



IV Year-II Semester	L	T	P	C
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SATELLITE COMMUNICATIONS (RT42043A)				

Prerequisite Course:

Analog communication. Digital Communication

Course Description and Objectives:

This course presents the fundamentals of satellite communications link design and an in-depth treatment of practical considerations. Existing commercial, civil, and military systems are described and analyzed, including direct broadcast satellites, high throughput satellites, VSAT links, and Earth-orbiting and deep space spacecraft. Topics include satellite orbits, link analysis, antenna and payload design, interference and propagation effects, modulation techniques, coding, multiple access, and Earth station design.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Understand the concepts, applications and subsystems of Satellite communications.	3
2	Derive the expression for G/T ratio and to solve some analytical problems on satellite link design	3
3	Understand the various types of multiple access techniques and architecture of earth station design	2
4	Understand the concepts of GPS and its architecture	2
5	Understand the concepts, applications and subsystems of Satellite communications.	3

Syllabus:

UNIT I:

Objective: To learn history and fundamentals of satellite communication and its advantages and also applications.

INTRODUCTION : Origin of Satellite Communications, Historical Background, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

UNIT II:

Objective: To learn about orbital mechanics and launchers.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.



UNIT III:

Objective: To study about satellite subsystems

SATELLITE SUBSYSTEMS : Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT IV:

Objective: To gain knowledge on satellite link design and multiple access.

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.

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 V:

Objective: To understand the concepts of power earth station technology and low earth orbit and geo-stationary satellite systems

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 VI:

Objective: To understand the concepts of satellite navigation & the global positioning system.

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.

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 G.Snyderhoud, 2nd Edition, Pearson Publications, 2003.

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.