Polytechnic University of Puerto Rico
Department of Electrical Engineering
Master's Degree in Electrical Engineering

Course Syllabus

Course Title : Satellite Communication Systems

Course Code : EE 6770

Credits : Three (3) credits

Duration : One academic quarter.

Schedule : Forty-five credit hours per course

Prerequisites : EE 5714 Digital Communication Systems (undergrad),

Course Description

Analysis and design of satellite communication systems and links including the study of propagation, satellite transponders, earth stations and satellite networks. Analog and digital modulation schemes, as well as antennas and microwave components are studied at a block system level. This course also introduces the economics, regulatory law, and business characteristics of the satellite communications field. A final project or report is required.

Justification

The course provide an opportunity to integrate a variety of areas, from propagation and antennas to digital modulation schemes and satellite networks, in a way that the student has a unified look at the use and importance of the different topics learned during his studies. Satellite communication has become main stream and is a multibillion dollar industry that offers graduates unlimited opportunities.

Objectives

To provide adequate foundation in the area of Satellite Communication Systems. Some of the specific objectives of this course are:

1. Perform a satellite link design between two earth stations to achieve a specified performance.
2. Do elevation and azimuth calculations.
3. Incorporate rain and ice effects in his link analysis or design.

4. Describe the various satellite systems such as power system, telemetry system, altitude and orbit control systems, and communications systems.
5. Incorporate the various multiple access and modulation techniques in his system analysis or design.
6. The student should have an understanding of the economics, regulatory law, and business characteristics of the satellite communications field.

Textbook

Satellite Communications (2003)
2nd edition
By T. Pratt, C. W. Bostian and Jeremy Allnutt,
John Wiley & Sons. New York, N.Y.

Topics Covered

1. Orbital aspects of satellite communications.
2. Spacecraft power system. Satellite Systems. Transponders.
3. Propagation on satellite-earth paths and its influence in microwave and satellite link design. Atmospheric Effects.
4. Satellite link design.
5. Earth station design.
6. Modulation and multiplexing techniques for satellite links.
7. Satellite Networks. Multiple Access: FDMA, TDMA, CDMA.
8. Encoding and forward error correction for digital satellite links.
9. Spectrum regulation.
10. Reliability of a satellite communication system.
11. Satellite launching. A look at the industry.
12. Business, economics, regulatory and legal issues.
13. Satellite communications versus its alternatives.
14. Project or report discussion and specifications.
15. Introduction to GPS systems.

Evaluation Criteria

Final course grade will be determined, unless otherwise accorded in class, based on the following scale:

100-90 A
89-80 B
79-70 C
69-60 D
59 –0 F

Homework is suggested to be 0% to 10% of the final grade. Two exams (50%) and a final exam (25%) are suggested. A design project, research report or paper reviews (15%), should be assigned to the students. Final percentages are to be determined by the instructor.

Course History

April, 2002; prepared by Marvi Teixeira, Ph.D., P.E.
May, 2002; revised by Carlos Ortiz, Ph.D.

Bibliography

Communication System Engineering. (2002)
by J. G. Proakis and M. Salehi.
2nd Edition
Prentice Hall
ISBN: 0-13-061793-8

Satellite Communications. (2000)
by D. Roddy.
3nd Edition.
McGraw Hill

Satellite Communication Systems Engineering. (1993)
By W. L. Pritchard, H. G. Suyderhoud and R. A. Nelson.
2nd Edition.
Prentice Hall

Gagliardi. Satellite Communications. (1984)
by R. M. Gagliardi.
1st Edition
Lifetime Learning Publications

Communications Satellite Systems. (1978)
by J. Martin.
1st Edition
Prentice Hall

Digital Communications by Satellite. (1977)
by J.J. Spilker.
1st Edition
Prentice Hall