

NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
B.Tech. Electronics & Communication Engineering
Semester - VI
Department Elective II

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| Course Code | 2ECDE02 |
| Course Title | Satellite Communication |

Course Outcomes (COs):

At the end of the course, the students will be able to

1. Comprehend the principle, operation and working of various subsystems of satellite as well as the earth station.
2. Analyze and design a satellite link.
3. Apply communication techniques in satellite applications.
4. Appreciate the role of satellite in a wide spectrum of applications such as navigation, remote sensing, and communication.

Syllabus:

Teaching Hours:45

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| UNIT 1: Orbital Mechanics and Launching | 07 |
| Kepler's law, perturbations, orbital effects, type of orbits, launching of satellite, launch vehicle technology | |
| UNIT II: Satellite Sub Systems | 07 |
| Attitude & orbit control, thermal control, power supply, propulsion, telemetry, tracking & command, transponder, antennas | |
| UNIT III: Satellite Link Design | 08 |
| Free space path loss, G/T ratio, equivalent noise temperature, G/T ratio, link budget, design for uplink, design for downlink, Inter satellite links | |
| UNIT IV: Communication Techniques and Earth Station Technologies | 09 |
| Hybrid Modulation techniques, multiple Access techniques, Earth stations Configuration, classes, performance criteria, subsystems, antennas | |
| UNIT V: Applications of Satellite Communication | 10 |
| Telecom and data communication, Satellite navigation systems (GPS), Satellite broadcasting systems (DTH, world space radio), Very Small Aperture Terminal (VSAT) systems, Mobile satellite systems, Remote sensing satellite systems | |
| UNIT VI: Future Trends in Satellite Communication | 04 |
| High altitude platforms, high throughput satellite systems, Optical inter-satellite links, Open standards – DVBS | |

Self-Study:

The self-study content will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Assignments:

The students will be given 8-10 programming/simulation/projects assignments based on the above syllabus as mentioned below

- i. Program to determine orbital parameters
- ii. Satellite Link Design Calculator
- iii. Simulation modulation and error control coding for satellite communication
- iv. Review of deep space mission satellite payload
- v. Comparative study of satellite launchers and space shuttles
- vi. Project-based on location determination/ tracking using GPS module

- vii. Study of NaVIC receiver
- viii. Project-based on IRNSS data utilization

Suggested Readings:

1. T. Pratt, Satellite Communication, Wiley
2. Dennis Roddy, Satellite Communication, Wiley
3. A. K. Maini, Satellite Communication, Wiley
4. Bruce R. Elbert, Introduction to Satellite Communication, Artech House
5. Bruce R. Elbert, Satellite Communication Applications, Artech House

L = Lecture, T = Tutorial, P = Practical, C = Credit