



<b>Course Code</b> ECE-456	<b>Course Title</b> Satellite Communication Systems	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Spring	<b>Prerequisites</b> ECE-350
<b>Type of Course</b> Elective	<b>Field</b> Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 4 <sup>th</sup>	<b>Lecturer</b> Dr John Sahalos
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> None

**Objectives of the Course:**

<p>The main objectives of the course are to:</p> <ul style="list-style-type: none"><li>• introduce the components of satellite systems</li><li>• develop the principles of satellite communication system design</li><li>• develop an understanding of the satellite communications channel</li><li>• introduce the satellite communications links and link budget</li><li>• introduce applications for satellite communication systems</li><li>• give details about satellite networks</li></ul>
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**Learning Outcomes:**

<p>After completion of the course students are expected to:</p> <ol style="list-style-type: none"><li>1. demonstrate knowledge and understanding of the principles and components of satellite communication systems</li><li>2. explain the characteristics of the satellite communications channel</li><li>3. analyze satellite links in various bands and estimate the link budget</li><li>4. analyze the requirements of earth stations for satellite communications</li><li>5. apply principles in designing applications of satellite communication systems</li><li>6. be able to analyze modern satellite networks</li></ol>
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**Course Contents:**

<ol style="list-style-type: none"><li>1. Basic satellite system: System design considerations, basic structure and elements, satellite communications spectrum, technology trends and services.</li><li>2. Satellite orbits: Governing laws of satellite motion, satellite path, geostationary satellites, launching, non-stationary constellation.</li><li>3. Baseband signals and quality of service: Telephone, sound and TV signals. Delay problems.</li><li>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).</li></ol>
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- 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 <sup>th</sup> 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