

Course Title: Satellite Communication and Broadcasting

Course Code: ETEG 427

Credit Hours: 3

Course Description:

This course provides a comprehensive understanding of satellite communications principles and related technologies including orbital mechanics, satellite link design, earth Station technologies and access techniques.

Course Contents:

Unit 1: Introduction to Satellite Communications

Origin, History, Overview of Satellite System Engineering

Unit 2: Orbital Aspects of Earth Satellites

Orbital Mechanics and Orbital Elements, Azimuth and Elevation, Coverage Angle and Slant Range, Placement of a Satellite in a Geostationary Orbit

Unit 3: Satellite Link Design

Basic Radio Transmission Theory, System Noise Temperature and G/T Ratio, Uplink and Downlink Design, Interference Analysis, Carrier-to-Noise plus Interference Ratio, Interference to and from Adjacent Satellite Systems, Terrestrial Interference, Cross-polarization interference, Inter-modulation Interference, Design of Satellite Links for Specified Carrier-to-Noise plus Interference Ratio, Digital Satellite Link

Unit 4: Propagation on Satellite-Earth Paths and Its Influence on Link Design

Absorptive Attenuation Noise by Atmospheric Gases, Rain Attenuation, Noise due to Rain, Rain Depolarization, Tropospheric Multipath and Scintillation Effects

Unit 5: Modulation, Multiplexing and Multiple Access Techniques in Satellite Communications

Classification of Different Analog and Digital Modulation Schemes as Used in Satellite Communications and their Performance, Band-Limited Nonlinear Satellite Channel, Digital Modulation with Error-Correction Coding, Different Multiple Access Techniques Used in Satellite Communication

Unit 6: Spacecraft and Earth Station Technology

Spacecraft Subsystems, Description of Communication Subsystems, Types of Earth Stations and Design, Types of Antennas in Satellite Communications, Small Earth Station Antennas

Unit 7: Types of Satellite Networks

Fixed Point Satellite Network, INTELSAT, Mobile Satellite Network, INMARSAT, Low Earth Orbit and Medium Earth Orbit Satellite Systems, Very Small Aperture Terminal (VSAT) Network, Direct Broadcast Satellite Systems.

References:

1. Tri T. Ha, *Digital Satellite Communications*, McGraw-Hill Communications Series
2. Dennis Roddy, *Satellite Communications*, McGraw-Hill Telecommunications Series, 2001

Evaluation:

In-Semester Evaluation: 50%

End-Semester Evaluation: 50%