



Course Code ECE-556	Course Title Satellite Communication Systems	ECTS Credits 8
Department Engineering	Semester Fall or Spring	Prerequisites ECE-350
Type of Course Elective	Field Engineering	Language of Instruction English
Level of Course 2 nd Cycle	Year of Study 1 st	Lecturer Dr John Sahalos
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are to:

- Provide in depth the components of satellite systems
- Provide in depth the principles of satellite communication system design
- Analyze of the satellite communications channel
- Provide in depth the satellite communications links and link budget
- Provide in depth applications for satellite communication systems
- Give details about satellite networks

Learning Outcomes:

After completion of the course students are expected 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 Contents:

- 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.
- Projects on Satellite Communications design. Computer simulations using software packages and comparison of the results with the international literature

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises

Assessment Methods:

Homework, midterm exam, final exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
G. Maral, M. Bousquet	Satellite Communication Systems: Systems, Techniques, and Technology, 5 th Edition	John Wiley & Sons	2009	978-0-470-71458- 4

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
M. Richharia	Satellite Communication Systems: Design and Principles, Second Edition	MacMillan Press Ltd	1999	0071342087