Broadband Communication Systems(404189)

Teaching Scheme:
Lectures 3 Hrs/ Week

Examination Scheme:
In Semester Assessment:
Phase I: 30
End Semester Examination:
Phase II:70

Course Objectives:

- To understand the three primary components of a fiber-optic communication system.
- To understand the system design issues and the role of WDM components in advanced lightwave systems.
- To understand the basics of orbital mechanics and the look angles from ground stations to the satellite.
- To apply their subject understanding in Link Design.

Course Outcomes:

After successfully completing the course students will be able to:

- Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.
- Carry out Satellite Link design for Up Link and Down Link.

UNIT I: Lightwave System Components

Key Elements of Optical Fiber Systems, Optical Fibers as a Communication Channel: Optical Fiber Modes and Configurations , Mode Theory for Circular Waveguides , Single-mode Fibers, Graded-index Fiber Structure, Signal Degradation in Optical Fibers.Optical Sources: Basic Concepts and characteristics of LEDs and LASERs. Photodetectors: Basic Concepts, Common Photodetectors.

UNIT II: Lightwave Systems

System Architectures, Point-to-Point Links: System Considerations, Design Guidelines: Optical Power Budget, Rise Time Budget, Long-Haul Systems.

UNIT III: Multichannel Systems

Overview of WDM, WDM Components: 2 x 2 Fiber Coupler, Optical Isolators and Circulators, Multiplexers and De-multiplexers, Fiber Bragg Grating, FBG applications for multiplexing and De-multiplexing function, Diffraction Gratings, Overview of Optical Amplifiers: SOA, EDFA and RFA in brief.

UNIT IV: Orbital Mechanics and Launchers

History of Satellite Communication, Orbital Mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and Launch Vehicles, Orbital effects in communication system performance.

UNIT V: Satellites

Satellite Subsystems, Attitude and control systems (AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment Reliability and space qualification.

UNIY VI: Satellite Communication Link Design

Introduction, Basic transmission Theory, System Noise Temperature and G/T Ratio, Design of Downlinks, Satellite Systems using Small Earth Stations, Uplink Design, Design of Specified C/N : Combining C/N and C/I values in Satellite Links, System Design Examples

Text Books

1. Gerd Keiser, “Optical fiber Communications”, Tata McGraw Hill, 4th edition.
2. Timothy Pratt, Charles Bostian, Jeremy Allnutt “Satellite Communications”, John Wiley & Sons.

Reference Books

1. Govind P. Agrawal, Fiber-Optic Communication Systems, Wiley, 3rd edition.
2. Dennis Roody, “Satellite Communications”, McGraw Hill