

Course Code	Course Title	L	T	P	C
1152EC120	SATELLITE COMMUNICATION	3	0	0	3

a) Course Category

Program Elective

b) Preamble

The principles of radio communication have wider applications, but the unique attributes of orbiting satellites and the techniques used for communication via these satellites requires a specialized course. This course gives students a broad treatment of the diverse subsystems that make up a complete satellite communication system

c) Prerequisite

Analog Communication Systems

d) Related Courses

Wireless Digital Communication, Cellular Mobile Communication.

e) Course Outcomes

Upon the successful completion of the course, student will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the basic concepts of orbit mechanics and satellite Launching	K2
CO2	Describe about link design between earth station and satellite	K2
CO3	Explain the basic concepts of earth station technology	K2
CO4	Classify various access methods in space segment	K2
CO5	Describe the services rendered by the satellite and its future applications	K2

f) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	-	M	-	L	L	-	-	-	-	-	-	-
CO2	M	M	M	-	L	-	-	-	L	-	-	-	-	-
CO3	L	L	M	-	M	L	L	L	-	L	L	-	L	-
CO4	L	M	M	-	-	L	L	-	-	-	-	-	-	-
CO5	L	M	M	-	L	-	-	-	L	-	-	L	L	-

g) Course Content

UNIT I INTRODUCTION TO SATELLITE COMMUNICATION 9

Orbital mechanisms: Origin and Brief History - Basic laws (Kepler's law & Newton's law), Orbital mechanics: Equation of Orbit- Geostationary Orbit- Location of Satellite in Orbit- Orbital Elements, Orbital Perturbations, Look Angle Determination: Elevation and Azimuthal Calculation, Launching Techniques. Satellite subsystems: Attitude and orbit control subsystem, power subsystem, telemetry tracking and command systems, communication subsystems

UNIT II SATELLITE LINK DESIGN 9

Basic transmission theory, Equivalent isotropic radiated power – Transmission losses – Free-space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and ionospheric losses – Link power budget equation, System Noise: Noise Temperature and Noise Figure – G/T Ratio, Downlink and uplink system design, Design of satellite links for specified C/N.

UNIT III EARTH SEGMENT 9

Introduction – Receive – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV, Master antenna TV system, Community antenna TV system, Transmit – Receive earth stations

UNIT IV SATELLITE ACCESS 9

Analog – digital transmission system- Modulation and Multiplexing, Digital video Broadcast, Types of multiple access: FDMA concepts - Inter modulation and back off - SPADE system- TDMA concept-frame and burst structure - CDMA concept, Comparison of multiple access schemes

UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS) - Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

h) Learning Resources

Text Books

1. Dennis Roddy, "Satellite Communication", McGraw Hill, Fourth Edition, 2006.
2. Pratt and Bostian, "Satellite communication", John Wiley and Sons, 2007

Reference Books

1. Tri. T. Ha, "Digital satellite communication system", McGraw Hill.
2. Pritchend and Sciulli, "Satellite communication systems engineering", PHI Learning, 1986.
3. Robert M. Gagliendi, "Satellite communication", John Wiley and Sons, 1988.
4. M. Richharia, "Satellite communication system design and analysis", Mc-Millan, 1996.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc17_ec14
2. <https://www.coursera.org/learn/satellite-communications>
3. <https://www.class-central.com/tag/satellite%20communications>
4. <https://ep.jhu.edu/programs-and-courses/525.440-satellite-communications-systems>

Practice Aspects

1. Tool: Satellite Network Simulator 3 (SNS3).