IV B.Tech – I Semester

(20EC7044) SATELLITE COMMUNICATIONS
(Honors)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	4

Pre-Requisites: Analog & Digital Communications

Course Objectives:

- Understand the basic concepts and history of satellite communications and also frequency allocations for satellite services
- Know various satellite subsystems with their functionality and link design for transmission & reception of signals
- Familiar with various multiple access techniques used for satellite communication
- Understand earth station technology and various LEO satellite considerations
- Understand Satellite GPS system

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 antenna Equipment reliability and Space qualification.

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 example.

Unit III

Multiple Access: Frequency division multiple access (FDMA) Intermodulation, 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.

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

Unit V

Satellite Navigation & The 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.

Course Outcomes:

After successful completion of the course, the students can be able to

S. No	Course Outcome	BTL
1	Illustrate the basic concepts of satellite communication and different Frequency allocations for satellite services.	L2
2	Understand various satellite subsystems and its functionality and Analyze up/down link for transmission & reception of signals.	L4
3	Choose appropriate multiple access technique for a given satellite communication application.	L3
4	Understand the low earth orbit and geostationary satellite systems	L2
5	Illustrate the Satellite Navigation and Global position system.	L2

Correlation of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	-	-	-	1	-	-	-	-	-	3	-
CO3	3	2	1	-	-	-	1	-	-	-	-	-	3	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	2	1	-	-	-	1	-	-	-	-	-	3	-

Text Books:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.

2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri.

Reference Books:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004.
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.