



Subject Code:
Subject Name: Optical and Satellite Communication
Diploma Year – III (Semester V)

Objective: The rationale behind this course is to understand working of optical and satellite communication systems.

Credits Earned: 4 Credits

Course Outcomes: After learning this course, students should be able to,

1. Interpret the functions of the various blocks of optical fiber communication system.
2. Differentiate losses in optical fiber link and state transmission characteristics of optical fiber
3. Understand working of various optical source and detectors.
4. Understand the basics of satellite communication.
5. Understand different application of satellite communication.

Pre-requisite of course: Analog and Digital Communication.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Sr No	Course content	Total Hrs.
1	Optical fiber communications: Advantages, Disadvantages and Applications, Construction of fiber optic cable, Classification based on modes of propagation of light and index profile, Block diagram of optical fiber communication, Optical sources: LEDs, Lasers, Optical Detectors: PIN Diodes and APDs	10
2	Reflection, Refraction, Total internal reflection, Snell's law, Critical angle, numerical aperture, acceptance angle and acceptance cone, splicing techniques, losses in optical fiber.	07



3	Optical transmitter circuit, Optical receiver circuit, Optical system design considerations: Component choice, Multiplexing, Analog and Digital System Design	07
4	Working principle, concepts and basic components of satellite system, Satellite frequency bands and frequency allocations, Basic terminologies, communication satellite orbits and its types, Kepler's law, Apogee and Perigee heights, Orbit perturbations, Effects of non-spherical earth, atmospheric drag	10
5	Satellite Earth Station (Block diagram, Antenna subsystem, LNA, Power subsystem, TTAC, Attitude control, Spinning satellite stabilization, Momentum wheel stabilization, Station Keeping, Thermal control transponder), Space Link (EIRP, transmission losses), Satellite Applications (GPS, VSAT)	08
Total		42 hrs.

References:

1. Kieser, Gerd, Fiber Optic Communication, McGraw Hill
2. Senior John M., Optical Fiber Communications Principles and Practices, Pearson
3. Roddy Dennis, Satellite Communications, TMH
4. Rao Raja, Satellite Communications concepts and applications, PHI
5. P Chakrabarti, Optical Fiber Communication, McGraw Hill
6. Gerard Maral, Michel Bousquet, Satellite Communications Systems, Wiley

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
40%	40%	10%	10%	0%	0%

Suggested List of Experiments:

1. Identify various layers and parts of an optical fiber cable.
2. Calculate bandwidth of optical fiber cable for analog link.
3. Calculate numerical aperture and acceptance angle for the given optical fiber cable.
4. Connect the given optical cable with relevant optical connector and test the performance of cable.
5. Measure attenuation losses for the given length of optical fiber cable.



6. Measure bending losses for given optical fiber cable.
7. Join optical fiber cable using splicing machines.
8. Demonstrate working of OTN.
9. Test the performance of audio satellite link for the specified uplink and downlink frequency.
10. Develop a program using a relevant simulation tool to calculate the time period of a satellite for the given velocity and altitude based on Kepler's third law.
11. Detect satellite link fail operations and re-establish the link.
12. Establish a link to transmit and receive three separate signals simultaneously through satellite link.

Reference Materials:

- <https://nptel.ac.in/courses/117/104/117104127/>
- <https://nptel.ac.in/courses/117/105/117105131/>
- <https://www.coursera.org/learn/satellite-communications>