BLACKBIRD FOR TRAINING

Design and Operation of Space Systems

1 – 5 August 2027
Cairo (Egypt)

UK Traininig
PARTNER



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Introduction

As global reliance on satellite technology increases, mastering the principles of space mission design and operations has become a strategic imperative.
This course offers a comprehensive and advanced-level exploration of how space systems are designed, operated, and managed in both commercial and military contexts.
Participants will explore the architecture of modern satellites, delve into orbital mechanics, analyze Non-Geostationary Orbit NGSO satellites, and evaluate the role of space communications, AI in space systems, and emerging technologies in driving next-generation space capabilities.
The course also addresses pressing issues such as space sustainability and space domain awareness.

Course Objectives

By the end of this course, participants will be able to:

- Grasp the fundamentals of space mission design and understand the impact of the space environment.
- Identify and analyze key satellite subsystems and their operational functions.
- Understand the dual-use nature of space technology for military and commercial applications.
- Evaluate the architecture, advantages, and limitations of NGSO satellites, including LEO, MEO, and polar orbits.
- Explain the structure and challenges of non-GEO satellite communications and supporting ground infrastructure.
- Review current and future trends such as AI in space, autonomous systems, and space sustainability regulations.

Course Outlines

Day 1: Introduction to Space Mission Design

- Overview of space system components.
- Basics of orbital mechanics and trajectory planning.
- Environmental factors affecting spacecraft design.
- Fundamentals of mission planning and launch dynamics.



Day 2: Spacecraft Technology

- Satellite structures and thermal control systems.
- Propulsion systems: chemical, electric, and hybrid.
- Satellite communication and power systems.
- Trade-offs in subsystem design and selection.

Day 3: Subsystems and Integration

- Attitude Determination and Control System ADCS.
- Onboard computers and space-grade electronics.
- Payload design and system integration strategies.
- Reliability, fault tolerance, and redundancy management.

Day 4: NGSO Satellites and Military Applications

- Comparing NGSO vs. GEO satellites.
- LEO, MEO, and polar orbit dynamics.
- Coverage, latency, and mega-constellation implications.
- Non-GEO satellite communication architecture: frequency bands and infrastructure.
- Applications: satellite internet, intelligence, surveillance, and reconnaissance.
- Strategic use of space in defense and cybersecurity operations.

Day 5: Operations and Future Trends

- Mission operations: telemetry, monitoring, and control.
- Space domain awareness and tracking systems.
- Integration of artificial intelligence in space systems and autonomous spacecraft.
- Space sustainability: debris mitigation, regulatory frameworks, and environmental stewardship.
- Case studies from real-world space missions.

Why Attend This Course? Wins & Losses!

- Master the full lifecycle of space mission design from planning to operations.
- Gain deep insights into satellite subsystems, including propulsion, payload, and communication.
- Understand the value and strategic use of NGSO satellites in modern space networks.
- Stay ahead with trends in AI in space and autonomous spacecraft management.
- Learn about the future of space sustainability, regulations, and orbital debris handling.
- Apply knowledge through real-world case studies in military and commercial missions.

Conclusion

This course is a gateway to mastering the art and science of space mission design and operations.



Whether you're involved in engineering, defense, policy, or technology development, you'll leave equipped with critical tools to shape the future of space systems architecture, drive innovation in satellite communication, and contribute to a more sustainable space environment.

Step into the future of aerospace leadership—where systems thinking meets AI-driven orbital precision.

