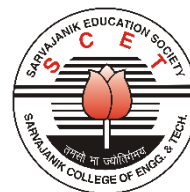




SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



B. Tech. Semester VIII

Subject Name: Non Terrestrial Communication

Subject Code: BTEC13801

Type of course: PEC

Prerequisite: Analog and Digital Communication.

Rationale: The students will explore basic concepts of satellite communication, components of satellite systems, advantages and disadvantages of Satellite systems. The course will also highlight the fundamentals of unmanned aerial vehicles and its applications.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	3	60	25	15	--	--	100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. no.	Topics	Teaching Hrs.	Module % Weightage
1	Introduction to Satellite Communication: Principles and architecture of satellite communication, Brief history of satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.	4	15
2	Orbital Mechanics and launchers: Orbital equations, Kepler’s laws, Apogee and Perigee for an elliptical orbit, orbital perturbation, orbit determination , launches and launch vehicles, orbital effects, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.	7	15
3	Satellite sub-systems: Study of architecture and roles of various sub-systems of a satellite system such as Telemetry, tracking , command and monitoring (TTC&M),Attitude and orbit control system (AOCS),Communication sub-system, power sub-system etc, satellite antennas, equipment reliability and space qualification.	7	15
4	Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for eclipse, sun	7	15



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	transit outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift. Space Segment, Earth Segment.		
5	Satellite link budget: Flux density and received signal power equations, Calculation of system noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clean air and rainy conditions.	7	15
6	Unmanned Aerial Vehicles: Introduction to UAV, Definition, History, Difference between aircraft and UAV, DGCA, Classification of UAVs, Autonomous Flying Robots, Types and Characteristics of Drones, Fixed, Multi-rotor, Flapping Wing, Applications, Defence, Civil, Environmental Monitoring.	6	15
7	Satellite Applications: INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).	7	10

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	25	25	10	10	0

Legends: **R:** Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom’s Taxonomy**)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

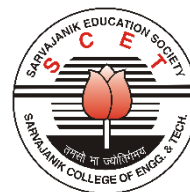
Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of pub	Pub Edition
1.	Satellite Communications	Timothy Pratt, Charles	Wiley India	2002	2 nd
2.	Satellite Communication	Dennis Roddy	McGraw Hill	2017	4 th
3.	Autonomous Flying Robots	Kenzo Nonami Satoshi Suzuki Wei Wang	Springer 9784431538554	2010	Latest

Course Outcome:



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Sr. No.	CO Statement After learning this subject students will be able to	Marks % weightage
CO-1	Describe the satellite orbits and its trajectories with the definitions of parameters associated with it.	20
CO-2	Describe the electronic hardware systems associated with the satellite subsystem and earth station.	20
CO-3	Explain various technologies associated with satellite communication.	20
CO-4	Compute the satellite link parameters under various propagation conditions with the illustration of multiple access techniques.	20
CO-5	Describe the Satellite Applications	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	1	-	1	-	-	1	1	-	1	1	-	2	2	2	2
CO-2	1	--	1	-	-	1	1	-	1	1	-	2	2	2	2
CO-3	2	1	2	2	2	2	2	2	2	2	2	2	3	2	2
CO-4	2	1	2	2	2	2	2	2	2	2	2	2	3	2	2
CO-5	1	-	1	-	-	1	1	-	1	1	-	2	2	2	2

List of Open Source/learning website:

- <https://nptel.ac.in/courses/117105131> - Satellite Communication Systems