MTE 7202 Satellite & Microwave Communications

Course Description:

This course will cover the most relevant aspects of satellite & microwave communications, with emphasis on the most recent applications and developments.

AIMS:

- To understand Radio communication in general and also the special aspects that relate to microwave and satellite communications.
- To give a thorough understanding of satellite systems including topics of orbits and constellations, satellite space segment, and propagation and satellite links; baseband communications techniques for satellites including modulation, coding, multiple access and on-board processing as well as the applications of various satellite communications systems and with emphasis on recent development in LEO satellite systems for personal communications
- To discuss the use of microwave radio systems in communications highlighting the design, deployment and oprtational challenges of microwave radio communications

Detailed Course Content:

Radio Communications Principles

- Review of wireless Communication principles
- The design of a digital radio link: link budgets, modulation, error control coding, baseband signaling theory, and multiple access methods.
- Broadcast radio Systems: AM, FM broadcast

Satellite Communications:

- A review on the background and basic concepts of satellite communications.
- Satellite orbital aspects with emphasis on the geostationary orbit
- Satellite subsystems, launching methods, and on-board processing.
- Frequency assignments and propagation aspects that affect the satellite.
- Antennas and earth station technology including the design of very small aperture terminals (VSATs).
- Non-geosynchronous orbits and their applications.
- Specific applications of satellites including the global positioning system (GPS), satellites for mobile communication, and satellites for internet.

Microwave Communications:

- Physics of microwave components
- Microwave systems design, link budgets and link designs
- Interconnection of microwave links to make networks.
- Telecommunication transport systems (PDH, SDH, Ethernet on Microwave, Copper, & Fiber) and how microwaves fit into this part of the system.

Teaching and Learning Pattern

The teaching of students will be conducted through lectures, tutorials, short classroom exercises, case studies, group discussions among the students and projects aimed at solving real life problems. The lecture material will be availed to the students in advance to enable them have prior reading. Solving real life problems in each theme or a number

of topics will enhance the students' understanding of the problem based learning techniques.

Assessment method

Assessment will be done through coursework which will include assignments, class room and take home tests, project work and presentations and a written examination. Course work will carry a total of 40% and written examination carries 60%. Coursework marks will be divided into; Assignments 5%, Tests 10% and Practical/project Work 25%.

References:

1. M. Richharia, "Satellite Communication Systems", Second edition, McGraw-Hill, 1999, ISBN: 0071342087
2. M Richharia, 'Satellite Communication Systems'.(Second Ed.),Macmillan Press Ltd.
3. Robert M Gagliardi: 'Satellite Communication', Van Nostrand Reinhold
4. Tri T Ha: 'Digital Satellite Communication', MGH
5. Miller, Vucetic and Berry: 'Satellite Communication Techniques', Kluwer
6. Ferdo Ivanek (Editor): 'Terrestrial Digital Microwave Communications', Artech House
7. George M. Kizer: 'Microwave Communication', IEEE Press
8. E. Hund: 'Microwave Communications', IEEE Press