INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

SECOIAS SUMMER SCHOOL 2026

JUNE 22 – JULY 3, 2026
INSA TOULOUSE, FRANCE

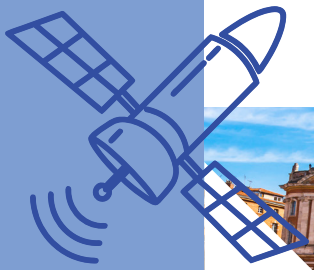
Security and Communication In Aerospace Embedded Systems

JOIN THE FUTURE OF AEROSPACE TECHNOLOGY

Immerse yourself in the heart of Europe's aerospace capital - Toulouse - home to **Airbus, Thales Alenia Space, Safran, and CNES.**

Over two weeks at **INSA Toulouse**, one of France's top engineering institutes, you'll explore how **embedded systems, radio communications, and cybersecurity** come together to shape the next generation of **aeronautic and space systems.**

This summer school blends **hands-on experimentation, technical lectures, and industrial insights,** allowing you to experience the full lifecycle of a connected aerospace system - from design to secure communication.



PROGRAM OVERVIEW

Electronic embedded systems are at the core of avionics and spacecraft. They enable navigation, communication, control, and data processing - all under extreme constraints of safety, performance, and reliability.

The SECOIAS Summer School offers a unique multidisciplinary experience covering embedded programming, antenna design, radio communications, and cybersecurity in aerospace contexts.

MODULE 1 Development of Embedded Systems for a Nanosatellite Mission

Learn to program microcontrollers (MCU) from scratch to control sensors (temperature, light) and actuators (servos, RF transceivers) in a realistic nanosatellite scenario.

You will manipulate GPIOs, timers, ADCs, serial buses (USART/SPI) and interrupts, while managing power and hardware constraints typical of aerospace systems.

SKILLS

Embedded C programming, hardware interfacing, mission-oriented software design.

MODULE 2 Design, Fabrication and Testing of Antennas for Aerospace

Discover how antennas make communication possible between aircraft, satellites, and ground stations.

You'll design and simulate an ADS-B antenna using electromagnetic software, then manufacture it using photolithography and test it in a VNA and anechoic chamber.

SKILLS

RF design, electromagnetic simulation, antenna characterization.

MODULE 3 Secure Wireless Communication and Software-Defined Radio (SDR)

Dive into the world of wireless telecommunication for aeronautics and space. Using SDR platforms, you will implement signal modulation schemes (FM, PSK) and analyze real-world protocols such as VOLMET, ATIS, ADS-B, and ACARS.

You'll also test vulnerabilities by simulating replay attacks, learning how to build and defend resilient communications.

SKILLS

Radio protocol analysis, SDR implementation, cybersecurity basics.

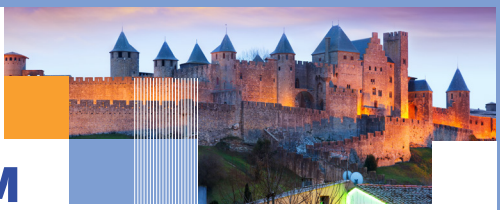
MODULE 4 Security Challenges in Aerospace Communication

This module focuses on designing and protecting custom onboard communication protocols.

Through iterative lab work, you'll create a simple protocol, test it against real attacks (e.g., spoofing, replay, injection), and progressively integrate encryption, authentication, and anti-replay mechanisms.

SKILLS

Protocol design, applied cryptography, security engineering.



BEYOND THE CLASSROOM

GUEST LECTURES

Industry and research experts share insights on the latest aerospace innovations.

LAB VISIT

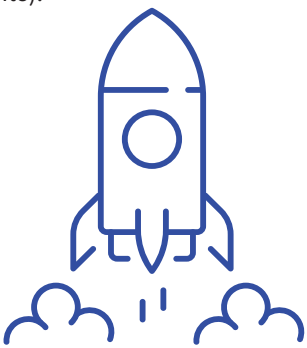
Discover cutting-edge research at the **LAAS-CNRS Laboratory**.

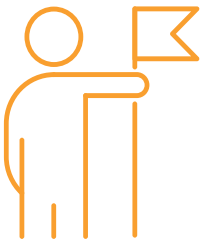
CULTURAL EXPERIENCE

Guided tour of **Carcassonne** (UNESCO World Heritage Site).

INDUSTRIAL VISIT

Explore the **Airbus facilities** in Toulouse.





WHO CAN APPLY?

Open to **Bachelor-level students** (or equivalent >120 ECTS) in:

- Electronics
- Computer Science
- Telecommunications
- and related scientific and engineering fields.

Basic programming (C or Python) and familiarity with electronics or signal processing are recommended.

WHY SECOIAS?

- Learn from top academics and aerospace industry experts.
- Gain hands-on experience in embedded systems, telecom, and cybersecurity.
- Work on real projects: program MCUs, secure radio links, and build/test concepts.
- Enjoy personalized mentorship in small groups (1 teacher per 12 students).
- Join an international network of passionate students and engineers.
- Develop skills and a research mindset for aerospace, defense, and high-tech careers.
- Earn 5 ECTS credits.

PRACTICAL INFORMATION

PARTICIPANT FEES:
Free movers: € 2,300
Partners: € 1,250 (tuition fees are waived for participants from INSA Toulouse partner institutions).
The fees include accommodation, weekday lunches, visits, and tours.

LOCATION: INSA Toulouse, France

Two weeks:
June 22 to July 3, 2026

You will earn **5 ECTS credits** over these two weeks.

Contact:
secoias.contact@insa-toulouse.fr

https://demandes.insa-toulouse.fr/

To access the detailed program, practical information and registration link, please visit:
gei.insa-toulouse.fr/fr/international/secoias.html

Université de Toulouse

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité