



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

PhD in **Aerospace Science and Technology**

Course "**Aerospace and Climate Change**"
by Mirco Cantelli – CURTI SpA

Duration: **8 hours** (4 lessons of 2 hours each)

Course Objectives:

1. Understand interactions between aerospace sector and climate change.
2. Analyze the environmental impact of aerospace activities.
3. Explore technologies and strategies to reduce the environmental impact of the aerospace industry.
4. Evaluate the role of space missions in studying climate change and discuss future trends and challenges in the aerospace.

Lesson 1: Introduction to the Aerospace Sector and Climate Change
Wednesday April 30th 4:00-6:00pm Room 0.4 Via Montaspro 97 – Forlì
and online

Topics:

- Overview of the aerospace sector.
- Definition and causes of climate change.
- Impact of the aerospace sector on climate change.
- Introduction to greenhouse gas emissions and role in global warming.

Activities:

- Aerospace sector's case studies of environmental incidents: discussion.
- Viewing of a short documentary on the environmental impact of air travel.

Lesson 2: Emissions and Pollution in the Aerospace Industry
Monday May 05th 4:00-6:00pm Room 1.5 Via Montaspro 97 – Forlì and
online

Topics:

- Sources of emissions in the aerospace (CO₂, NO_x, particulate matter...).
- Techniques for measuring and monitoring emissions.
- Impact of emissions on the atmosphere and terrestrial ecosystems.

Activities:

- Analysis of data on aircraft emissions.
- Space Pollution and space waste management.
- Group work to identify possible mitigation strategies.



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Lesson 3: Technologies and Innovations to Reduce Environmental Impact
Wednesday May 7th 4:00-6:00pm Room 0.4 Via Montaspro 97 – Forlì and
online

Topics:

- Low-impact propulsion technologies (e.g., electric engines, biofuels).
- Advanced aerodynamic design to improve fuel efficiency.
- Lightweight and sustainable materials for aircraft construction.
- Space waste management.

Activities:

- Presentations on recent innovations in aircraft design.
- Benefits and challenges of adopting green technologies (discussion).

Lesson 4: Space Missions, Study of Climate Change and Future of the
Aerospace Sector

Monday May 12th 4:00-6:00pm Room 1.2 Via Montaspro 97 – Forlì and
online

Topics:

- Use of satellites for climate monitoring.
- Earth observation space missions (e.g., Landsat, Sentinel).
- Analysis of satellite data for studying climate change.
- Future prospects for the aerospace sector in relation to climate change.
- Regulations and policies for reducing emissions in the aerospace sector.
- Challenges and opportunities for the aerospace industry in the transition to sustainability.

Activities:

- Practical exercise on the use of satellite data for climate analysis.
- How space missions contribute understanding climate change.
- Debate on climate policies and the aerospace sector.
- Designing a roadmap for sustainability in the aerospace sector.

Final Assessment:

- ✓ Group Project: Development of a proposal to reduce the environmental impact of an aerospace company.
- ✓ Oral Presentation: Presentation of the project and discussion of proposed strategies.

Course Materials:



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- Assigned readings (scientific articles, book chapters).
- Lecture slides.
- Access to emission databases and satellite data.
- Software for data analysis (e.g., GIS tools).

Supplementary Resources:

- Links to documentaries and educational videos.
- List of scientific journals and websites for further reading.

Conclusion:

The course will provide students with an in-depth understanding of the interactions between the aerospace sector and climate change, preparing them to make significant contributions to reducing the environmental impact of the sector.