# IS418 - Space communications systems

From the Advanced Master TAS ASTRO (Space Systems Engineering)

## Key elements

Dates:
**January 9 to 13, 2023**
**(exam: January 19, 2023*)**

Duration: **21,5 hours**

For whom:
**recent graduates, jobseekers and experienced employees**

Location:
**ISAE-SUPAERO, Toulouse and/or on-line**

Course fees: **€2,000**

Language: **English**

## Highlights

- Introduction to telecommunication satellite system architecture
- Introduction to digital communications
- Introduction to networking
- Satellite link performances

This module will allow an understanding of the main constraints on link capacity and the methods needed to derive satellite link performances from radio frequency specifications. Introduction to modern digital communication techniques allows to derive basic satellite link metrics from the link budget: capacity (available data rate), quality (bit error rate) and availability (outage cumulated duration).

## Prerequisites

- Master level

*not compulsory

## Learning objectives

After completing this course, participants will be able to:

- Identify the major components of a satellite based telecommunication network;
- Understand digital communication principles and methods used to derive link quality from radio specifications;
- Understand the impact of network access techniques on satellite link throughput;
- Have a broad view of achievable satellite network capacity on large user service zones.

## Practical information and registration

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## Course content

- Introduction to Satellite Communications Systems
  Satellite communications systems architectures and components
  Types of orbits, radio regulations

- Link Analysis and Link Budget
  Carrier and Noise Power Budget, Carrier to Noise Power Spectral Density (C/No) Ratio
  Intermodulation and Interference
  Link Performance Evaluation

- Digital communications
  Spectral Efficiency, BER vs E/No
  Use of Channel Coding for Bandwidth and Power Trade-off

- Satellite networking
  Multiple access techniques
  Multibeam satellite systems

- Satellite Communications Payload
  Performance objectives and functions
  Repeater architecture
  Antenna coverage concepts

## Teaching methods

| Teaching methods | Yes |
|---|---|
| Lectures / tutorial | X |
| Collaborative learning | |
| Flipped classroom | |
| Blended learning (online and face to face) | |
| Learning by doing | |
| Project-based | |
| Simulation | |
| Case study | |

## Assessment

- Written test