SEMESTER	DEPARTMENT	COURSE TITLE
Eighth	*Telecommunications Engineering*	*Satellite Communications*
COURSE CODE	**HOURS** 3	**COURSE SPECIFICATIONS**
ET803	**UNITS** 3	*Theoretical Content*

1. ***Introduction:***
   - Birth of satellite communications.
   - Development of satellite communications.
   - Configuration of a satellite communications system.
   - Types of orbit.
   - Radio regulations.
   - Technology trends.
   - Services.
   - The way forward.

2. ***Orbits and related issues:***
   - Keplerian orbits.
   - Useful orbits for satellite communication.
   - Perturbations of orbits.

3. ***Baseband signals and quality of service:***
   - Baseband signals.
   - Performance objectives.
   - Availability objectives.
   - Delay.

4. ***Digital communications techniques:***
   - Baseband formatting.
   - Digital modulation.
   - Channel coding.
   - Channel coding and the power–bandwidth trade-off.
   - Coded modulation.
   - End-to-end error control.
   - Digital video broadcasting via satellite (DVB-S).
   - Second generation DVB-S.

5. ***Uplink, downlink and overall link performance; intersatellite links:***
   - Configuration of a link.
   - Antenna parameters.
   - Radiated power.
   - Received signal power.
   - Noise power spectral density at the receiver input.
   - Individual link performance.
   - Influence of the atmosphere.
   - Mitigation of atmospheric impairments.
   - Overall link performance with transparent satellite.
   - Overall link performance with regenerative satellite.

- Link performance with multibeam antenna coverage versus moonbeam.
- Intersatellite link performance.

6. ***Multiple access:***

- Layered data transmission.
- Traffic parameters.
- Traffic routing.
- Access techniques.
- Frequency division multiple access (FDMA).
- Time division multiple access (TDMA).
- Code division multiple access (CDMA).
- Fixed and on-demand assignment.
- Random access.

7. ***Satellite networks:***

- Network reference models and protocols.
- Reference architecture for satellite networks.
- Basic characteristics of satellite networks.
- Satellite on-board connectivity.
- Connectivity through intersatellite links (ISL).
- Satellite broadcast networks.
- Broadband satellite networks.
- Transmission control protocol.
- IPv6 over satellite networks.

8. ***Earth stations:***

- Station organization.
- Radio-frequency characteristics.
- The antenna subsystem.
- The radio-frequency subsystem.
- Communication subsystems.
- The network interface subsystem.
- Monitoring and control; auxiliary equipment.

9. ***The communication payload:***

- Mission and characteristics of the payload.
- Transparent repeater.
- Regenerative repeater.
- Multibeam antenna payload.
- Introduction to flexible payloads.
- Solid state equipment technology.
- Antenna coverage.
- Antenna characteristics.

10. ***The platform:***

- Subsystems.
- Attitude control.
- The propulsion subsystem.
- The electric power supply.

- Telemetry, tracking and command (TTC) and on-board data handling (OBDH).
- Thermal control and structure.
- Developments and trends.

11. ***Satellite installation and launch vehicles:***

- Installation in orbit.
- Launch vehicles.

12. ***The space environment:***

- Vacuum.
- The mechanical environment.
- Radiation.
- Flux of high energy particles.
- The environment during installation.

13. ***Reliability of satellite communications systems:***

- Introduction of reliability.
- Satellite system availability.
- Subsystem reliability.
- Component reliability.

References:

1. ***Satellite Communications Systems*** by Gerard Maral, Michel Bousquet, 2009.