



Course Code ECE-456	Course Title Satellite Communication Systems	ECTS Credits 6
Department Engineering	Semester Spring	Prerequisites ECE-350
Type of Course Elective	Field Engineering	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 4 th	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:

- 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
- give details about satellite networks

Learning Outcomes:

After completion of the course students are expected to:

1. demonstrate knowledge and understanding of the principles and components of satellite communication systems
2. explain the characteristics of the satellite communications channel
3. analyze satellite links in various bands and estimate the link budget
4. analyze the requirements of earth stations for satellite communications
5. apply principles in designing applications of satellite communication systems
6. be able to analyze modern satellite networks

Course Contents:

1. Basic satellite system: System design considerations, basic structure and elements, satellite communications spectrum, technology trends and services.
2. Satellite orbits: Governing laws of satellite motion, satellite path, geostationary satellites, launching, non-stationary constellation.
3. Baseband signals and quality of service: Telephone, sound and TV signals. Delay problems.
4. 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.
5. Advanced topics on multiple access techniques (FDMA, TDMA, CDMA).
 6. Communication link design: Propagation issues and antenna basics. Effects of rain and precipitation on satellite links. Noise considerations and calculation of link budget.
 7. Earth stations: RF characteristics, antenna sub-systems, communications sub-systems, network interface, monitoring and control.
 8. Satellite networks: GEO, LEO, ISL, Broadcast and Broadband satellite networks.

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