



Course Syllabus

Course Code	Course Title	ECTS Credits
ECE-456	Satellite Communication Systems	6
Prerequisites	Department	Semester
ECE-350	Engineering	Fall or Spring
Type of Course	Field	Language of Instruction
Elective	Engineering	English
Level of Course	Lecturer(s)	Year of Study
1 st Cycle	Prof. Anastasis Polycarpou	4 th
Mode of Delivery	Work Placement	Corequisites
Face-to-Face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Introduce the components of satellite systems;
- Develop the principles of satellite communication system design;
- Develop an understanding of the satellite communications channel;
- Introduce the satellite communications links and link budget;
- Introduce applications for satellite communication systems;
- Provide details about satellite networks.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Demonstrate knowledge and understanding of the principles and components of satellite communication systems;
- Explain the characteristics of the satellite communications channel;
- Analyze satellite links in various bands and estimate the link budget;
- Analyze the requirements of earth stations for satellite communications;
- Apply principles in designing applications of satellite communication systems;
- Analyze modern satellite networks.

Course Content:

- Basic satellite system: System design considerations, basic structure and elements, satellite communications spectrum, technology trends and services;
- Satellite orbits: Governing laws of satellite motion, satellite path, geostationary satellites, launching, non-stationary constellation;
- Baseband signals and quality of service: Telephone, sound and TV signals. Delay problems;
- Digital communications techniques: Digital modulation (FSK, PSK, QPSK), Differential modulation (DPSK, DQPSK). Channel coding and codes classification (linear and cyclic), error correction coding (convolutional codes, Trellis diagrams). DVB-S systems;
- Advanced topics on multiple access techniques (FDMA, TDMA, CDMA);
- Communication link design: Propagation issues and antenna basics. Effects of rain and precipitation on satellite links. Noise considerations and calculation of link budget;
- Earth stations: RF characteristics, antenna sub-systems, communications sub-systems, network interface, monitoring and control;
- Satellite networks: GEO, LEO, ISL, Broadcast and Broadband satellite networks.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises

Assessment Methods:

Homework, exams, final exam

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Satellite Communication Systems: Systems, Techniques, and Technology	G. Maral, M. Bousquet, Z. Sun	John Wiley & Sons	2010	978-0-470-71458-4

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performance Systems: Design and Principles, Second Edition	Louis J. Ippolito Jr.	Wiley	2017	978-1119259374