

EC742PE : SATELLITE COMMUNICATIONS (PE – IV)**B.Tech. IV Year I Semester**

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Prerequisite: Analog and Digital Communications**Course Objectives :**

1. To acquired foundation in orbital mechanics and launch vehicles for the satellites.
2. To provide basic knowledge of link design of satellite.
3. To understand multiple access systems and earth station technology
4. To understand the concepts of satellite navigation and GPS.

Course Outcomes: Upon completing this course, the student will be able to

1. Explore the basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
2. Envision the satellite sub systems and design satellite links for specified C/N.
3. Familiarize the various multiple access techniques for satellite communication systems and earth station technologies.
4. Known the concepts of LEO, GEO Stationary Satellite Systems and satellite navigation

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	1	1	-	1	1	-	-	-	-	1
CO2	3	-	1	1	-	1	1	-	-	-	-	1
CO3	3	1	1	1	-	1	1	-	-	-	-	1
CO4	3	-	1	1	-	1	1	-	-	-	-	1

UNIT - I

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT - II

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT - III

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT - IV

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT - V

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXT BOOKS:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt - Satellite Communications, WSE, Wiley Publications, 2nd Edition, 2003.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud - Satellite Communications Engineering, 2nd Edition, Pearson Publications, 2003.

REFERENCE BOOKS:

1. M. Richharia - Satellite Communications : Design Principles, 2nd Edition, BS Publications, 2003.
2. D.C Agarwal - Satellite Communication, 5th Edition, Khanna Publications,
3. K.N. Raja Rao - Fundamentals of Satellite Communications, PHI, 2004
4. Dennis Roddy - Satellite Communications, 4th Edition, McGraw Hill, 2009.