

Branch Name:	Information and Communication Technology
Semester/Year:	Semester II / First Year
Subject Title:	Advances in Satellite Communication Technology
Subject Code:	2ET2080205T
Pre-requisite:	Electronics Communication, Digital Communication

Course Objective:

To understand fundamentals of Satellite Communication .To introduce students a set of advanced topics in Satellite Communication Technology and lead them to understand research in Satellite Communication. To Learn M2M developments and satellite applications and Understand Satellite Communication In Ipv6 Environment.

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCE		SEE		CCE		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Overview of Satellite Communication: Overview of satellite communication and orbital mechanics Link budget Parameters, Link budget calculations, Auxiliary Equations, Performance Calculations.	03	09	

2	M2M Developments and Satellite Applications : Overview of the Internet of Things and M2M- M2M Applications Examples and Satellite Support Satellite Roles Context and Applications- Antennas for Satellite M2M Applications- M2M Market Opportunities for Satellite Operators- Ultra HD Video/TV and Satellite Implications- High Throughput Satellites (HTS) and Ka/Ku Spot Beam Technologies- Aeronautical, Maritime and other Mobility Services	08	22
3	Satellite Communication in IPV6 Environment: Overview of IPv6 and its benefits for Satellite Networks - Migration and Coexistence—Implementation scenarios and support- Preparations for IPv6 in Satellite communication- Satellite specific Protocol issues in IPv6 – Impact of IPv6 on Satellite Network architecture and services- Detailed transitional plan- IPv6 demonstration over satellites - Key results and recommendations..	08	22
4	Satellite Navigation and Global Positioning System: Over view of Radio and Satellite Navigation, GPS Principles, Signal model and Codes, Satellite Signal Acquisition, Mathematical model of GPS observables, Methods of processing GPS data , GPS Receiver Operation and Differential GPS. IRNSS, GAGAN, GLONASS and Galileo.	08	22
5	Deep Space Networks and Inter Planetary Missions : Introduction – Functional description - Design procedure and performance criterion-Mars exploration Rover- Mission and space craft summary Telecommunication subsystem overview-Ground Subsystem-Telecom subsystem and Link performance Telecom subsystem Hardware and software Chandrayaan-1 Mission - Mission and space craft summary-Telecommunication subsystem overview Ground Subsystem-Telecom subsystem and Link performance. Mangalyaan Mission - Mission and space craft summary-Telecommunication subsystem overview- Ground Subsystem-Telecom subsystem and Link performance	09	25

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same. Recommended sites for journal papers are (1) dl.acm.org (2) springer.com (3) sciencedirect.com (4) elsevier.com (5) ieeexplore.ieee.org (6) scholar.google.co.in (7) scopus.com or similar of similar repute.

Course Outcome:

Upon successful completion of this course the student would be able to:

- Discuss satellite navigation and global positioning system
- Outline deep space networks and inter planetary missions

List of References:

1. Adimurthy.V,|| Concept design and planning of India's first interplanetary mission|| Current Science, VOL. 109, NO. 6, 1054 25 SEPTEMBER 2015.
2. Anil K. Maini, Varsha Agrawal, _Satellite Technology: Principles and Applications', Third Edition, Wiley, 2014.
3. Daniel Minoli' —Innovations in Satellite Communication and Satellite Technology|| Wiley, 2015
4. Daniel Minoli, —Satellite Systems Engineering in an IPv6 Environment||, CRC Press, First Edition, 2009
5. Hofmann-Wellenhof B., Lichtenegger H., and ElmarWasle, —Global Navigational Satellite Systems|| Springer-Verlag, 2008.
6. Jim Taylor, —Deep Space Communications|| John Wiley & Sons, 2016.
7. Louis J. Ippolito, Jr. —Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performancel, Second Edition, 2017

E-Resources:

1. <http://nptel.ac.in/>
2. <http://www.isro.gov.in/pslv-c25-mars-orbiter-mission>
3. https://en.wikipedia.org/wiki/Mars_Orbiter_Mission
4. <https://en.wikipedia.org/wiki/Chandrayaan-1>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To understand fundamentals of Satellite Communication	1 Remembering 2 Understanding
CLO2	To introduce students a set of advanced topics in Satellite Communication Technology	2 Understanding
CLO3	Overview of the Internet of Things and M2M- M2M Applications	2 Understanding 3 Applying
CLO4	Overview of IPv6 and its benefits for Satellite Networks	3 Applying
CLO5	Over view of Radio and Satellite Navigation, GPS Principles	2 Understanding 3 Applying

CLO6	Introduction – Functional description - Design procedure and performance criterion-Mars exploration Rover- Mission and space craft summary	2 Understanding 3 Applying
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Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H		L										M			
CLO2	M		M	H		L								L		
CLO3	M		M	H		L								L		
CLO4					H	M				L		L		L		
CLO5		M	H			L	L		M				M			
CLO6		M	H			L			M				M			

H: High, M: Medium, L: Low