- Geocaching: Space Treasure Hunt
- Introduction to EU Space data
- Problem Definition: Which challenges can be solved?
- EO Imagery Game
- App API Development related to EO space

3. Entrepreneurship for Space Solutions

- Entrepreneurship crash course
- Space entrepreneurship deep dive
- What makes a good team
- Team building exercise
- Solving earth challenges with EU Space data
- Solution Design
- Pitch training
- Critical thinking on data & information
- Responsible usage of LLM

4. Career Guide to Space

- Space Career Handbook
- Space Talks: Beyond Astronauts
- Space Markets & Technologies
- Personal USP

5. Space Exploration

- Space Exploration History
- Astronomy Night
- Planetarium/ Observatory Visit
- Design of mission proposal
- Launch your rocket
- Observing space objects in real-time using Apps
- “Kerbal space Programme”
- Building a lego moon/mars-rover
- Virtual Reality Exploration of Space
- Building a HAM radio ground station
- On-the-air

6. Space-for-All

- Tackling space challenges
- Mock Debate "Who owns space?"
- Funding: Financing your space solution
- Ethics (dual use, space treaties)

Mandatory | Final Event | Optional | LO suggestions

Local Organisers are encouraged to ‘design their own camp’ with bringing forward suggestions that adhere to the learning objectives and methods proposed

1. Introduction to the Space Industry

- Who is who in space?
- Basics of Space economy & NewSpace trends
- NewSpace Startup game
- Icebreaker: What do you actually know about space?
- Science Slam
- …

2. Space-for-Earth

- Presenting practical space-for-earth use cases
- Deep Dive on sectoral applications
- Geocaching: Space Treasure Hunt
- Introduction to EU Space data
- Problem Definition: Which challenges can be solved?
- EO Imagery Game
- App API Development related to EO space
- …

3. Entrepreneurship for Space Solutions

- Entrepreneurship crash course
- Space entrepreneurship deep dive
- What makes a good team
- Team building exercise
- Solving earth challenges with EU Space data
- Solution Design
- Pitch training
- Critical thinking on data & information
- Responsible usage of LLM
- …

4. Career Guide to Space

- Space Career Handbook
- Space Talks: Beyond Astronauts
- …
- Space Markets & Technologies
- Personal USP

5. Space Exploration

- Space Exploration History
- Astronomy Night
- Planetarium/ Observatory Visit
- Design of mission proposal
- Launch your rocket
- Observing space objects in real-time using Apps
- Kerbal space Programme
- Building a lego moon/mars-rover
- Virtual Reality Exploration of Space
- Building a HAM radio ground station
- On-the-air
- …

6. Space-for-All

- Tackling space challenges
- Mock Debate "Who owns space?"
- Funding: Financing your space solution
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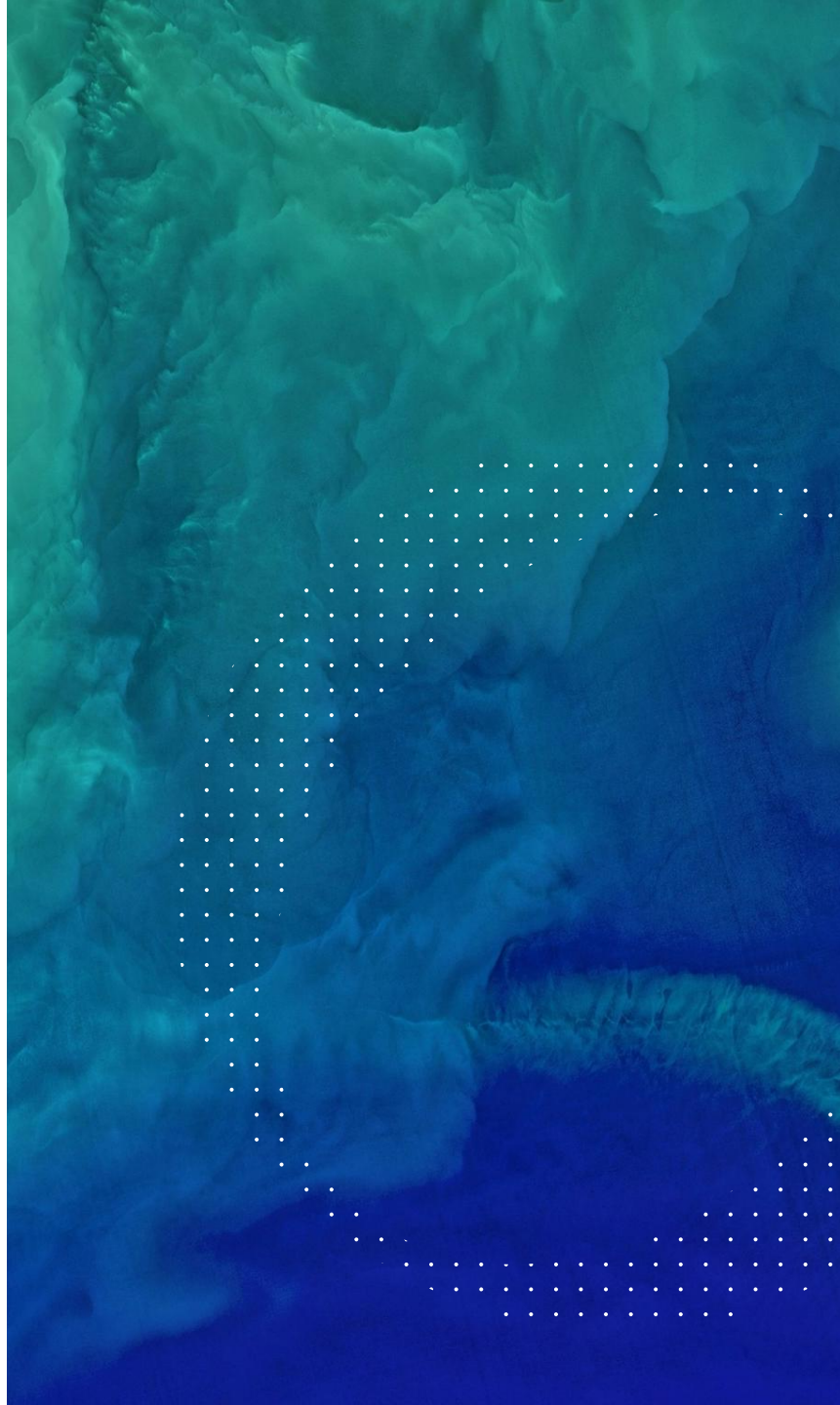
- …

Mandatory | Final Event | Optional | LO suggestions

Learning methods



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There are 4 types of learning methods to deliver the sub-modules

Workshop

The vast majority of the training modules will be delivered in a workshop/ interactive format

Training

Some trainings may as well be included in the camp, rather than traditional lectures

Excursion

To get outside, the format of excursions is encouraged

Game

Gamification shall be used to deliver the training contents

Examples

- Flipped classroom
- Experiments
- Coding
- Case studies
- Problem-based learning

- Expert talks
- Instructor-led multimedia presentations
- VR/ AR learning videos
- Software demos

- Stargazing and astronomy
- Company visits
- Musea visits
- Planetarium/ Observatory
- University visits

- Quiz nights
- Space trivia
- Team-building activities
- Space movie nights
- Geocaching game (outdoor)
- VR/ AR gaming
- Mock Debate
- Role Playing exercises
- Board games

Level of interaction based on different learning methods

Note: This is a suggestion. You may adapt the learning methods to your preference.

1. Introduction to the Space Industry

- Who is who in space?
- Basics of Space economy & NewSpace trends
- NewSpace Startup game
- Icebreaker: What do you actually know about space?
- Science Slam
- LO suggestions

2. Space-for-Earth

- Presenting practical space-for-earth use cases
- Deep Dive on sectoral applications
- Geocaching: Space Treasure Hunt
- Introduction to EU Space data
- Problem Definition: Which challenges can be solved?
- EO Imagery Game
- App API Development related to EO space
- LO suggestions

3. Entrepreneurship for Space Solutions

- Entrepreneurship crash course
- Space entrepreneurship deep dive
- What makes a good team
- Team building exercise
- Solving earth challenges with EU Space data
- Solution Design
- Pitch training
- Critical thinking on data & information
- Responsible usage of LLM
- LO suggestions

4. Career Guide to Space

- Space Career Handbook
- Space Talks: Beyond Astronauts
- LO suggestions
- Space Markets & Technologies
- Personal USP

5. Space Exploration

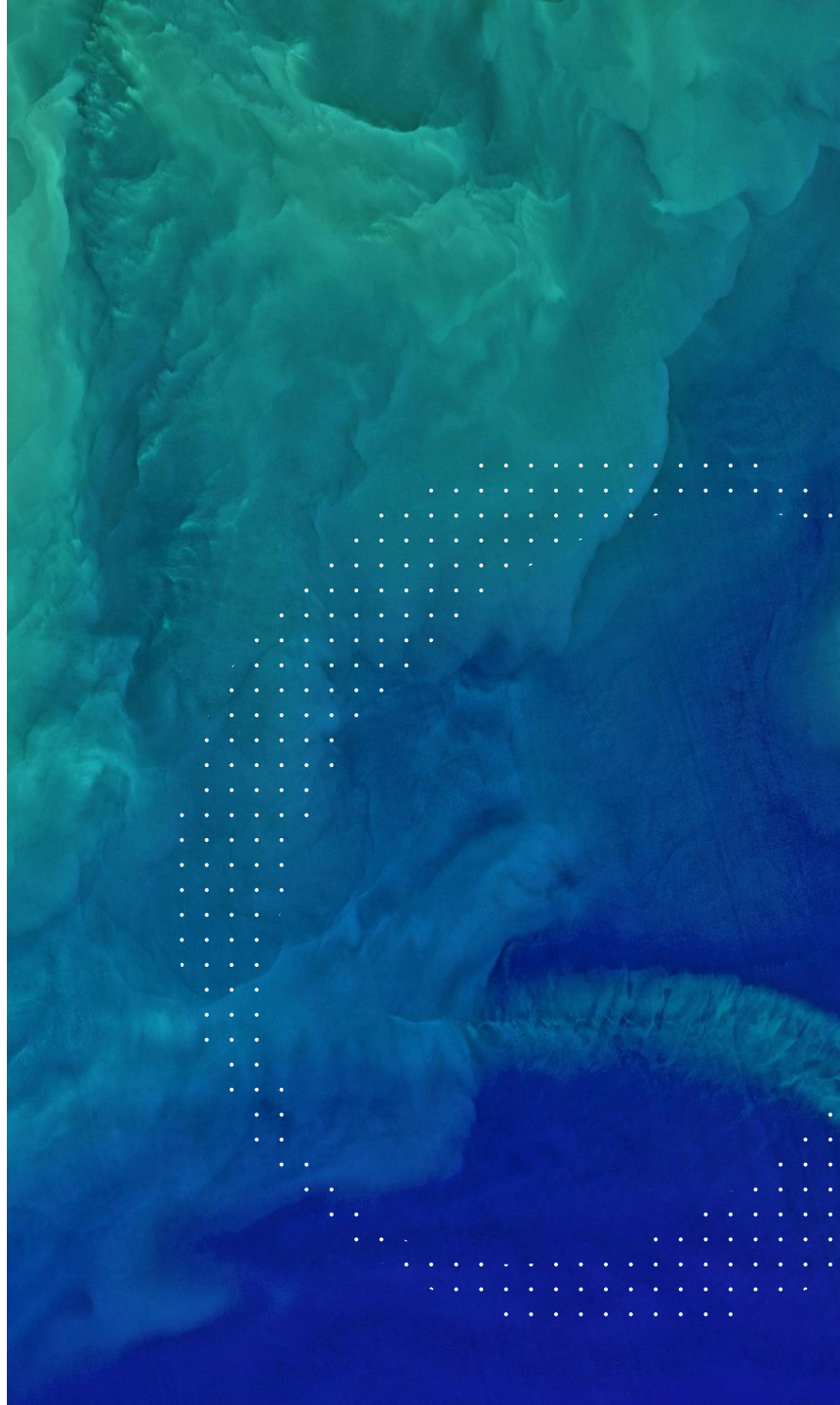
- Space Exploration History
- Astronomy Night
- Planetarium/ Observatory Visit
- Design of mission proposal
- Launch your rocket
- Observing space objects in real-time using Apps
- Kerbal Space Programme
- Building a lego moon/mars-rover
- Virtual Reality Exploration of Space
- Building a HAM radio ground station
- On-the-air
- LO suggestions

6. Space-for-All

- Tackling space challenges
- Mock Debate "Who owns space?"
- Funding: Financing your space solution
- How space promotes democracy
- Ethics (dual use, space treaties)
- LO suggestions

Workshop | Training | Excursion | Game

How to design your local camp



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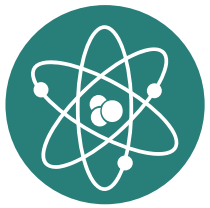
The Five I's guiding the design of the CASSINI Space Camps

Inspirational
Utilise **storytelling and role models** to deliver the camp activities. Not just a mere transfer of information, but also with fun activities that spark a **lasting sense of wonder and ambition**



Innovative
The CASSINI Space Camps offer a **flexible, modular curriculum** developed with subject matter experts that can be adapted to a variety of local contexts. We emphasise real-world space industry applications and **preparing participants** for future innovation driven roles.

Interdisciplinary
The interdisciplinary approach helps participants understand how **different fields come together** in the space industry and how a **diversity of skill sets** and perspectives can be leveraged

Inclusive
Inclusive and accessible to students from **all backgrounds** across multiple EU Member States- also catering to **different learning styles and needs.**

Impactful
The CASSINI Space Camps are the **starting point** where students can **kickstart** their career development in the space sector, get **connected** to an international network and contribute to the **real world.**

How to design your camp!

01

Open the day-by-day schedule

02

Place the submodules that are marked with **‘Final Event’** in a logical order in the schedule, so that those **project-based activities** lead naturally to a final event on the last day.

03

Collect all the **mandatory submodules** and place them in the schedule.

04

For each mandatory submodule, propose a **method of delivery.** Think of your existing facilities, experts and resources. The **requirement** is that the workshop, training, game or excursion you will design fulfils the learning objectives.

05

Now for the remaining time you can pick and choose from any of the **optional submodules** you find interesting and place them in the schedule at your convenience. Alternatively, **you can add your own activities** that are not included in this document.

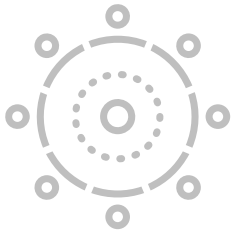
A curriculum template that allows the local organisers to design their own camp and calculate the time spent on all activities during the week

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	
Mandatory Sub-Modules	1.1. Who is who in space 1.2. Basics of the space economy ~ 1 hours	2.1. Presenting practical space-for earth use cases 2.2 Deep Dive into sectoral applications ~ 2 hours	3.1. Entrepreneurship Crash Course 3.2 Space Entrepreneurship deep dive ~ 1 hours	2.3. Introduction to EU Space Data 2.4. Problem Definition 3.3 What Makes a Good Team ~ 3 hours	3.5 Solving earth challenges with EU space data 4.1 Space Career Handbook ~ 2 hours	3.6 Solution Design ~ 2 hours	Final Event with award ceremony ~ 3 hours	**14 hours**
Optional Sub-Modules	1.4 Icebreaker 5.2. Astronomy Night 1.3 NewSpace Startup Game 5.1. History of Space Exploration ~ 4 hours	3.7. Pitch training 5.8. Build a LEGO mars rover ~ 3 hours	4.2. Space talks (talk from an astronaut) Observatory Tour	3.4. Team Building Activity 5.5. Launch your rocket	6.2 Mock Debate "Who owns space" 5.10. Building a HAM ground station the-air ~ 3 hours	6.1 Tackling space challenges ~ 1 hours	~ 1 hours	**18 hours**
Your proposed Sub-Modules	Local Organiser Suggestions ~ x hours	Local Organiser Suggestions ~ x hours	Local Organiser Suggestions ~ x hours	Suggestions ~ x hours	aniser ns ~ x hours	Local Organiser Suggestions ~ x hours	Local Organiser Suggestions ~ x hours	**X hours**
Other Activities (sports, outdoor, games etc.)	Campfire, Social Gathering ~ 2 hours	Team sports, Social ~ 3 hours	Long distance hike ~ 4 hours	~ 2 hours	Campfire Rafting ~ 4 hours	Campfire ~ 2 hours	Social Gatherings ~ 2 hours	**19 hours**
	7 hours	8 hours	8 hours	9 hours	9 hours	5 hours	5 hours	**51 hours**

EXAMPLE

Insights that would strengthen your Space Camp concept

Most space camps seems to benefit when they implement a series of **project-based activities** at the core of their curriculum during a set time period. These project-based activities often lead to a final event.



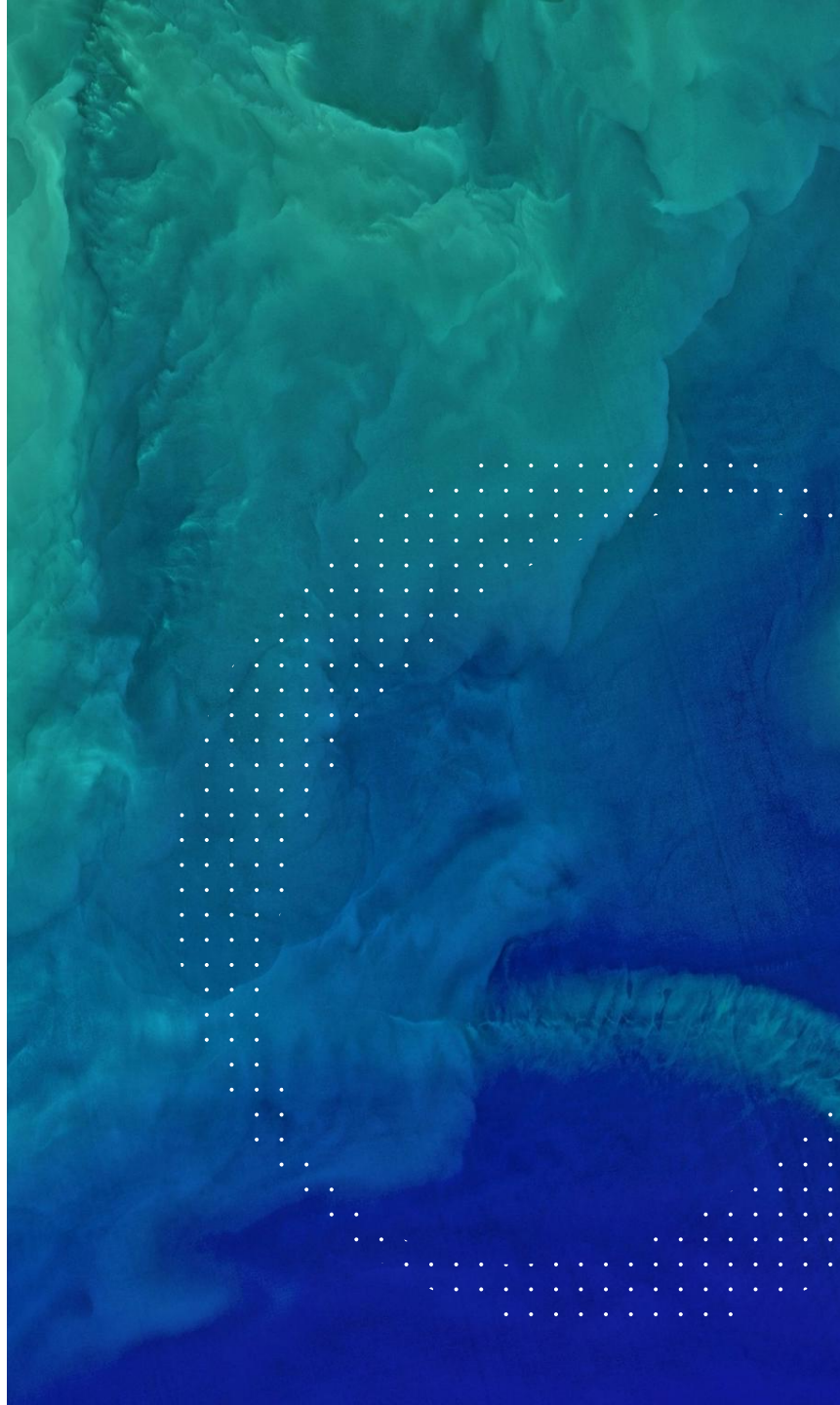
It is generally favourable when **larger consortia** with complementary abilities join forces, to form a local task force behind a summer camp organisation.

Residential space camp experience is severely lacking across the EU, while existing space education programmes **lack standardisation and branding**.

There is a gap to be addressed for a **multidisciplinary approach** in space-related training curricula and **space entrepreneurship** programmes, related to the commercialisation of space data and services.

Camps typically benefit when a **motivation letter** is included in the selection process.

Training Modules and Submodules Description



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Start with a welcome event!

Agenda

Inspire the students of what waits for them ahead.

Project

Make a separate introduction to the students about the project-based activities they will be doing that are relevant and leading to the final pitching event.

Fun

Most importantly, keep it fun! Plan a game or icebreaker!

Facilities

Don’t forget to show the students around!

People

Make sure they meet the people that are there for them during the camp.

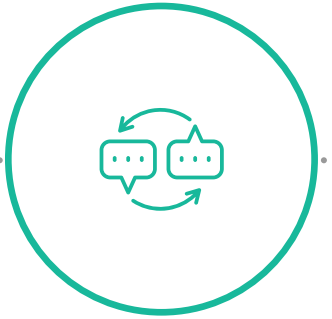
End with a final event!

Reflection

Reflect on the activities of the past week and facilitate networking and social time between students.

Pitching competition

Let the students present and pitch their space-enabled solutions in teams. Encourage a collaborative approach and build the confidence in the students to treat this as a learning experience. Include a diploma award ceremony.

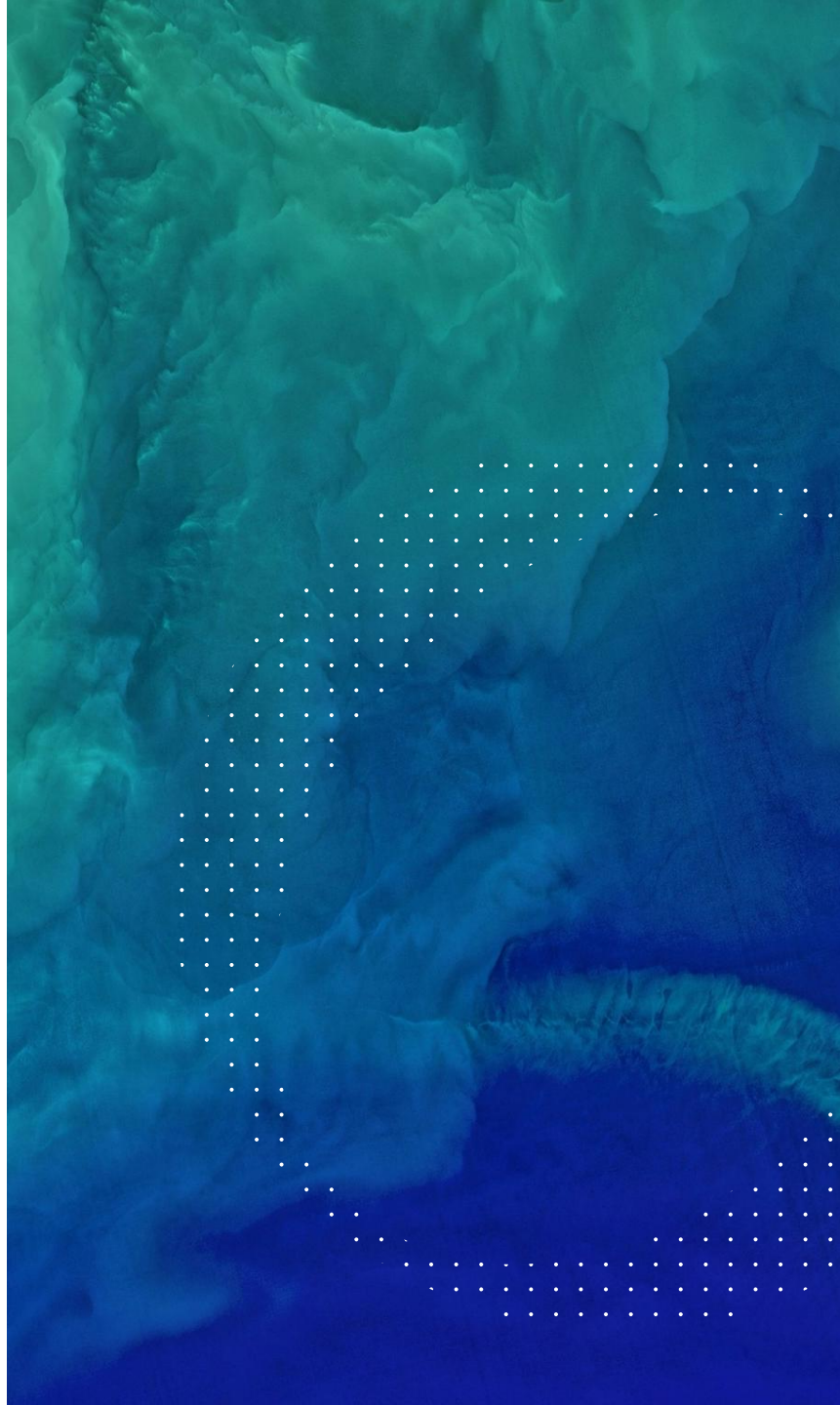


Feedback

Gather feedback from the students about their satisfaction related to the camp programme through written forms.

Training Module 1

Introduction to the Space Industry



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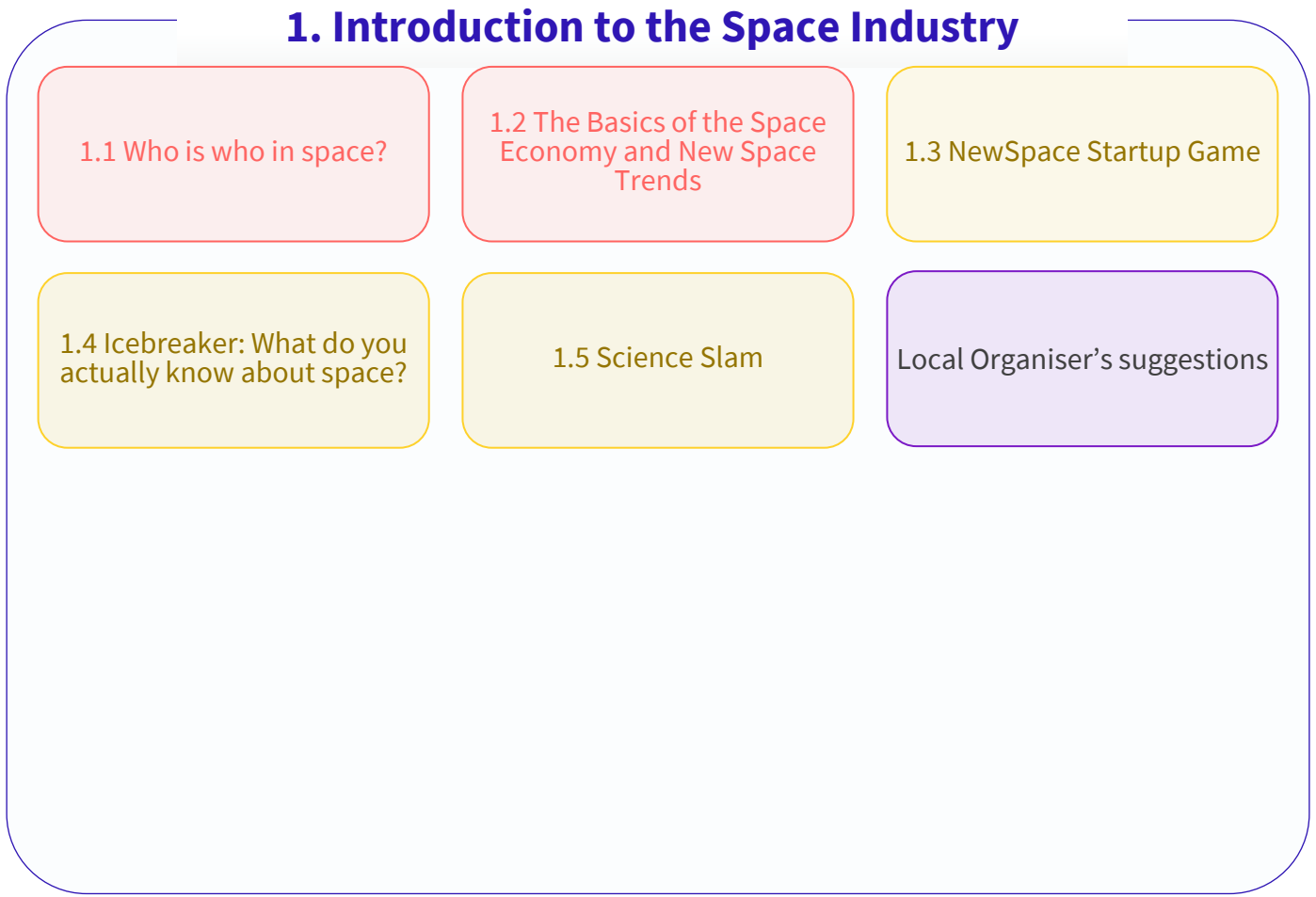
Overview Training Module 1



Mandatory | Final Event | Optional | LO suggestions

Training Module 1: Introduction to the Space Industry

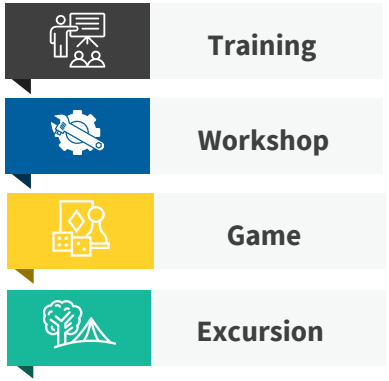
Module description

This module provides an overview of the **structure and capabilities** of the space industry, as well as the **key players**. The basics of the space economy are outlined and **NewSpace trends** are introduced. Participants learn about the emerging New Space technologies and the influence they have on traditional space structures.

Learning Objectives

- Gain foundational knowledge of the space economy
- Understand the key players in the space industry and how they work together
- Learn about the space value chain, from rockets to satellites and satellite services
- Discover how new space ventures are changing the industry

Proposed Learning Methods



Mandatory sub-modules

1.1. Who is who in space?

'Who is who in space?' is a multimedia introduction to how the space sector works and who are the key players. An emphasis is put on the European space sector (and EU Space programmes) and a contrast is made with the rest of the world. An interactive lecture is foreseen with quizzes.

1.2. The Basics of the Space economy and NewSpace trends

This submodule helps students understand the space value chain, the key economic facts behind it and how different stakeholders collaborate to contribute to space missions. Identify the upstream (e.g., manufacturing and launch) and downstream (e.g., applications and services) segments and introduction. Learn how new technologies transform the space economy in the NewSpace era.

Optional sub-modules

1.3. The NewSpace Startup game

In this game, students are engaged in a fun interactive game to revise what they learned in the lectures. Combine creativity, critical thinking and fun to make the material memorable.

1.4. Icebreaker: What do you actually know about space?

This session serves as an engaging icebreaker that helps students reflect on their current understanding of space, dispel myths, and spark curiosity for the rest of the camp.

1.5. Science Slam

In the *Science Slam* submodule, students are tasked with choosing a complex scientific concept related to space or Earth sciences and explaining it in a creative and engaging way to an audience.

Recommended hours of the module | **1 - 3 hours**

Submodule 1.1: Who is who in space?

Mandatory

Module | **1. Introduction to the Space Industry**

Recommended hours of the program | **~ 40 minutes**

Content description

This lesson provides a comprehensive overview of the major players shaping the space industry. Students will explore the roles of organisations & agencies like EUSPA, the European Commission and the UN Office for Outer Space Affairs as well as other global space actors (NASA, ESA, CNSA, ISRO and private companies (SpaceX, Blue Origin, Rocket Lab, The Exploration Company). Emphasis is placed on understanding **their collaborative and competitive dynamics**, highlighting real-world missions and achievements.

Learn about the achievements of the different organizations and their **historic contributions to the space industry**. Make an interactive game/ quiz, engaging the students to understand the different players.

Underline the **specificities of the European space stakeholder map** and contrast it to the global landscape.

Learning objectives

- Identify key public and private players in the space sector.
- Understand the roles and missions of space agencies and companies.
- Learn about global collaboration in space exploration and commercialization.

Learning Methods

- Company/ institution representatives to give lecture about their experience
- Multimedia presentation with interactive quiz
- Design a game that teaches students these concepts by roleplaying
- Visits to universities or important institutions to learn the role they play in the industry

Submodule 1.2: The Basics of the Space Economy and New Space Trends

Mandatory

Module 1. Introduction to the Space Industry

Recommended hours of the program ~ 30 minutes

Content description

This submodule starts by exploring the space value chain, from satellite manufacturing to launch services and beyond. Learning about the space value chain will be essential when students are invited **in other training modules** to think entrepreneurially about **building downstream space services**.

The focus will be on the interconnected roles of research organizations, manufacturers, launch providers, and service operators. The lesson introduces the upstream and downstream segments of the space industry, using relatable examples such as building a CubeSat or launching a commercial satellite for EO.

Use **relevant space mission examples from the EU Space Programme** (e.g the Sentinel satellites), giving an overview of the manufacturing to the customer services chain.

Present key concepts such as what is NewSpace, the paradigm shift it presents and the key players, the key trends of NewSpace. Provide insights into the business philosophy that underpins NewSpace and the opportunities presented by NewSpace. Brainstorm on the possibilities that this new era brings forth.

Learning objectives

Understand the space value chain and how different stakeholders collaborate to contribute to space missions

- Identify the upstream (e.g., manufacturing and launch) and downstream (e.g., applications and services) segments
- Describe the areas where entrepreneurial companies are developing new markets and give examples of commercial space revolution
- Identify and understand opportunities presented by NewSpace, for various stakeholders

Learning Methods

- New Space company representatives to give lecture about their experience
- Multimedia presentation with interactive quiz
- Design a game that teaches students these concepts by roleplaying
- Visits to universities or important institutions to learn the role they play in the industry

Submodule 1.3: NewSpace Startup Game

Optional

Module | **1. Introduction to the Space Industry**

Recommended hours of the program | **~ 60 minutes**

Content description

In the NewSpace Startup Game, students are engaged in a interactive game to revise what they learned in submodule 2.1.

Game setup:

- Divide students into teams of 4-6. Each team represents a NewSpace startup.
- Provide each team with a pre-made startup card (detailing their company's mission and focus area, e.g., space tourism, satellite EO, asteroid mining)
  - **Step 1:** Teams sign up on a game platform (e.g. Mentimeter, Kahoot) and compete to answer industry-related trivia questions to earn 'funding' points. (15 mins)
  - **Step 2:** Teams use their pre-made startup card to brainstorm their company's missions, target market and USP. Using 'funding points' they can buy guidance, data and partnerships. (15 mins)
  - **Step 3:** Teams pitch their startup idea to a panel of "investors" (instructors). They must pitch their startup outlining why they deserve funding. (20 mins)

The Investors rate each pitch based on their thinking (10 mins)

Learning objectives

- Keep information from Module 1 digestible and interactive
- Combine creativity and critical thinking to make the material memorable

Learning Methods

Follow the game instruction and receive materials to make the game happen

Materials needed

- Startup Cards
- Quiz game platform setup
- Pitch template
- Investor table

Submodule 1.4: Icebreaker: What do you actually know about space?

Optional

Module 1. Introduction to the Space Industry

Recommended hours of the program ~ 30 minutes

Content description

This session serves as an engaging icebreaker that helps students reflect on their current understanding of space, dispel myths, and spark curiosity for the rest of the camp.
The goal is to create an interactive, light-hearted environment where students actively participate and share their thoughts. Start by introducing the activity with a **brief discussion** on how space is often misunderstood and filled with common misconceptions.
Steps for Organisers:

1. Prepare a series of space-related questions that touch on popular topics, such as the solar system, astronauts, space exploration, and common space myths.
2. Ask students to respond individually or in teams, through a Quiz game platform (e.g. Kahoot or Mentimeter) keeping the atmosphere fun and relaxed.
3. After each question, discuss the correct answer and provide a brief explanation, highlighting any misconceptions students may have.

Learning objectives

- Cultivate an engaging, open-minded attitude toward learning complex space concepts, by debunking common myths
- Encourage active participation through low effort activities

Learning Methods

Follow the game instruction and receive materials to make the game happen

Materials needed

- Trivia questions and answers (printed or digital)
- Myth-busting cards or statements
- Polling tools (Mentimeter, Kahoot etc.)
- Flipchart/whiteboard for brainstorming session

Submodule 1.5: Science Slam

Optional

Module 1. Introduction to the Space Industry

Recommended hours of the program ~ 45 minutes

Content description

In the *Science Slam* submodule, students are tasked with choosing a complex scientific concept related to space or Earth sciences and explaining it in a creative and engaging way to an audience. The goal is to take a challenging topic and break it down into simple, entertaining, and accessible language, using visual aids, metaphors, and interactive demonstrations. Students will work in teams or individually to prepare their presentations, and the session culminates in a fun competition where each student or team presents their work.

You may implement a voting process from the audience, for the most innovative, clear, and engaging explanation. The focus is on creativity, clarity, and enthusiasm, with the ultimate aim of fostering a love for science and promoting effective communication skills.

Learning objectives

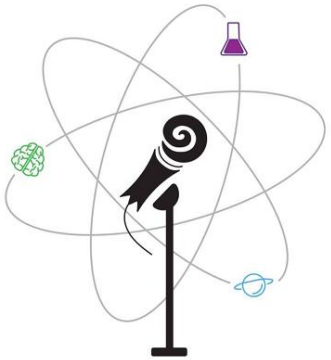
- Understand how to communicate complex scientific topics and create entertaining content
- Foster creativity in communicating science to a diverse audience, making it relatable and fun
- Gain confidence through friendly competition

Learning Methods

Follow the game instruction and let the students develop their pitches freely

Materials needed

- Access to computers/tablets for research and presentation creation.
- Art supplies for posters, models, or other visual aids.
- Projector and screen for digital presentations.
- A microphone or sound system to ensure the audience can hear the presentations.



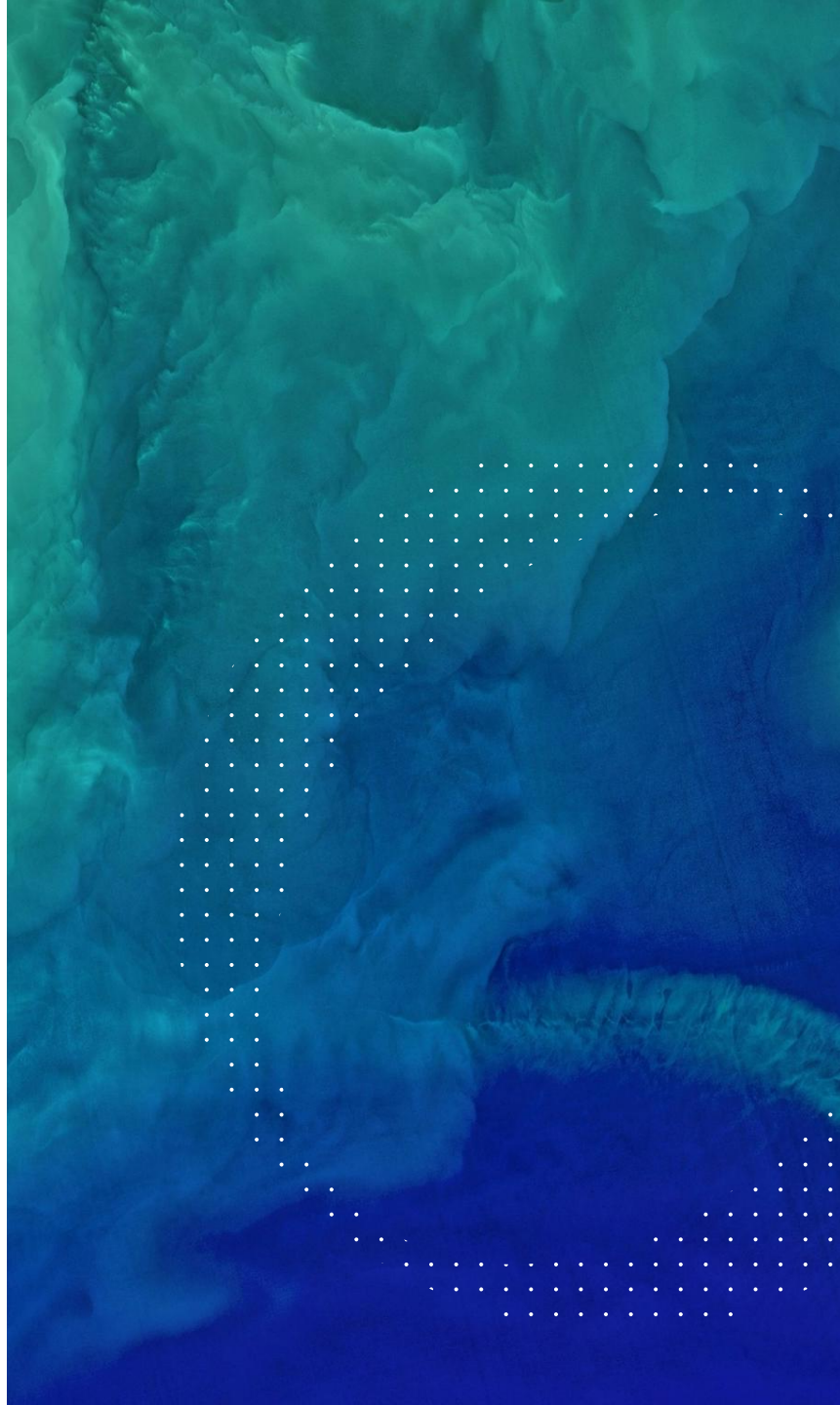
Your turn!

Your input is essential in crafting a truly dynamic, regionally relevant training experience.

- Shape mandatory submodules by innovative learning methods
- Suggest new submodules and help the young students get a good **introduction to the space sector!**

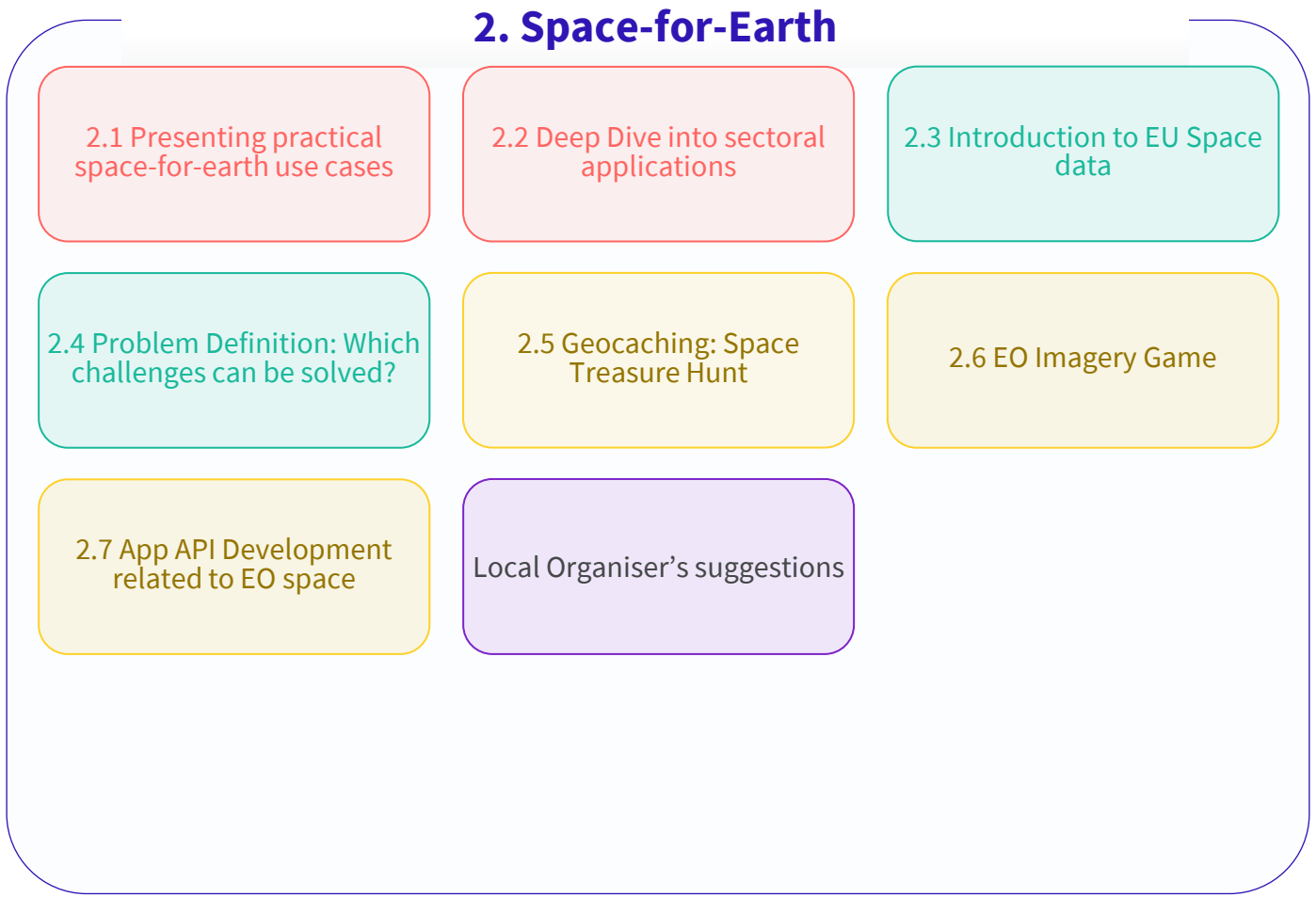
Training Module 2

Space-for-Earth



NOVASPACE

Overview Training Module 2



Mandatory | Final Event | Optional | LO suggestions

Training Module 2: Space-for-Earth

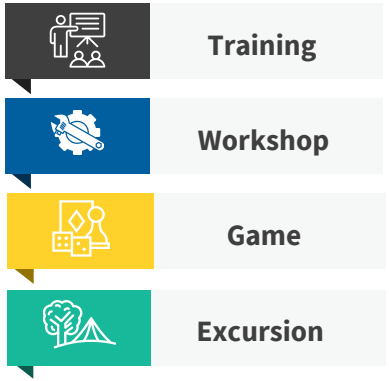
Module description

This module encompasses all activities that relate to **downstream space and its benefits for earth**. Practical space-for-earth use cases in different sectors such as 'saving the planet, environmental protection & sustainability', 'agriculture, forestry, natural resources' and 'maritime and ocean monitoring' will be demonstrated. Real-life case studies will show how space technologies can be used. The goal is also to show the use of the EU Space Programmes.

Learning Objectives

- Understand the intersection of space technology and Earth-focused solutions.
- Explore practical space-for-Earth use cases across different sectors
- Recognize the role and contributions of EU Space Programmes
- Apply space technology to real-world challenges

Proposed Learning Methods



Mandatory sub-modules

2.1 Presenting practical space-for-earth use cases

In this introductory submodule, an overview will be provided on how space technologies, also related to the EU Space Programme, can be used to solve real world challenges. Local organisers are provided with different sectoral options. **(provided in detail) VR/ AR tech may be provided.**

2.2 Deep Dive on Sectoral Applications

In this submodule, **Local organisers do a deep dive on their chosen sectoral applications**. They may ideally choose a sector that is highly relevant to their local context. Local organisers are welcome to propose innovative methods on how they plan to do a deep dive on demonstrating the applications. Local Organisers are invited to host several deep dives at the same time to ensure participants' interests are accommodated.

2.3. Introduction to EU Space Data

In this submodule, students will explore the wealth of space data provided by the EU through its various space programmes and the focus being **the accessibility and practical use cases of this data**, especially how it can help address societal challenges.

2.4. Problem Definition

In this submodule, students will work to brainstorm and **define specific problems** that can be addressed using space data.

Optional sub-modules

2.5 Geocaching: Space Treasure Hunt

In this geocaching game, players work in teams to find hidden geocaches using GNSS-enabled devices and satellite data. At each cache, they solve puzzles or challenges tied to real-world applications of Earth Observation (EO) and GNSS, such as analyzing satellite imagery. They can use GNSS enabled app to navigate with precise coordinates.

2.6 EO Imagery Game

In this game, you can guide students to analyse Earth Observation pictures and let them determine the complexity of their creation., with educated guesses.

2.7 API App Development for EO

In this workshop, students will be introduced to Earth Observation (EO) data and basic API development by creating a simple web app that fetches and displays satellite imagery.

Recommended hours of the module | **4 - 5 hours**

Submodule 2.1: Presenting practical space-for-earth use cases

Mandatory

Module | **2. Space-for-Earth**

Recommended hours of the program | **~ 60 minutes**

Content description

In this introductory submodule, an overview will be provided on how space technologies, also related to the EU Space Programme, can be used to solve real world challenges. Local organisers are provided with different sectoral options.

- Agriculture
- Maritime
- Aviation and Drones
- Urban Development
- Automotive and Mobility
- Forestry and Natural Resources
- Mining and Energy
- ESG Reporting
- Climate Services

The Local Organisers are **required to do an overview of all relevant applications.** It is encouraged to give a little more emphasis on markets that are highly relevant to the **local context** of your space camp.

Learning Methods

Multimedia presentation with interactive quiz

You may use VR/ AR to teach students space applications concepts

Learning objectives

- Understand the intersection of space technology and Earth-focused solutions.
- Understand the applications of space technologies in innovating and addressing the challenges in multiple sectors

Submodule 2.2: Deep dive into sectoral applications

Mandatory

Module | **2. Space-for-Earth**

Recommended hours of the program | **~ 90 minutes**

Content description

In this submodule, **Local organisers do a deep dive on their chosen sectoral applications**.

Look at the following pages for inspiration on the different sectors and adapt to your regional context!

They may ideally choose sectors that are highly relevant to their local context. Local organisers are welcome to propose innovative methods on how they plan to do a deep dive on demonstrating the applications.

Local Organisers are invited to host several deep dives at the same time to ensure participants interests are accommodated. The participants may then choose which ones they want to watch.

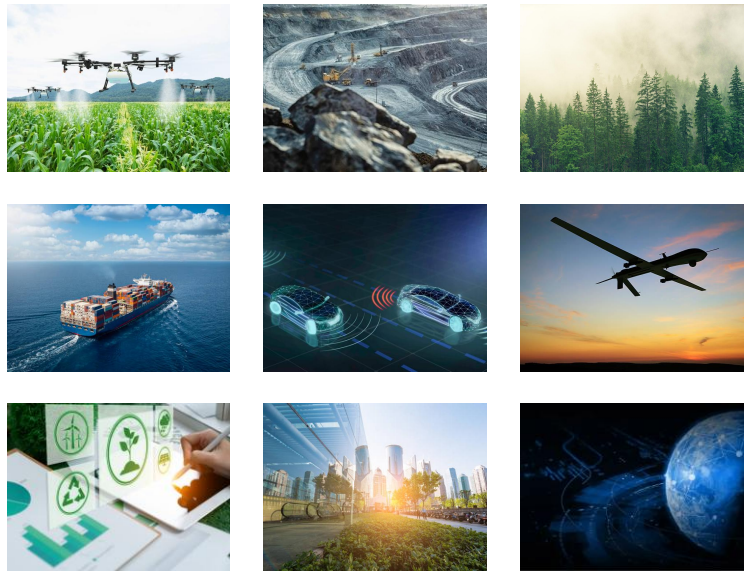
Learning objectives

- Learn how satellite data is used in specific sectors through case studies
- Learning how we can use space technology to solve real-world challenges

Learning Methods

Real-life case studies from the different sectors to enable students to brainstorm

You may use VR/ AR to teach students space applications concepts



Submodule 2.2: Deep dive into sectoral applications
Use cases in Agriculture

Guide the students to examine the intersection of space technologies and agriculture, focusing on how satellite-based Earth Observation and GNSS technologies are revolutionizing the agricultural sector. From crop monitoring to precision farming, space technologies are transforming the way farmers manage resources, increase yields, and make data-driven decisions.

Participants will explore the practical applications of space-based tools that can drive more efficient, sustainable, and productive agricultural practices.

The main concepts presented include:

- **Precision Agriculture Using Satellite Data:** Learn how Earth Observation (EO) satellites monitor crop health, soil moisture, and pest infestations, leading to more effective resource management and better yields.
- **GNSS for Precision Farming:** Discover the importance of GNSS systems like Galileo and EGNOS for precision farming, including field mapping, automated equipment, and improving irrigation systems.
- **Climate-Smart Agriculture:** Explore how space technologies help farmers adapt to climate change by providing real-time data for weather forecasting, drought monitoring, and pest control.
- **Sustainable Agriculture with Space Technologies:** Understand how space-based solutions are key to optimizing land use, minimizing chemical inputs, and improving water management.

Submodule 2.2: Deep dive into sectoral applications
Use cases in Maritime

Teach your students what are the applications of space technologies in the maritime sector, highlighting the role of the EU Space Programme in improving maritime operations, safety, and sustainability. From maritime navigation to tracking environmental changes, space-based solutions provide critical insights into the world's oceans and waterways.

Participants will explore how Earth Observation (EO), GNSS, and other space technologies are transforming maritime safety, fleet management, and environmental monitoring.

The main concepts presented include:

- **Satellite Navigation for Maritime Safety:** Learn how GNSS systems like Galileo support maritime navigation, improving accuracy and safety for vessels.
- **Marine Environmental Monitoring with EO:** Discover how Earth Observation solutions are used to monitor ocean temperatures, sea levels, and marine pollution.
- **Maritime Domain Awareness (MDA):** Understand the role of space technologies in improving surveillance, anti-piracy efforts, and maritime traffic monitoring.
- **Sustainable Shipping & Green Ports:** Explore how space technologies are facilitating the transition to more sustainable shipping practices and the development of eco-friendly ports.

Submodule 2.2: Deep dive into sectoral applications
Use cases in Aviation and Drones

Gain an overview of the EU Space Programme's relevance to aviation and drones. Explore the capabilities of GNSS in enhancing aviation and drone operations.

This lesson on 'Aviation and Drones' is designed to equip learners with the knowledge and skills to understand and apply the latest technologies in the field.

The main concepts that will be presented include:

- **EGNSS and Copernicus current usage:** Understand the current applications of EGNSS and Copernicus in aviation and drone operations.
- **Monitoring aviation emissions:** Learn about the increased focus on monitoring aviation emissions and the role of GNSS in this process.
- **Sustainable and smart mobility - Green airports:** Discover the concept of green airports and how sustainable and smart mobility is being promoted.
- **Urban Air Mobility (UAM):** Learn about the emerging field of Urban Air Mobility and how drones are being used in urban environments.

Submodule 2.2: Deep dive into sectoral applications
Use cases in Urban Development and Smart Cities

Explore the intersection of the EU Space Programme with urban development, focusing on climate-neutral cities and the role of the EU Space Programme. Delve into Earth Observation (EO) applications for urban greening and the contribution of GNSS to smart cities.

This lesson on 'Urban Development' is designed to equip learners with the knowledge and skills to understand and apply the latest technologies in the field.

The main concepts that will be presented include:

- **Climate-Neutral Cities and Space Technologies:** Learn how space technologies can enable our cities to become climate-neutral
- **Multi-dimensional cadastre:** Explore the concept of multi-dimensional **cadastre and its relevance in urban development**
- **GNSS-based mapping for smarter cities:** Discover how GNSS-based mapping can contribute to the development of smarter cities
- **Urban greening with EO solutions:** Learn about the role of EO solutions in urban greening initiatives

Submodule 2.2: Deep dive into sectoral applications
Use cases in Automotive, Mobility and Transportation Systems

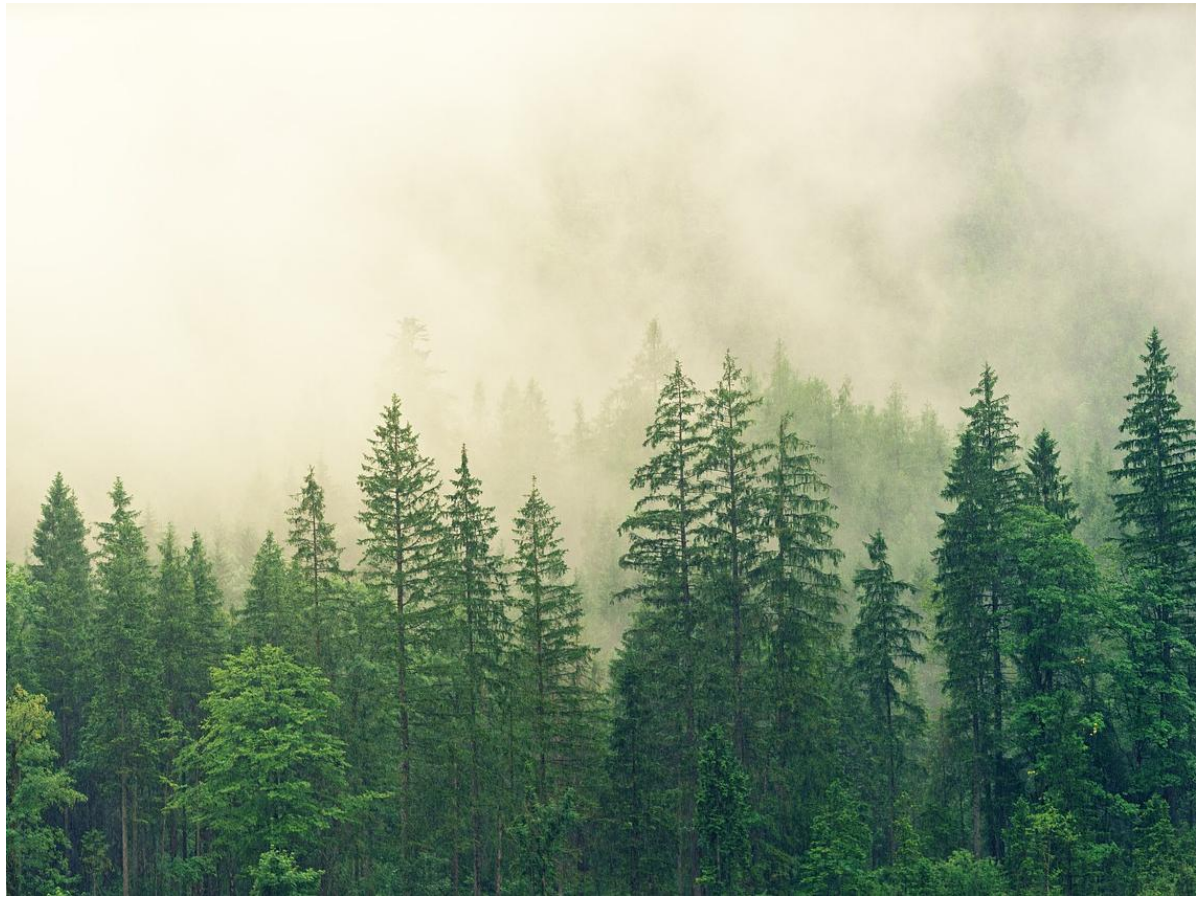
Examine the profound impact of the EU Space Programme on the automotive sector and mobility. It provides a comprehensive overview of space technologies for autonomous driving and sustainable mobility. You will gain valuable insights from experts who are shaping the mobility landscape.

Mobility is an integral part of our daily lives, and this course focuses on the Road and Automotive market applications, which include services and products offered to and consumed by the automotive industry.

The main concepts that will be presented include:

- **Mobility challenges:** Understand the current issues and obstacles in the mobility sector.
- **EGNOS and Galileo:** Learn how these two major European satellite navigation systems contribute to smarter and more sustainable mobility.
- **EU Space Programme and sustainable mobility:** Discover how the EU Space Programme can help create more sustainable mobility and transport efficiency.
- **Space technologies and autonomous driving:** Explore the significant contribution of space technologies to autonomous driving.

Submodule 2.2: Deep dive into sectoral applications
Use cases in Forestry and Natural Resources



Forestry is a vital sector that plays a crucial role in the economy and the environment. This lesson aims to provide you with a comprehensive understanding of the forestry sector, its challenges, and the latest space technological advancements that are being used to address them.

The main concepts that will be presented include:

- **Forestry challenges:** Understand the current issues and obstacles in the forestry sector
- **Securing sustainable timber supply chains:** Learn about the importance of sustainable timber supply chains and how they can be secured
- **EO for forest carbon monitoring:** Explore the use of Earth Observation (EO) technology for forest carbon monitoring
- **Battling the increased and more extreme occurrence of forest fires:** Learn about the latest techniques and space technologies that are being used to battle the increased and more extreme occurrence of forest fires

Submodule 2.2: Deep dive into sectoral applications
Use cases in Mining and Energy

Explore how space technologies enhance resource management, monitoring, and sustainability in the mining and energy sectors. Satellite-based Earth Observation (EO) and GNSS technologies are transforming how resources are located, extracted, and managed, helping to improve operational efficiency while reducing environmental impact. Space solutions also support monitoring emissions, tracking resource supply chains, and ensuring regulatory compliance.

The main concepts that will be presented include:

- **Satellite Applications for Resource Exploration:** Learn how Earth Observation satellites assist in mineral exploration, mapping, and assessing resource availability.
- **GNSS for Mining and Energy Operations:** Discover how GNSS systems like Galileo enable efficient resource management, transportation logistics, and site monitoring in remote areas.
- **Energy Monitoring and Optimization with Space Technologies:** Explore how EO and GNSS are used to monitor energy production, including monitoring renewable energy sources like wind and solar farms.
- **Sustainable Practices in Mining with Space Data:** Understand how space technologies monitor environmental impacts, reduce waste, and help improve sustainability in mining operations.

Submodule 2.2: Deep dive into sectoral applications
Use cases in Environmental Protection and Sustainability

Understand the EU Space Programme's role in sustainability, climate services, exploring space tech applications for climate change monitoring, forecasting, and mitigation. Gain insights from experts that are developing climate solutions. And protecting the environment. Dive also into Environmental, Social, and Governance (ESG) considerations. You will gain valuable insights from startups (e.g. GlobeEye) that are at the forefront of this field.

The main concepts that will be presented include:

- **Global climate and environment-related trends:** Understand how global climate and environment-related trends and policies are driving and generating demand for EO data and applications.
- **Earth's Digital Twin and the Destination Earth Initiative:** Learn about the ultimate sustainability project – Earth's Digital Twin and the Destination Earth initiative.
- **Integration of AI in climate-related applications:** Discover how the integration of AI is increasing the quality of climate-related applications.
- **Space Technologies and Supply Chains:** Learn how space technologies can be used in monitoring supply chains to ensure ethical and sustainable practices.
- **Space data and ESG reporting:** Discover the use of space data to fill the gaps of data for comprehensive and accurate ESG reporting

Submodule 2.3: Introduction to EU Space Data

Final Event

Module | **2. Space-for-Earth**

Recommended hours of the program | **~ 60 minutes**

Content description

In this submodule, students will explore the wealth of space data provided by the European Union (EU) through its various space programs, such as Copernicus and Galileo.

The focus will be on the **accessibility and practical uses of this data**, especially in terms of how it can help address societal challenges.

Through hands-on examples, students will **understand how satellite data can be used for applications of the sectors mentioned above.**

The lesson will cover the **types of available datasets**, such as Earth observation imagery and satellite navigation data, and introduce basic tools for working with and interpreting this data.

Learning Methods

- Use online tools and real time examples to guide students through the process of accessing and interpreting satellite data
- Provide students with specific datasets (e.g., satellite images, weather data) and task them with analysing the data patterns in small groups
- Engage in discussions about how they could use EU space data to solve similar challenges in different sectors

Learning objectives

- Understand the types of space data available through EU space programs (e.g., Copernicus Earth observation, Galileo navigation data)
- Recognize the practical applications of space data in addressing real-world challenges, from environmental issues to disaster response
- Learn basic techniques to interpret and visualize space data using accessible tools

Submodule 2.4: Problem definition – Which challenges can be solved?

Final Event

Module | **2. Space-for-Earth**

Recommended hours of the program | **~ 60 minutes**

Content description

In this submodule, students will work to **brainstorm and define specific problems that can be addressed using space data.**

By focusing on real-world challenges such as climate change, disaster management, or sustainable agriculture, they will use the space data from the previous module to better understand these issues. Students will identify key questions and challenges that could be solved or mitigated using satellite data, helping them transition from theory to practical application.

This phase will encourage creativity and critical thinking**, as students begin formulating ideas for potential business solutions that could emerge** from the data and the challenges defined.

The business idea formation is coming up in Module 3! The challenges defined here feed into the business idea creation! In principle: When they understand **what is possible** with the available data, then they can understand **how to effectively use it.**

Learning Methods

- Use online tools and real time examples to guide students through the process of accessing and interpreting satellite data
- Provide students with specific datasets (e.g., satellite images, weather data) and task them with analysing the data patterns in small groups
- Engage in discussions about how they could use EU space data to solve similar challenges in different sectors

Learning objectives

- Learn how to define a real-world problem that could be solved with space data
- Understand the importance of clearly identifying a problem before developing a solution
- Develop skills to break down complex challenges into manageable components using space data
- Begin conceptualizing solutions that leverage space technologies for practical, Earth-based applications

Submodule 2.5: Geocaching – Space Treasure Hunt

Optional

Module 2. Space-for-Earth

Recommended hours of the program ~ 120 - 180 minutes

Content description

In this geocaching game, players work in teams to find hidden geocaches using GNSS-enabled devices and satellite data. At each cache, they solve puzzles or challenges tied to real-world applications of Earth Observation (EO) and GNSS, such as analyzing satellite imagery. Solving the riddle unlocks information about the coordinates of the next geocache. They can use a GPS device or mobile app app to navigate with the coordinates.

Learning objectives

- Develop skills in interpreting satellite data to make informed climate-related observations

Learning Methods

Follow the game instruction and receive materials to make the game happen

Materials needed

- GNSS-enabled devices (e.g., smartphones, GPS units)
- Printed imagery/ maps in pre-hidden geocaches (containers, logs, small puzzles, or clues)
- Challenges (puzzle sheets, EO-related tasks)
- Writing tools (pens/ pencils)

Submodule 2.6: EO Imagery Game

Optional

Module 2. Space-for-Earth

Recommended hours of the program ~ 45 minutes

Content description

In this game, you can guide students to analyse Earth Observation pictures and let them determine the complexity of their creation.

Players are presented with EO images of varying complexity and tasked with identifying the features, understanding the **technology used to capture them**, and analyzing the processes involved. Challenges include matching images to their resolutions, determining the type of sensors used, and deciphering clues about data processing techniques like atmospheric corrections and georeferencing.

Prerequisite: You have already presented the various sensors and data processing techniques in previous submodules.

Complexity levels:

- **Basic:** Single-band imagery with minimal processing (e.g. grayscale satellite images)
- **Moderate:** Multispectral imagery with atmospheric corrections and georeferencing
- **Advanced:** Multitemporal, hyperspectral, or synthetic aperture radar (SAR) data requiring sophisticated processing and AI models

Learning objectives

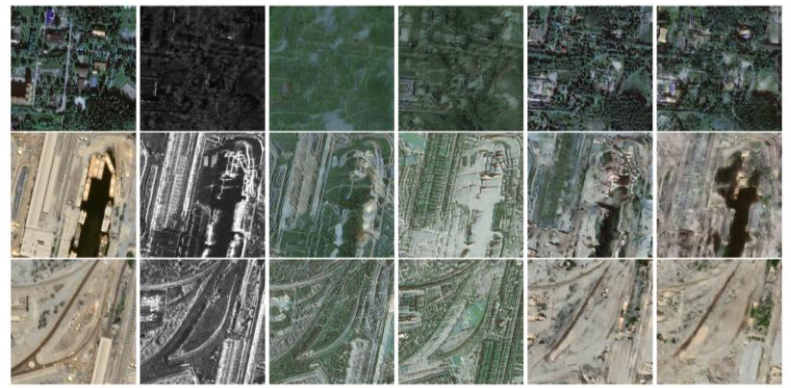
- Understand the technology and methods behind satellite imagery creation
- Differentiate between types of EO data, such as multispectral, hyperspectral, and radar imagery
- Develop skills in analysing image features and identifying the complexity of processing steps

Learning Methods

Follow the game instruction and receive materials to make the game happen

Materials needed

- Printed satellite imagery with various resolutions, data processing techniques, data acquisition techniques etc.



Submodule 2.7: Application API Development for Earth Observation

Optional

Module | **2. Space-for-Earth**

Recommended hours of the program | **~ 90 minutes**

Content description

In this workshop, students will be introduced to Earth Observation (EO) data and basic API development by creating a simple web app that fetches and displays satellite imagery. The goal is to bridge the gap between raw space data and practical applications by helping students prototype a small **data-driven tool** that solves a real-world problem. The workshop will introduce basic **API concepts, data integration, and visualization techniques**, while keeping it accessible for beginners.

- Understanding how space data is made available through **public APIs** (e.g., Copernicus OpenHub, Sentinel Hub, Open-Meteo for weather data)
- Learning the basics of **API calls** (fetching data, filtering, and displaying results)
- Designing a **simple web or mobile app** that presents space data in a meaningful way

Learning objectives

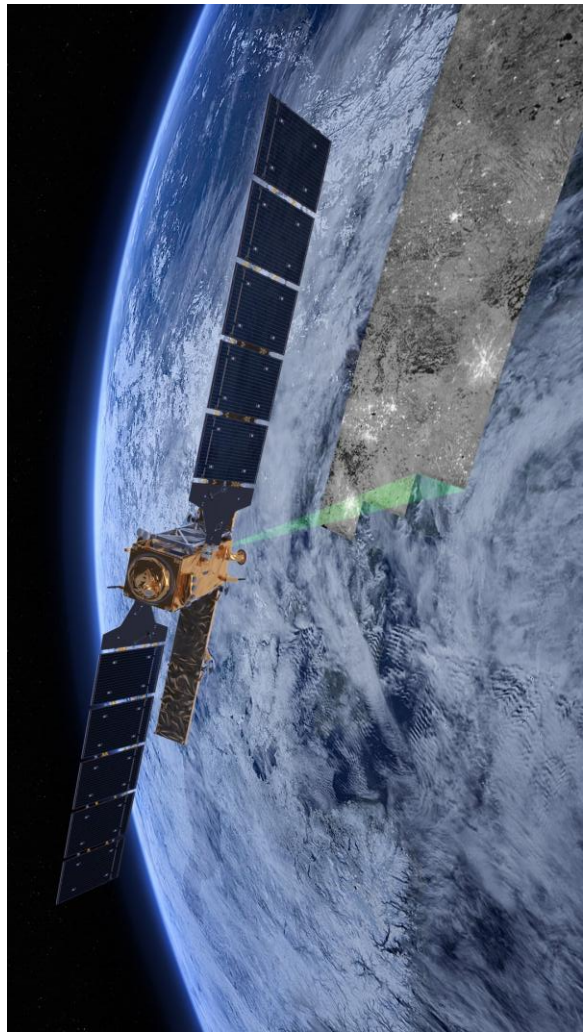
- Help students understand what an API is and how it can be used to access EO data
- Foster skills in programming, spatial analysis, and real-world applications of EO data

Learning Methods

Guided demo

Materials needed
- Laptops
- Basic coding templates

Your turn!

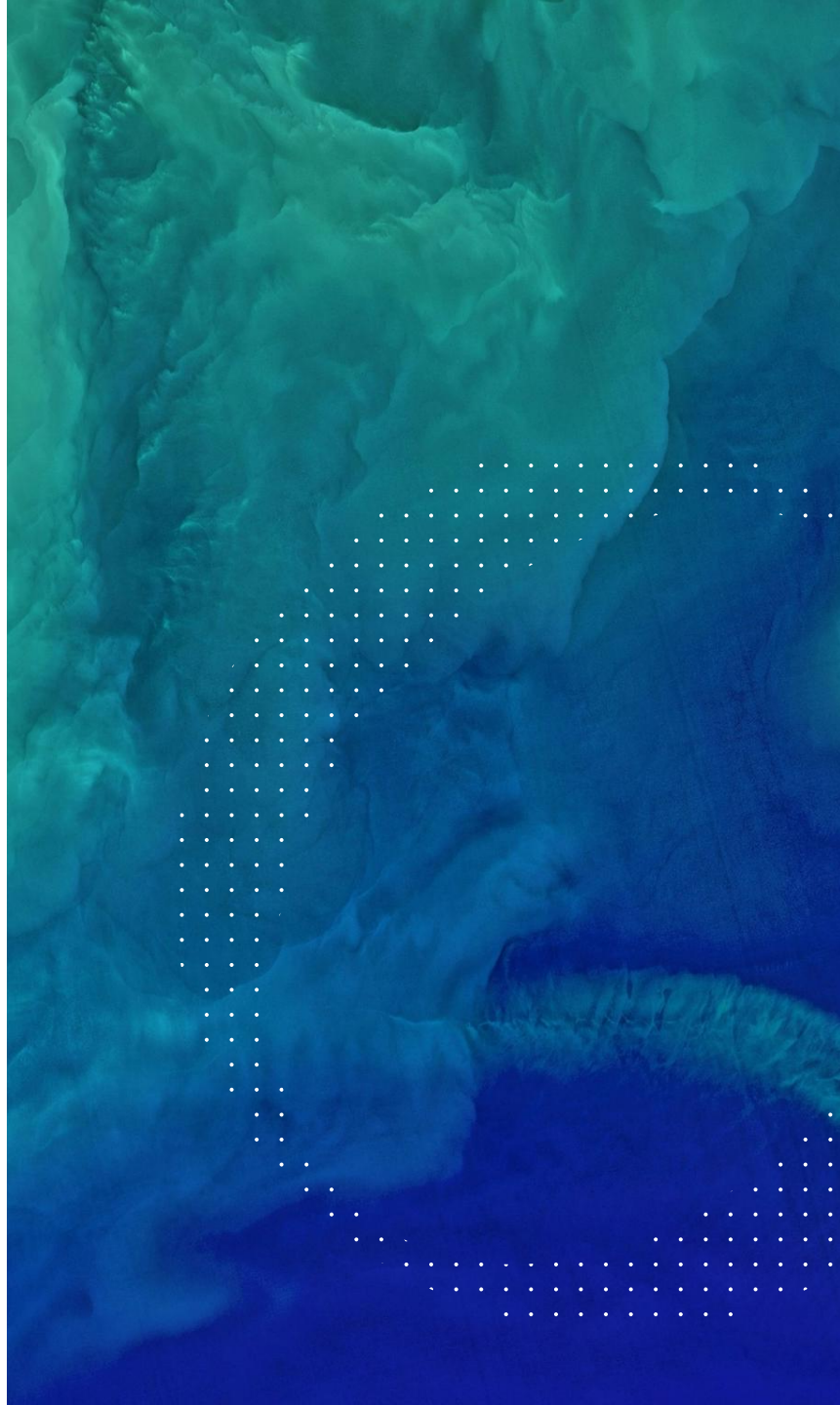


Your input is essential in crafting a truly dynamic, regionally relevant training experience.

- Shape mandatory submodules by innovative learning methods
- Suggest new submodules and help the young students understand how **Space** technologies can be used **for Earth!**

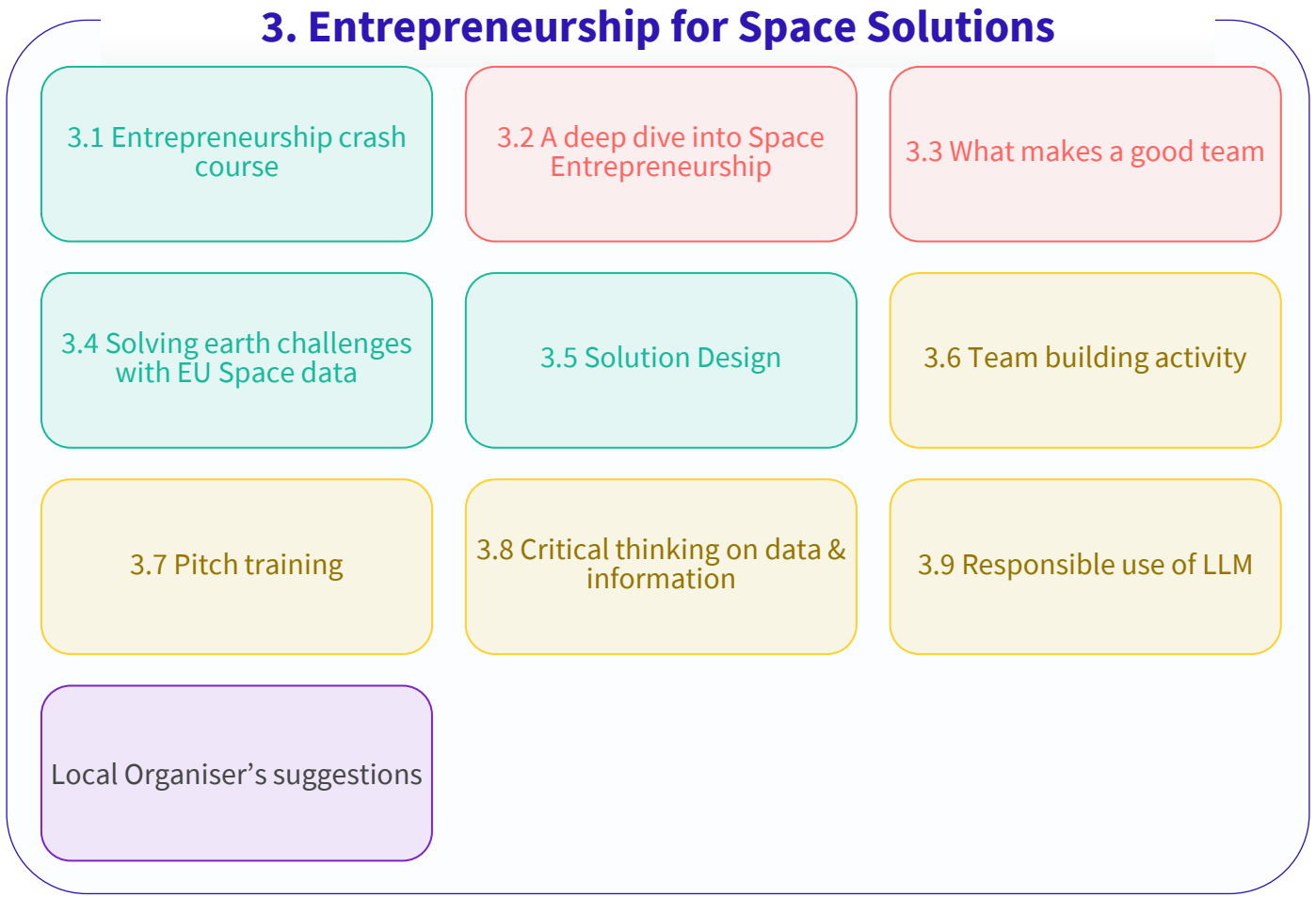
Training Module 3

Entrepreneurship for Space Solutions



NOVASPACE

Overview Training Module 3



Mandatory | Final Event | Optional | LO suggestions

Training Module 3: Entrepreneurship for Space Solutions

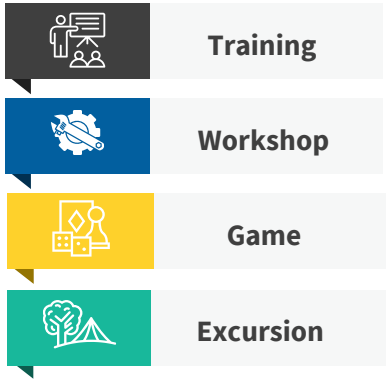
Module description

Introducing the **fundamentals of entrepreneurship** by exploring real-world downstream space applications. Building on insights from the 'Space-for-Earth' module, participants learn how to identify problems, develop innovative solutions, and create sustainable business models. Through a hands-on **design sprint process**, they quickly prototype and validate their ideas, gaining practical experience in turning concepts into viable opportunities.

Learning Objectives

- Understand the fundamentals of entrepreneurship and how they apply to the space industry
- Develop creative business ideas and solutions for space-related challenges
- Gain skills in creating business ideas and pitching to a group

Proposed Learning Methods



Mandatory sub-modules

3.1 Entrepreneurship crash course

This submodule introduces students to the fundamentals of entrepreneurship, providing a solid foundation for those new to the concept. It demystifies entrepreneurial jargon and focuses on the essential building blocks of starting a business.

3.2 Space entrepreneurship deep dive

Students get familiar with how entrepreneurial concepts from the crash course relate to space businesses and analyze space technologies for their potential to solve real-world problems. Possible interconnections to Module 1.

3.3 What makes a good team

In this submodule, students will explore the essential elements of **effective teamwork**, not only in the context of project development but **also as it relates to career success and personal growth**

3.5 Solving earth challenges using EU Space Data

In this submodule, students will combine their knowledge of EU space data and entrepreneurship to brainstorm unique business ideas that address real-world Earth challenges. Using the Business Model Canvas as a framework.

3.6 Solution design

In this submodule, students will take their business ideas to the next level by exploring how to design a **Minimum Viable Product (MVP).**

Optional sub-modules

3.4. Team Building Exercise

In this submodule, students will participate in an engaging team-building activity designed to **reinforce the principles of effective teamwork.**

3.7. Pitch training

This submodule equips students with the skills and confidence to effectively pitch their business ideas.

3.8. Critical thinking on data and information

This submodule fosters critical thinking skills by teaching students how to **analyse and interpret data with a critical lens**.

3.9. Responsible usage of LLMs

Prompt engineering workshop with emphasis on responsible usage

Recommended hours of the module | **3 - 5 hours**

Submodule 3.1: Entrepreneurship crash course

Final Event

Module

3. Entrepreneurship for Space Solutions

Recommended hours of the program ~ 45 minutes

Content description

This submodule introduces students to the fundamentals of entrepreneurship, providing a solid foundation for those new to the concept. It demystifies entrepreneurial jargon and focuses on the essential building blocks of starting a business. Among the key topics covered are:

- **What is Entrepreneurship?**: Definition, examples, and its significance in problem-solving.
- **Business Strategy:** How to pitch your venture, the market component, achieving substantial revenue and grabbing the momentum
- **Business Model:** The components of a business canvas, fill the canvas with interactive case studies
- **Marketing and Sales:** How to build a marketing strategy & plan, B2B, customers & pricing, customers & sales
- **How to build a Minimum Viable Product (MVP):** Highlight MVP case studies and where to start building
- **Understanding the design process** – from ideation to prototyping
- How to build a **successful team** and allocate resources – key factors of success

Learning objectives

- Get familiar with basic entrepreneurial concepts
- Get introduced to the concepts of business strategy and business models

Learning Methods

- Expert/ entrepreneur talk
- Multimedia presentation with interactive quiz
- Design a game that teaches students these concepts by roleplaying
- Visits to universities or companies that can give a crash course

Submodule 3.2: A deep dive into Space Entrepreneurship

Mandatory

Module | **3. Entrepreneurship for Space Solutions**

Recommended hours of the program | **~ 60 minutes**

Content description

Students get familiar with how entrepreneurial concepts from the crash course relate to space businesses and analyze space technologies for their potential to solve real-world problems.

Possible interconnections to Module 1.

The lecturers choose 2-3 case studies related to sectors they chose in Module 2 to deep dive on. Lecturers present real-world examples to inspire students about disruptive space ventures. Students connect back to the basic entrepreneurship concepts they learnt in submodule 3.1. mapping the business model canvas to space ventures or building space-specific MVPs.

Business Model Canvas: Discuss how space startups solve unique problems on earth (value propositions), the related customer segments, revenue streams, key resources and partnerships.

MVP: What are the challenges of prototyping in space (high costs, technical complexity, higher amount of reliability testing) and give an overview of lean testing for space applications. Highlight some examples of space MVPs.

Navigating the space ecosystem: Hurdles for space entrepreneurship, licensing and national laws, funding opportunities, overview of suppliers and investors. (possible connection to Module 6)

Learning Methods

Industry professionals share their experiences and insights on space entrepreneurship.

Deep dive into case studies of successful space ventures and business model canvas mapping to the ventures

Learning objectives

- Get familiar with how entrepreneurial concepts relate to space businesses
- Analyze space technologies for their potential to solve real-world problems

Submodule 3.3: What makes a good team

Mandatory

Module | **3. Entrepreneurship for Space Solutions**

Recommended hours of the program | **~ 60 minutes**

Content description

In this submodule, students will explore the essential elements of **effective teamwork**, not only in the context of project development but **also as it relates to career success and personal growth**.

By understanding the dynamics of good teams, students will learn how to collaborate effectively, contribute to group goals, and manage conflicts constructively.

Additionally, the lesson will dive into **the psychology of team roles**, focusing on **how different personalities and skills contribute to overall success**. Through self-reflection and practical exercises, students will recognize their strengths and weaknesses as team members and learn how to adapt in various professional environments, whether in space-related projects or broader career contexts.

Here we want to carry out an interactive workshop engages participants in a team-based problem-solving challenge that emphasizes key principles of effective teamwork. Participants will take on specific roles and work collaboratively to complete a multi-faceted task. The activity is designed to demonstrate the importance of **communication, role clarity, leveraging strengths, and adaptability.**

Learning objectives

- Understand the key characteristics of successful teams and how they function
- Identify different team roles and how to leverage diverse skills and personalities for optimal performance
- Learn how psychological factors, such as motivation, communication styles, and conflict resolution, impact teamwork

Learning Methods

Team-based activity exploring how different skillsets and skills contribute to overall success

Materials needed

- Local organisers to choose a regional specific challenge/ situation – could be from any sector, at any level of complexity.

Submodule 3.4: Solving earth challenges with EU Space data

Final Event

Module 3. Entrepreneurship for Space Solutions

Recommended hours of the program ~ 60 - 90 minutes

Content description

In this submodule, students will combine their knowledge of EU space data and entrepreneurship to brainstorm unique business ideas that address real-world Earth challenges. **Using the Business Model Canvas as a framework**, they will systematically map out the key elements of their business ideas, including value proposition, customer segments, and revenue streams.

The session emphasizes creativity, problem-solving, and entrepreneurial thinking, encouraging students to align their ideas with societal needs and market opportunities. By the end of this session, each team will have a well-defined business concept mapped out on a BMC.

Learning Methods

Business model canvas workshop

Learning objectives

- Generate innovative business ideas using EU space data
- Apply the Business Model Canvas to structure business concepts
- Identify value propositions, customer segments, and other key components of a business model
- Enhance teamwork and collaborative brainstorming skills

Submodule 3.5: Solution Design

Final Event

Module | **3. Entrepreneurship for Space Solutions**

Recommended hours of the program | **~ 60 minutes**

Content description

In this submodule, students will take their business ideas to the next level by exploring how to design a **Minimum Viable Product (MVP).**

They will learn the concept of **Technology Readiness Levels (TRLs)** to evaluate the feasibility and development stage of their solutions. The workshop emphasizes practical strategies to turn ideas into tangible prototypes, focusing on lean and iterative development. Students will leave with a clear understanding of how to plan for early-stage solution development.

Depending on the Local Organiser's capacity, students can either explore the MVP on a theoretical level, or try to develop a simple dashboard, mobile app or code that fetches and processes satellite data.

Learning Methods

Prototyping and Road mapping Exercise

Learning objectives

- Learn how to develop an MVP to validate business ideas
- Understand Technology Readiness Levels (TRLs) and their role in product development
- Explore lean development principles to build cost-effective, functional prototypes
- Create a roadmap for advancing from concept to a deployable solution

Submodule 3.6: Team Building Activity

Optional

Module | **3. Entrepreneurship for Space Solutions**

Recommended hours of the program | **~ 60 - 120 minutes**

Content description

In this submodule, students will participate in an engaging team-building activity designed to **reinforce the principles of effective teamwork learned in Submodule 3.3.**

Through sports or game-based challenges, students will practice communication, problem-solving, leadership, and collaboration in a dynamic and fun environment. These activities will help students build trust, develop camaraderie, and understand how their individual contributions strengthen the team.

Example activities include: Lake Sailing, escape room, outdoor obstacle course, raft building, mountain hiking. Feel free to propose your own!

Learning Methods

Local organisers choose one or more team-based activities for the students to engage in

Learning objectives

- Practice teamwork and collaboration in a fun, high-energy setting
- Build trust and camaraderie among team members.

Submodule 3.7: Pitch Training

Optional

Module 3. Entrepreneurship for Space Solutions

Recommended hours of the program ~ 45 minutes

Content description

This submodule equips students with the skills and confidence to **effectively pitch their business ideas**. Students will learn the structure of a compelling pitch, including how to articulate their value proposition, showcase their use of EU space data, and highlight the market potential of their solution. Through hands-on practice and constructive feedback, they will refine their delivery to captivate and persuade an audience of potential investors, stakeholders, or judges.

Learning Methods

Pitch workshop

Materials needed

- Computers or tablets for preparing pitch decks
- Projector and screen for presentations
- Pitch deck templates or examples
- Feedback forms or rubrics for evaluators

Learning objectives

- Understand the key components of a persuasive business pitch
- Develop storytelling skills and learn techniques for clear delivery
- Practice pitching in front of an audience and respond to questions with confidence

Submodule 3.8: Critical Thinking on Data and Information

Optional

Module | **3. Entrepreneurship for Space Solutions**

Recommended hours of the program | **~ 45 minutes**

Content description

This submodule fosters critical thinking skills by teaching students how to **analyse and interpret data with a critical lens**. Students will explore the **potential biases in data collection, analysis, and presentation**, as well as **learn to identify misleading information**. They will also discuss **ethical considerations** and the responsible use of data in their projects.

Through hands-on activities and real-world examples, students will develop the ability to evaluate the quality and credibility of data, a skill essential for informed decision-making in entrepreneurship and beyond.

After discussing fundamental principles of data quality and ethics, the session culminates in a thought-provoking and fun "How to Lie Using Data" exercise. This activity encourages students to intentionally manipulate or misrepresent data to understand how misinformation is created.

Learning Methods

Presentation of statistics concepts and a “How to lie with data” exercise

Materials needed

- Example datasets with potential biases or errors
- Case studies or news articles showing data misrepresentation
- Computers or tablets for data analysis exercises
- Ethical guidelines or principles for data use

Learning objectives

- Understand the sources and types of bias that can exist in data and information.
- Develop skills to critically evaluate the quality, accuracy, and reliability of data.
- Learn about ethical considerations and the responsible use of space data.
- Enhance awareness of how data can be misrepresented or misused in different contexts.

Submodule 3.9: Responsible use of LLMs

Optional

Module | **3. Entrepreneurship for Space Solutions**

Recommended hours of the program | **~ 60 minutes**

Content description

This submodule explores the potential and limitations of using Large Language Models (LLMs) in innovation and entrepreneurship. Students will learn how to leverage LLMs effectively for tasks such as brainstorming, research, and communication while understanding the importance of maintaining their own creativity and critical thinking.

The session emphasises **the balance between utilizing AI tools and nurturing independent problem-solving skills** to ensure that **reliance on LLMs enhances, rather than diminishes, their intellectual development.**

Learning objectives

- Understand the capabilities and applications of LLMs in entrepreneurship and problem-solving
- Recognize ethical and practical limitations of LLMs, including biases and misinformation
- Identify the importance of maintaining independent creativity and critical thinking while using LLMs
- Develop strategies for the responsible and balanced use of LLMs in projects and daily work.

Learning Methods

Prompt engineering workshop with emphasis on responsible usage

Materials needed

- Computers with access to LLMs (if possible, in a controlled environment)
- Example outputs from LLMs and techniques
- Scenario-based prompts for group discussions

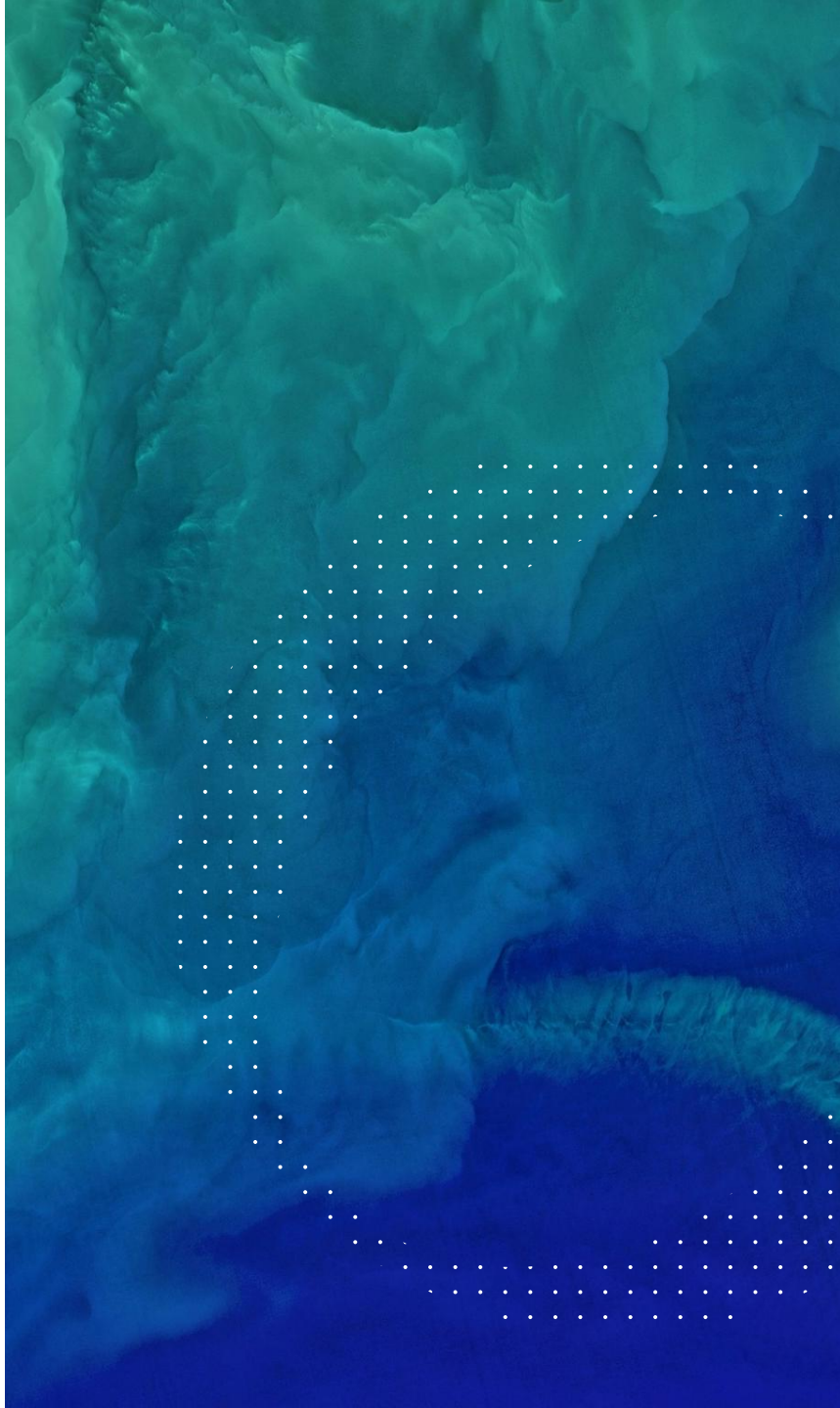
Your turn!

Your input is essential in crafting a truly dynamic, regionally relevant training experience.

- Shape mandatory submodules by innovative learning methods
- Suggest new submodules and help the young students understand how **Space** technologies can be used **for Earth!**

Training Module 4

Career Guide to Space



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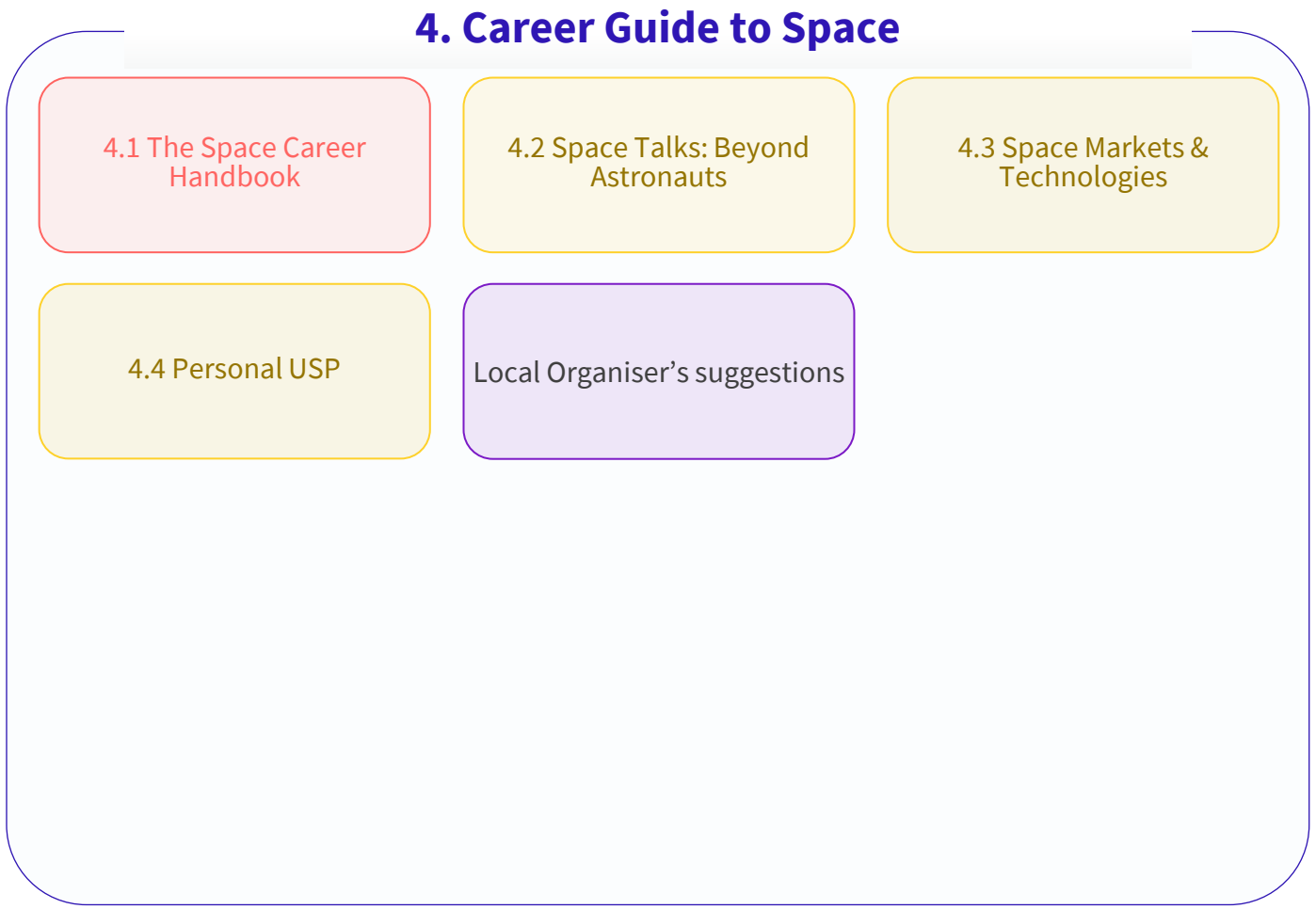
Overview Training Module 4



Training Module 4: Career Guide to Space

Module description

The aim is to inspire and guide students toward potential careers in the space industry. By showcasing role models and offering mentorship, it highlights the wide variety of opportunities, from engineering and science to business, policy, and beyond. Students will be gaining practical tools to shape their journey after finishing school. Through exposure to diverse careers, studies, and industry opportunities, the module equips participants to craft their own path in the dynamic world of space.

Learning Objectives

Discover the wide range of career opportunities in the space sector.

- Learn about educational pathways and skills needed for space-related jobs.
- Create a personalized career roadmap based on individual interests and goals
- Build confidence and motivation to pursue a career in space.

Proposed Learning Methods

- Training
- Workshop
- Game
- Excursion

Mandatory sub-modules

4.1 Space Career Handbook

A physical 'Space Career Handbook' will be provided, to be printed and handed out to the participants during the workshop. The participants fill out the handbook with mentorship guidance.

Optional sub-modules

4.2 Space Talks: Beyond Astronauts

In this submodule, Local Organisers have the flexibility to choose external speakers to share their own stories and introduce the various space-related careers, including engineering, science, policy, business, and space systems design.

4.3 Space Markets and Technologies

The goal is to understand the different markets of the space industry and the different technologies.

4.4. Personal USP

Small guided activity, students will learn how to define what makes them valuable as professionals, build a personal brand, and effectively communicate their strengths to future employers or collaborators in their fields.

Recommended hours of the module 1 - 3 hours

Submodule 4.1: The Space Career Handbook

Mandatory

Module | **4. Career Guide to Space**

Recommended hours of the program | **~ 60 - 120 minutes**

Content description

We will provide a template for the '**Space Career Handbook**', to be printed and handed out to the participants during the workshop

Through this template, you will introduce students to the diverse career opportunities within the space industry. The handbook will serve as a personal guide throughout their career exploration journey. The handbook includes sections on various space-related career paths, necessary skills, industry trends, and educational pathways. During the workshop, participants will fill out the handbook with personalized guidance from mentors, who will offer advice on career goals, skill development, and strategies for entering the space sector. This interactive session helps students take proactive steps toward shaping their future in the space industry.

The Handbook will be kept by the participants after the event and will be also available in a digital format.

Learning objectives

- Explore the multidisciplinary nature of the different career paths in the space industry
- Understand the key skills, qualifications, and training needed for a career in space
- Develop personalized career goals and a roadmap for achieving them
- Receive mentorship and guidance from expert mentors

Learning Methods

Hands-on career roadmap activity with provided template

Materials needed

- The physical handbook given by us, printed and handed out to all students

The Space Career Handbook would serve as a dynamic tool for inspiring and guiding students, while being flexible for local adaptations

Section	Purpose
1. Introduction Section: Dream Big!	Inspire participants to think about their aspirations and visualize their dream role in the space sector.
2. Discover Your Interests and Strengths (Personal USP)	Help participants identify their skills, interests, and preferences.
3. Explore Education Pathways	Provide participants with an overview of educational requirements for different space careers.
4. Develop Skills	Highlight the technical and soft skills needed for space careers and guide participants on how to build them.
5. Get Connected	Encouraging and guiding students how to network and engage with the space community and space organisations
6. Create Your Roadmap	Guide students to consolidate their plans into a personalized career roadmap.
7. Resources and Opportunities	Provide a curated list of resources for further exploration.

Customisation options

1. Highlighting regional universities, programs, or industries
2. Including guest speakers or mentor profiles relevant to their local context
3. Adding QR codes linking to local internships or online learning resources

Opportunities to be presented

- CASSINI initiatives ecosystem and related opportunities
- STARS*EU Space Career Launchpad
- Local opportunities to work in space

Submodule 4.2: Space Talks – Beyond Astronauts

Optional

Module 4. Career Guide to Space

Recommended hours of the program ~ 60 minutes

Content description

In this submodule, Local Organisers may have the flexibility to choose how they will introduce the various space-related careers, including engineering, science, policy, business, and space systems design.

This offers students the opportunity to hear directly from real-life models in the space industry. Industry experts, astronauts, engineers, and entrepreneurs will share their personal journeys, experiences, and insights into working in the space sector.

These talks provide students with authentic perspectives on the challenges and rewards of space-related careers, offering inspiration and practical advice for pursuing careers in space exploration, technology, and business. By learning from real-life role models, students gain valuable insights into the skills, dedication, and resilience required to succeed in the field.

Learning Methods

Expert Talks from real-life role models in the space sector

Learning objectives

- Gain firsthand insights into various careers within the space industry
- Understand the paths taken by industry professionals to reach their current positions
- Be inspired by the personal stories of success, overcoming obstacles, and driving innovation in space

Submodule 4.3: Space Markets and Technologies

Optional

Module | **4. Career Guide to Space**

Recommended hours of the program | **~ 30 – 60 minutes**

Content description

The goal in this submodule is to understand the different markets of the space industry and the different technologies.

We first start by asking the audience: "*How do you think space affects our daily life?*" and give relatable examples.

Markets: SatCom, Earth Observation, Space Exploration, Satellite Navigation, Launch and Space Logistics, Ground Segment, Security & Defence, Satellite Manufacturing, Space Situational Awareness, Next-Gen Space

Technologies: Launch Vehicles, Radars, Optical Sensors, the different satellite types, the different propulsion systems, space habitats, exploration technologies (from telescopes to rovers), power systems and energy storage, communication technologies.

Learning objectives

- Understand the primary markets and technologies in the space sector
- Identify how technologies support the needs of different markets
- Recognize the broad range of careers available in the space industry

Learning Methods

Multimedia presentation on the different markets and technologies of the space sector

Materials needed

- Multimedia presentation

Submodule 4.4: Personal USP

Optional

Module | **4. Career Guide to Space**

Recommended hours of the program | **~ 30 minutes**

Content description

Submodule 4.4 focuses on helping students identify and develop their **Personal USP (Unique Selling Proposition), which is the unique combination of skills, experiences, and qualities that set them apart in their career.**

Through a small guided activity, students will learn how to define what makes them valuable as professionals, build a personal brand, and effectively communicate their strengths to future employers or collaborators in their fields.

Start by giving an overview of what is a Personal USP. You may use scenario-based examples with made up characters. Then you can prompt the students with a series of questions like: “What are three things you’re naturally good at?, “What do friends or teachers compliment you on?, “What problems do you love solving?”, “What’s a memorable achievement that made you proud?”, “What kind of role models do you look up to, what do they do?”.
Help participants identify keywords in their answers and put them aside. Help students formulate sentences that summarise their unique strengths and connect it to future career paths.

This submodule may be a good warmup for Submodule 3.3. “What makes a good team”.

Learning Methods

Brainstorming game

Materials needed

- Pen and paper for the students to answer to the prompts

Learning objectives

- Understand what a USP is and why it’s important
- Identify their unique strengths, passions, and values and how this can guide them to their future

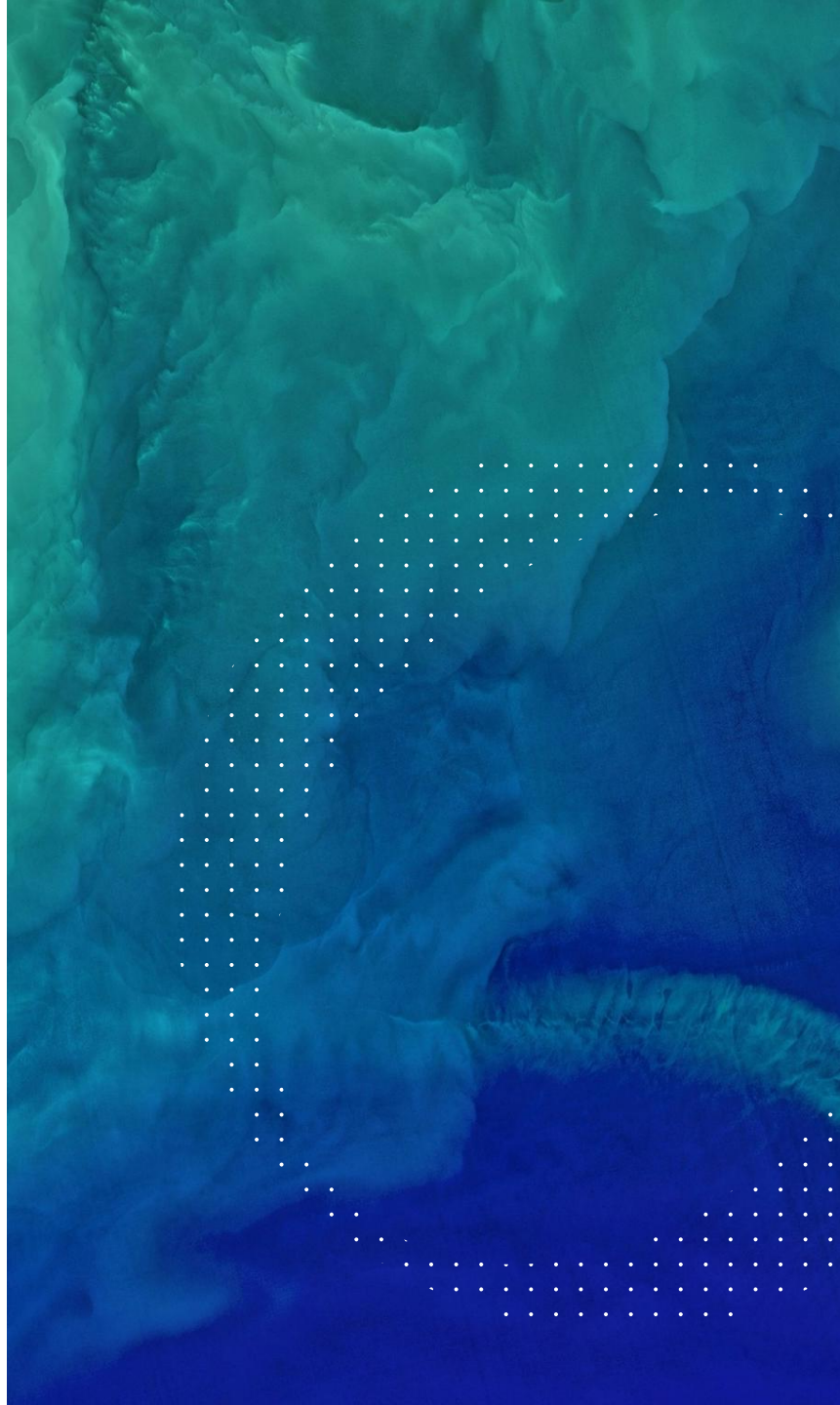
Your turn!

Your input is essential in crafting a truly dynamic, regionally relevant training experience.

- Shape mandatory submodules by innovative learning methods
- Suggest new submodules that will help students, **discover their career path to space!**

Training Module 5

Space Exploration



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Overview Training Module 5

Note: Please include at least one sub-module covering Training Module 5

5. Space Exploration

- 5.1 History of Space Exploration
- 5.2 Astronomy Night
- 5.3 Planetarium/ Observatory Visit
- 5.4 Design of mission proposal
- 5.5 Launch your rocket
- 5.6 Skywalk - Space object tracking using apps
- 5.7 Exploring with the ‘Kerbal Space Programme’ game
- 5.8 Build a LEGO moon/ mars rover
- 5.9 Virtual Reality Exploration of Space
- 5.10 Building a HAM radio ground station
- 5.11 On-the-Air
- Local Organiser’s suggestions

Mandatory | Final Event | Optional | LO suggestions

Training Module 5: Space Exploration

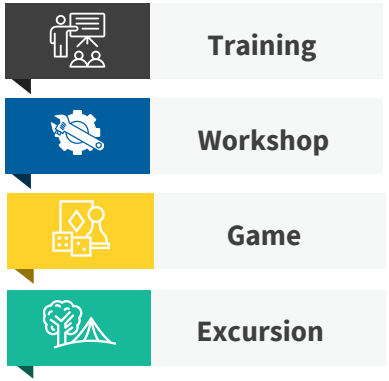
Module description

This module takes participants on a journey through key milestones in space history while inspiring them to connect the past, present, and future of space exploration. Through real-time observation of celestial objects, engaging storytelling, and hands-on activities, the module fosters curiosity about the cosmos and encourages a deeper understanding of humanity's role in exploring the universe.

Learning Objectives

- Understand key milestones in space exploration history
- Inspire participants by connecting the history and future of space exploration with the real-time observation of celestial objects
- Foster curiosity about the cosmos through engaging storytelling and hands-on activities

Proposed Learning Methods



Optional sub-modules

5.1 Space Exploration History

Local organisers are invited to propose innovative methods to help participants visualise the key milestones in space exploration history as well as the future of the EU in space exploration.

5.2 Astronomy Night

Stargazing excursion with telescopes or binoculars

5.3 Planetarium/ Observatory

Guided tour in a planetarium or observatory

5.4 Design of mission proposal

Competition-format brainstorming in teams

5.5 Launch your rocket

Outdoor mini rocket workshop and launch

5.6. Skywalk

Stargazing excursion with applications

5.7 Kerbal Space Programme

Educational game night session

5.8 Build a LEGO rover

Introductory space-themed LEGO robotics workshop

5.9. VR Space Exploration

Students take turns on a VR headset to explore space, can be done throughout the day

5.10 HAM Radio Ground Station

Assembly of HAM radio ground station, under licensed operator guidance

5.11. On-the-air

Coordinated communication with other space camps and teaches basics of radio

Recommended hours of the module | **2 - 6 hours**

Submodule 5.1: History of Space Exploration

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 60 minutes**

Content description

Local organisers are invited to propose innovative methods to help participants visualise the key milestones in space exploration history as well as the future of the EU in space exploration.

This could include VR/ AR exploration of space, the ISS, moon, mars etc.

This submodule starts with an introductory lecture on the history of space exploration. Learn about landmark missions like the Apollo Program, Mars rovers, and International Space Station (ISS). Participants may explore upcoming missions, including plans for a cis-lunar space station, Mars habitats, and robotic explorers. Include video screenings of important milestones of space exploration (e.g. moon landing/ mars rover/ cassini footage etc.) It is also acceptable to combine this with a 'documentary-style' video screening.

Space exploration activities of the EU are put in the spotlight.

Learning objectives

- Understand key milestones in space exploration history
- Understand the future of the EU in space exploration

Learning Methods

- Company/ institution representatives to give lecture about their experience
- Multimedia presentation with interactive quiz
- VR/ AR exploration of space
- Documentary screening

Submodule 5.2: Astronomy Night

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 120 minutes**

Content description

The module for space exploration encourages a story-based learning approach. Astronomy is one of the best intercultural achievements of humanity, as it builds on scientific knowledge from the ancient times to the modern age.

Students will gather under the night sky to observe celestial objects using telescopes and other astronomy tools. This session will introduce them to stars, planets, and constellations, while also sparking discussions about the vastness of space and our place in the universe. A local astronomer or facilitator can guide the session, providing fascinating insights into the cosmos.

The Local Organisers should find an evening slot to combine an astronomy night using binoculars and telescopes, with a brief introduction lecture on the history of astronomy, cosmology and space exploration. Thus, we aim to inspire participants and sparking a lasting sense of wonder and ambition.

Local Organisers will preferably choose dates where astronomical events are visible from the location. Local Organisers may choose one or more nights to go on an outdoor night expedition with the participants.

Learning objectives

- Identify key celestial objects and constellations visible in the night sky
- Understand basic principles of observational astronomy, including how telescopes work
- Develop an appreciation for the beauty and scale of the universe

Learning Methods

Stargazing excursion with telescopes or binoculars

Materials needed

- Telescopes or binoculars (at least one per group or shared for the session)
- Star charts or apps for identifying constellations
- Laser pointers for guiding the group to specific stars and objects
- Outdoor location with limited light pollution

Submodule 5.3: Planetarium or Observatory Visit

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 120 minutes**

Content description

Students will visit a planetarium or observatory to deepen their understanding of the universe through immersive, guided experiences.

At a planetarium, they can enjoy virtual sky tours and simulations of space exploration. If visiting an observatory, students will get a closer look at celestial objects through professional-grade telescopes and learn about ongoing research projects.

Local organisers that have such facilities and activities in their disposal are encouraged to utilise them.

Learning objectives

- Experience the night sky in detail through advanced technology or professional telescopes
- Learn about ongoing scientific research in astronomy and space exploration
- Explore how observatories contribute to our understanding of the universe
- Gain insights into careers in astronomy and astrophysics

Learning Methods

Guided tour in a planetarium or observatory

Materials needed

- Custom tour at a local planetarium or observatory

Submodule 5.4: Design of mission proposal

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 120 - 180 minutes**

Content description

Students are invited to do a workshop and competition on designing a mission proposal, for a future European space mission. You may choose space missions from different countries outside the EU and create a playful ‘space race’ setting of competition against these countries.

The challenge announcement will be: “You are now European innovators in the global space race. How will you design a mission that positions Europe as a leader in space exploration against flagship space programmes of other countries?”

The first to choose and present different mission focus to handout: Lunar Exploration, Mars Exploration, SSA, asteroid missions, human spaceflight, earth observation missions, satellite communication constellations etc.

Participants may be divided into group and compete against each other. They can be presented with the subject of the space missions and then instructed to come up with a proposal to present later during the day. In between they can engage in activities from other submodules and have some free time to rest and come up with solutions, refine their proposal, and prepare a presentation for a jury. Incusive awards are given such as “Most Innovative Proposal”, “Best Collaboration”, “Best Use of European Resources”, “Best Pitch” etc.

Learning objectives

- Understand the components of mission design, including scientific, technical, and collaborative aspects
- Foster creativity and strategic thinking within a global competitive context
- Build critical thinking and teamwork skills
- Gain insight into Europe’s role in the global space sector and its potential for leadership

Learning Methods

Brainstorming in teams with competition

Materials needed

- Mission brief template
- Creative supplies
- Rubric for evaluation
- Digital tools for presentation

Submodule 5.5: Launch your rocket

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 120 minutes**

Content description

Students will get a mini rocket science workshop to delve into the world of rocket science by designing and building their own small-scale rocket models.
This hands-on workshop introduces the basics of rocket science, such as propulsion, aerodynamics, and structural design, while fostering creativity and teamwork.

By constructing and testing their rockets, students will gain an appreciation for the challenges of launching payloads into space. The session culminates in a few fun and competitive launch event, where teams test their rockets and analyze performance.

Learning Methods

Mini rocket workshop and launch outdoors

Learning objectives

- Understand the fundamental principles of rocketry, including propulsion, aerodynamics, and payload capacity
- Apply problem-solving and engineering skills to design and build a functional model rocket
- Trigger the excitement of a working model rocket

Submodule 5.6: Skywalk - Space object tracking using apps

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 30 minutes**

Content description

This session uses user-friendly mobile apps like **Heavens-Above** and **StarWalk** to excite students about space object tracking.

Students will learn how to locate satellites, space stations, and celestial bodies in the night sky, understanding their trajectories and significance. This hands-on activity connects theoretical knowledge of space with practical tools, encouraging participants to explore the universe directly from their smartphones or tablets.

By the end of the workshop, students will have tracked satellites, identified celestial objects, and developed a deeper appreciation for the tools used by amateur and professional astronomers alike.

Learning Methods

Stargazing excursion with applications (can be combined with Astronomy Night)

Materials needed

- Smartphones or tablets with internet access
- Installed apps: **Heavens-Above** and **StarWalk** (free versions available).
- Outdoor area with minimal light pollution for direct sky observation

Learning objectives

- Understand how to use mobile applications to track satellites and celestial objects in real time
- Develop an appreciation for the accessibility of space science through modern technology

Submodule 5.7: Exploring with the ‘Kerbal Space Programme’ game

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 120 - 180 minutes**

Content description

Game night!

In this exciting and playful session, participants will take the controls of **Kerbal Space Program (KSP)**, a fun and immersive simulation game that lets you design, build, and launch your very own rockets. From crafting the perfect spacecraft to figuring out how not to crash on the Mun (Kerbin’s Moon), students will step into the shoes of a space engineer and mission planner.

The game features a pseudorealistic orbital physics engine, allowing for various real-life orbital maneuvers. Whether you’re launching satellites, setting up space stations, or bravely attempting to bring your Kerbal astronauts home in one piece, you’ll be solving problems, experimenting, and working as a team to conquer the final frontier.

Learning objectives

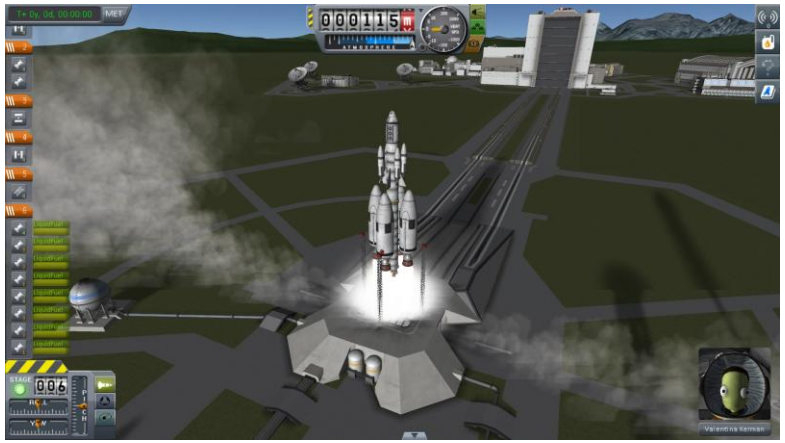
- Appreciate the challenges (and humor) of space exploration in a playful, low-pressure environment
- Discover the basics of rocket science, including propulsion, gravity, and orbital mechanics, through hands-on gameplay

Learning Methods

Educational game session

Materials needed

- Computers or laptops with Kerbal Space Program installed
- Projector or screen for a live demonstration of gameplay basics



Submodule 5.8: Build a LEGO moon/ mars rover

Optional

Module 5. Space Exploration

Recommended hours of the program ~ 90 minutes

Content description

Rovers are the eyes and ears of space exploration—they gather data, take pictures, and perform experiments in environments that are too dangerous for humans.

In this hands-on workshop, students will first receive a brief introduction to real-life Mars and Moon rovers, exploring key design elements like wheels, cameras, and scientific instruments. They will then break into teams and build their own rovers using Lego kits, focusing on creating functional mobility systems. After constructing their rovers, teams will test them by navigating an obstacle course simulating Martian or lunar terrain, overcoming challenges like craters and uneven surfaces.

Learning objectives

- Develop teamwork and problem-solving skills while building a functional and creative rover design
- Foster creativity and innovation in thinking about space exploration and engineering

Learning Methods

Introductory LEGO robotics workshop

Materials needed

- Lego rover building kits (including wheels, sensors, platform pieces, etc.)
- Pre-set obstacle course with materials to simulate Martian or lunar terrain (sand, rocks, ramps, etc.)
- Tape measure or ruler to measure rover travel distances

Submodule 5.9: VR Space Exploration

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 30 minutes**

Content description

In this session, students will explore space using Virtual and Augmented Reality (VR/AR) technologies. They will experience immersive simulations that allow them to explore the surface of Mars, navigate through the International Space Station, and observe celestial bodies.

Using VR headsets or AR-enabled devices, students will engage with interactive space environments and gain insight into how these technologies are used in real-world space exploration, astronaut training, and mission planning. After the experience, participants will reflect on how VR and AR enhance our understanding of space and discuss their potential future applications in space exploration and education.

Check example experiences:

- https://store.steampowered.com/app/953840/Apollo_11_VR_HD/
- https://spaceengine.org/

Learning objectives

- Experience immersive, interactive space environments and learn about celestial bodies, spacecraft, and missions

Learning Methods

Students take turns on a VR headset to explore space, can be done throughout the day

Materials needed

- VR headsets
- Pre-installed VR space exploration apps (e.g., Apollo 11 VR, Space Engine etc.)
- Space for students to move around safely (if using VR headsets)

Submodule 5.10: Building a HAM radio ground station

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 120 minutes**

Content description

In this workshop, students will learn the fundamentals of HAM (amateur) radio communication and gain hands-on experience building a ground station for space communication.

HAM radio has been a vital tool in space exploration, enabling communication with satellites and the International Space Station (ISS).

Participants will work together under supervision to **assemble their own HAM radio ground station**, learning how to connect antennas, set up receivers, and establish communication protocols. The session will cover the basic principles of radio waves, frequencies, and modulation techniques, with a focus on how amateur radio is used in space missions for both data transmission and personal communication. Once the stations are built, students will test their setups by attempting to **make contact with the ISS, other relaying the signal through HAM satellites,** bringing theory to practice.

Make sure the activity complies with local HAM radio regulations. If transmitting signals, a licensed HAM radio operator may need to supervise. Coordinate with a local HAM radio club for guidance, equipment support, or licensed operator participation.

Learning objectives

- Understand the basic principles of HAM radio communication, including radio waves, frequencies, and modulation
- Gain practical experience in setting up and operating a HAM radio ground station
- Learn about the use of HAM radio in space missions for communication with satellites and astronauts

Learning Methods

Assembly of HAM radio ground station, under licensed operator guidance

Materials needed

- HAM radio kits (transmitter, receiver, antenna, and cables)
- Tools for assembling the kits (screwdrivers, wire strippers)
- Computer with access to HAM radio frequency charts and communication software

Submodule 5.11: On-the-Air

Optional

Module | **5. Space Exploration**

Recommended hours of the program | **~ 45 minutes**

Content description

Note: This module has as a prerequisite that two or more camps are taking place simultaneously and coordinated time slots and access to frequencies for contacting other space camps.

In this interactive workshop, students will experience **real-time communication with other space camps around Europe using amateur radio,** just like the famous Jamboree on the Air (JOTA) event.

They will learn how to operate HAM radios and connect with other camp participants across various locations, exchanging messages and discussing space exploration. Using a portable amateur radio station, students will work together to communicate with other space camps, developing practical skills in satellite and radio communication.

This activity will also introduce students to the global amateur radio community and its role in space missions and international collaboration. The session will emphasize teamwork, communication protocols, and the technical aspects of radio waves, frequencies, and signal transmission, all while connecting with peers across the globe.

Learning objectives

- Understand the basics of amateur radio operation, including frequencies, communication protocols, and signal propagation.
- Gain hands-on experience in making contact with other space camps using HAM radio equipment.
- Learn about the role of amateur radio in space exploration, communication with satellites, and space stations.
- Develop communication skills by collaborating with other students

Learning Methods

Facilitator with experience in amateur radio coordinates communication with other space camps and teaches basics of radio

Materials needed

- Portable HAM radio station kits (transmitters, receivers, antennas, and cables).
- Computers or tablets for accessing radio communication software and logs (if applicable).
- Frequency charts and communication guidelines for operating within amateur radio bands.

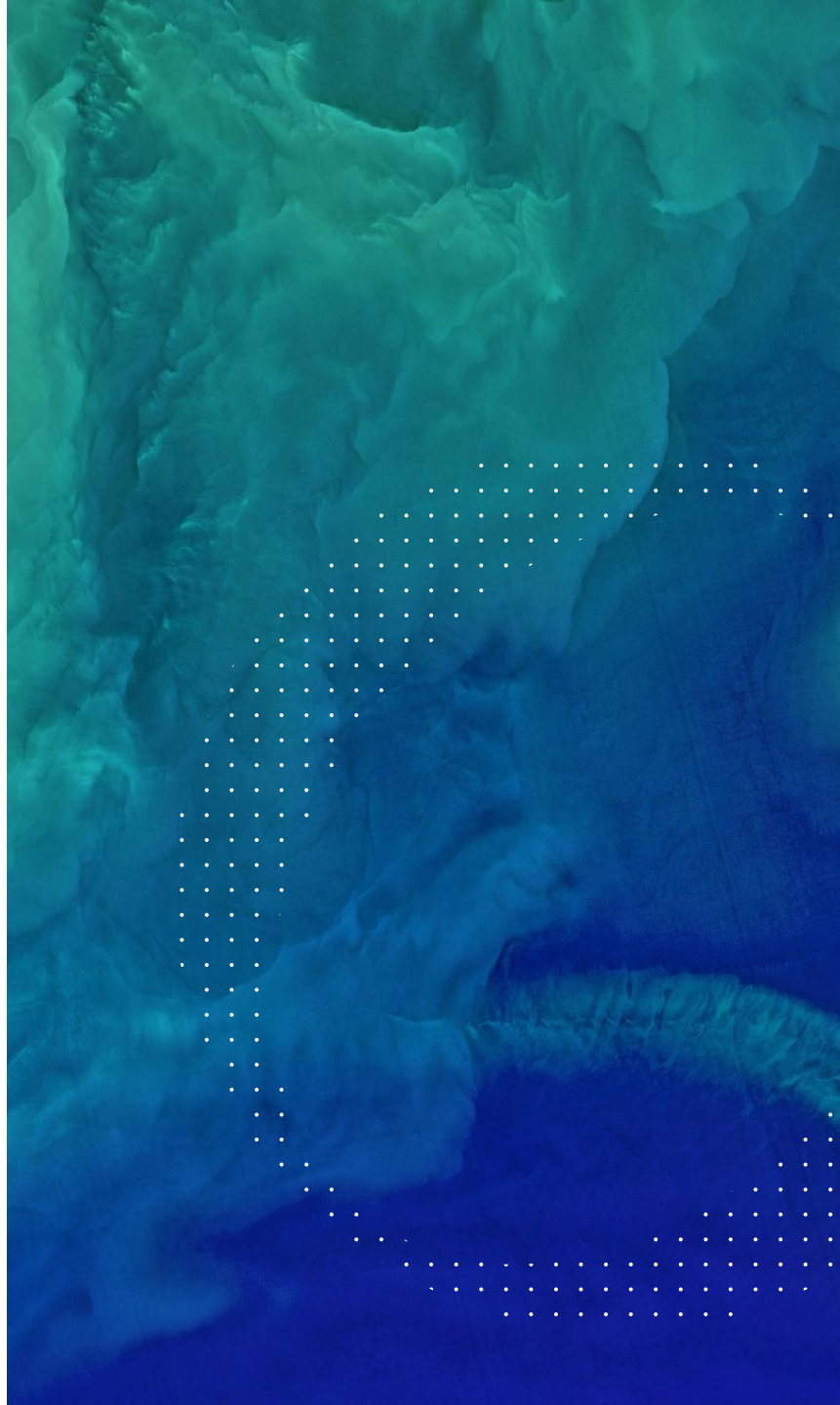
Your turn!

Your input is essential in crafting a truly dynamic, regionally relevant training experience.

- Shape mandatory submodules by innovative learning methods
- Suggest new submodules that will help students, **discover the wonders of space exploration!**

Training Module 6

Space-for-All



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Overview Training Module 6

Note: Please include at least one sub-module covering Training Module 6

6. Space-for-All

- 6.1 Tackling space challenges
- 6.2 Mock Debate "Who owns space?"
- 6.3 Funding: Financing your space solution
- 6.4 Ethics (dual use, space treaties)
- Local Organiser's suggestions

Training Module 6: Space-for-All

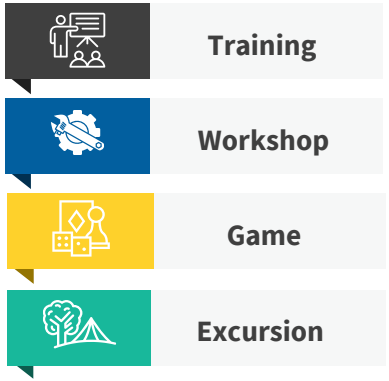
Module description

This module explores how space contributes to the democratisation of opportunities by promoting equal access, empowerment, and inclusion. Participants will examine the critical link between space governance and democracy. It encourages students to think critically about real-world space challenges and understand the value space brings to society as a shared resource.

Learning Objectives

- Understand how space governance promotes equal access and empowerment.
- Analyse space challenges and explore democratic solutions to address them.
- Recognise the value of space in supporting societal development and democracy.
- Develop critical thinking skills through interactive problem-solving activities.

Proposed Learning Methods



Optional sub-modules

6.1 Tacking space challenges

Immerse students in a simulated space law challenge to make abstract concepts tangible and relatable. Prepare real-world-inspired challenges related to space law, Assign students roles, such as governments of affected countries, representatives of private space companies, international space institutions and inspire them to interact and pursue solutions on space challenges.

6.2 Mock Debate “Who owns space?”

Engage teens in exploring space ethics through an interactive and fun debate. Divide students into two groups, each group representing one side of the argument, inspire them to brainstorm and prepare and let the debate play out.

6.3 Funding – financing your space solution

In this workshop, students will explore the **financial aspects of space ventures**, learning how to fund a space-based solution or startup.

6.4 Ethics (Dual use, Space Treaties)

In this workshop, students will explore how to analyse real-world dilemmas in space security, commercialization, and geopolitics.

Recommended hours of the module 1 - 2 hours

Submodule 6.1: Tackling space challenges

Optional

Module | **6. Space-for-All**

Recommended hours of the program | **~ 30-40 minutes**

Content description

Immerse students in a simulated space law challenge to make abstract concepts tangible and relatable.

Scenario Cards: Prepare real-world-inspired challenges related to space law, such as:

- Space Debris Crisis: A large defunct satellite is predicted to collide with an active satellite belonging to a different country. How should this be resolved?
- Asteroid Mining Dispute: Two private companies claim ownership of resources from the same asteroid.
- Radiofrequency Interference: A nation's satellite is disrupted by signals from a private telecom satellite.

Roles: Assign students roles, such as:

1. Governments of affected countries.
2. Representatives of private space companies.
3. International space law mediators.

Activity Flow:

- Brainstorming (10 minutes): Each group discusses their role and formulates a plan or argument.
- Resolution (20 minutes): Groups present their case and negotiate a resolution.

Learning Methods

Following the game instructions

Learning objectives

- Students learn how space law applies to real-life problems, while practicing diplomacy and critical thinking
- Analyse real challenges and consider possible solutions
- Making the complex topic of space law both accessible and enjoyable

Submodule 6.2: Mock Debate “Who owns space?”

Optional

Module | **6. Space-for-All**

Recommended hours of the program | **~ 40 minutes**

Content description

Engage teens in exploring space ethics through an interactive and fun debate.

Divide Into Teams:

- Team A argues: ”Space is the common heritage of all humanity and should not be owned by anyone."
- Team B argues: "Private companies and nations should be allowed to claim ownership of space resources.“

Teams then have 20 minutes to brainstorm and prepare their arguments, drawing on information provided in the lecture of submodule 7.1.

The instructor or peers vote on which team presented the most convincing argument, while giving feedback points.

Another point of the debate is to explore **“How space promotes democracy”.**

Learning objectives

- Develop critical thinking and argumentation skills while exploring space ethics

Learning Methods

Divide the students into two groups and let them brainstorm in a fun way about the topic before they present their arguments

Materials needed

- Presentation about the topic
- Graphic material for brainstorming

Submodule 6.3: Funding - Financing your space solution

Optional

Module | **6. Space-for-All**

Recommended hours of the program | **~ 30 minutes**

Content description

The session will introduce key concepts in space industry financing, including government funding, private investment, venture capital, and crowdfunding.

Turning a space-based idea into reality **requires funding**. Students will explore **different funding sources for space ventures**, understand the **investment landscape**, and learn how to **pitch their ideas effectively to attract funding**. The lecture will cover:

- The types of funding available for space projects (grants, VC funding, crowdfunding, government contracts).
- How startups and entrepreneurs secure investment and gain financial backing.
- The role of public vs. private funding in space innovation.
- Real-world case studies of startups and ESA/CASSINI funding programs.

Learning Methods

Expert Talks/ Integration within another submodule about the space industry or entrepreneurship

Learning objectives

- Understand the different sources of funding for space ventures, including government grants, venture capital, private investment, and crowdfunding

Submodule 6.4: Ethics (Dual Use, Space Treaties)

Optional

Module | **6. Space-for-All**

Recommended hours of the program | **~ 30 minutes**

Content description

Space technology is **not just for peaceful exploration**—many innovations have **dual-use applications**, meaning they can serve both **civilian and military purposes**. In this session, students will explore the **ethical dilemmas of space technologies**, examine the **role of international treaties**, and discuss how nations **balance cooperation and competition** in space.
The lecture will cover:

- The dual-use nature of space technologies (e.g., GPS, Earth Observation, satellite communications).
- International space treaties & policies (Outer Space Treaty, Artemis Accords, Liability Convention).
- Ethical challenges of space militarization, ASATs (anti-satellite weapons), and private space ventures.
- Real-world case studies on how space technology impacts global security and governance.

Learning Methods

Expert Talks/ Integration within another submodule about the space industry

Learning objectives

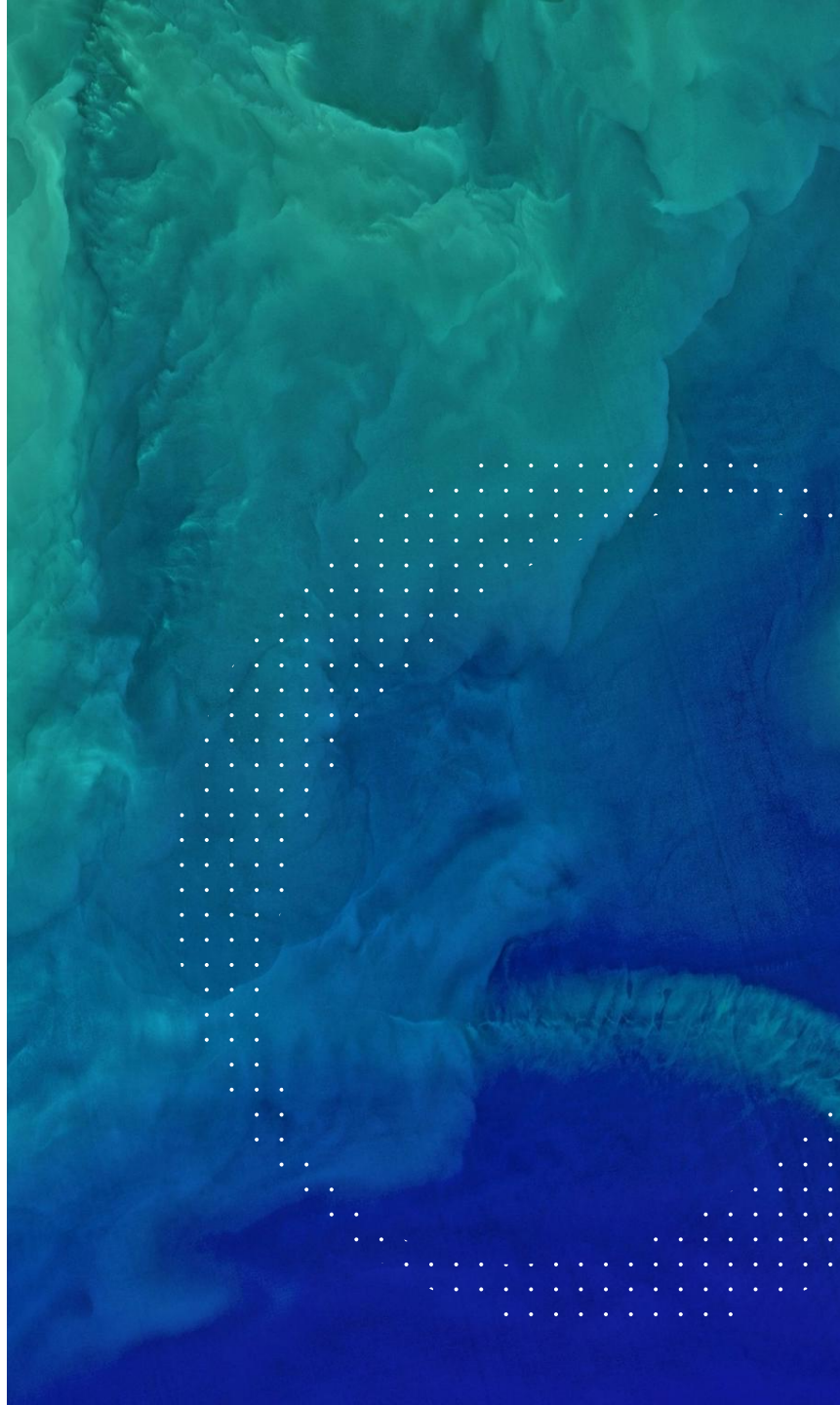
- Understand what dual-use technology means in space applications
- Learn about the Outer Space Treaty and key international agreements
- Analyse real-world dilemmas in space security, commercialization, and geopolitics
- Develop critical thinking on who owns space and how to ensure responsible use

Your turn!

Your input is essential in crafting a truly dynamic, regionally relevant training experience.

- Shape mandatory submodules by innovative learning methods
- Suggest new submodules that will help students, **discover the wonders of space exploration!**

Curricula Template



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You can find the curricula template on the website.

CASSINI Space Camps - Training Guideline

Training Module	Module Name	Sub-Module	Sub-Module Name	Status
1	Introduction to the Space Industry			
1	Introduction to the Space Industry	1.1	Who is who in space?	Mandatory
1	Introduction to the Space Industry	1.2	The Basics of the Space Economy and New Space Trends	Mandatory
1	Introduction to the Space Industry	1.3	NewSpace Startup Game	Optional
1	Introduction to the Space Industry	1.4	Icebreaker: What do you actually know about space?	Optional
1	Introduction to the Space Industry	1.5	Science Slam	Optional
2	Space-for-Earth			
2	Space-for-Earth	2.1	Presenting practical space-for-earth use cases	Mandatory
2	Space-for-Earth	2.2	Deep Dive into sectoral applications	Mandatory
2	Space-for-Earth	2.3	Introduction to EU Space Data	Final Event
2	Space-for-Earth	2.4	Problem Definition: Which challenges can be solved?	Final Event
2	Space-for-Earth	2.5	Geocaching: Space Treasure Hunt	Optional
2	Space-for-Earth	2.6	EO Imagery Game	Optional
2	Space-for-Earth	2.7	Application API Development for Earth Observation	Optional
3	Entrepreneurship for Space Solutions			
3	Entrepreneurship for Space Solutions	3.1	Entrepreneurship crash course	Final Event
3	Entrepreneurship for Space Solutions	3.2	A deep dive into Space Entrepreneurship	Mandatory
3	Entrepreneurship for Space Solutions	3.3	What makes a good team	Mandatory
3	Entrepreneurship for Space Solutions	3.4	Solving earth challenges with EU Space data	Final Event
3	Entrepreneurship for Space Solutions	3.5	Solution Design	Final Event
3	Entrepreneurship for Space Solutions	3.6	Team Building Activity	Optional
3	Entrepreneurship for Space Solutions	3.7	Pitch training	Optional
3	Entrepreneurship for Space Solutions	3.8	Critical Thinking on Data and Information	Optional
3	Entrepreneurship for Space Solutions	3.9	Responsible use of LLMs	Optional
4	Career Guide to Space			
4	Career Guide to Space	4.1	The Space Career Handbook	Mandatory
4	Career Guide to Space	4.2	Space Talks: Beyond Astronauts	Optional
4	Career Guide to Space	4.3	Space Markets and Technologies	Optional
4	Career Guide to Space	4.4	Personal USP	Optional
5	Space Exploration			
5	Space Exploration	5.1	History of Space Exploration	Optional
5	Space Exploration	5.2	Astronomy Night	Optional
5	Space Exploration	5.3	Planetarium/ Observatory Visit	Optional
5	Space Exploration	5.4	Design of mission proposal	Optional
5	Space Exploration	5.5	Launch your rocket	Optional
5	Space Exploration	5.6	Skywalk - Space object tracking using apps	Optional
5	Space Exploration	5.7	Exploring with the 'Kerbal Space Programme' game	Optional
5	Space Exploration	5.8	Build a LEGO moon/ mars rover	Optional
5	Space Exploration	5.9	VR Space Exploration	Optional
5	Space Exploration	5.10	Building a HAM radio ground station	Optional
5	Space Exploration	5.11	On-the-Air	Optional
6	Space-for-All			
6	Space-for-All	6.1	Tackling space challenges	Optional
6	Space-for-All	6.2	Mock Debate "Who owns space?"	Optional
6	Space-for-All	6.3	Funding: Financing your space solution	Optional
6	Space-for-All	6.4	Ethics (Dual Use, Space Treaties)	Optional

CASSINI #EUSpace Space Camps

Curriculum template for Local Organisers

Note: You can add or remove days and add new items but do keep the structure of the sheet!

Your local camp should last 5-10 days. Please fill the days you are planning to host the camp.
Use the mandatory and final event programme from the training guideline (see sheet 'Training Guideline').
Feel free to include optional sub-modules from the Training Guideline.
Add your own sub-modules that you would like to include in your local camp and/or other activities that you propose.

Day 1	Day 2
Mandatory Submodules (number and name) [see sheet 'Training Guideline']	
Optional Submodules (number and name) [see sheet 'Training Guideline']	
Your proposed sub-modules (in relation to the 6 training modules)	
Other activities (description)	

How to design your camp!

01

Open the day-by-day schedule

02

Place the submodules that are marked with **‘Final Event’** in a logical order in the schedule, so that those **project-based activities** lead naturally to a final event on the last day.

03

Collect all the **mandatory submodules** and place them in the schedule.

04

For each mandatory submodule, propose a **method of delivery.** Think of your existing facilities, experts and resources. The **requirement** is that the workshop, training, game or excursion you will design fulfils the learning objectives.

05

Now for the remaining time you can pick and choose from any of the **optional submodules** you find interesting and place them in the schedule at your convenience. Alternatively, **you can add your own activities** that are not included in this document.

If you have any questions please contact

hello@spacecamps.cassini.eu

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