ECE 521: Satellite Communication

Day/Time/Room: Tuesdays and Thursdays, 3.30pm – 4.45pm at ENGR B4
Instructor: Dr. V. Chandrasekar
Prerequisite: ECE 421 or consent of instructor
Course Credits: 03
Textbook: Satellite Communications (fourth edition) by Timothy Pratt, Charles Bostian and Jeremy Allnutt

Course Objective: The objective of this course is to provide focus on modern concepts of satellite communication and its applications including constellations of satellites and geo-navigation. It is very important in the curriculum to provide a course with focus on these topics.

Outline:
I. Introduction
   Function of a communication satellite
   Brief history
   Satellite subsystems
II. Orbital Aspects of Satellite Communication
   Orbital mechanics
   Look angle
   Orbit effects
   Perturbations
III. Satellites
   Subsystems, Orbit Control Systems, Power Systems, Communication Systems, Antennas
IV. Link Budget/Link Design
   Basic transmission theory
   System noise temperature
   Design of links
   Small Earth stations
   Examples of link budget
IV. Modulation and Multiplexing Techniques for Satellite Links
   Modulation methods
   Multiplexing
   Multiple access
   Phone/T.V. transmission
   Digital transmission
   Bandwidth compression
V. VSAT Systems
VI. Propagation on Earth-Satellite Paths and Link Design
Attenuation
Depolarization
Propagation effect not associated with hydrometeors
Propagation effect due to hydrometeors
Mitigation of propagation effects

VII. Earth Station Technology
Satellite antennas
Receiving antennas
System performance
Tracking

VIII. NGSO Satellite Systems
Orbital Considerations
System Considerations
Operational and Proposed NGSO Constellation Designs
System Design Examples

IX. Direct Broadcast Satellite Television and Internet
DBS-TV System Design
NGSO Satellite Systems
Link Budgets for NGSO Systems
Packet and Protocols for NGSO Systems
User Terminal Antennas for Ku-Band, Ka-Band, and V-Band

X. Navigation and GPS
Global Positioning System
Radio and Satellite Navigation
Satellite Signal Acquisition
Differential GPS

Grading and Exams: Homework 33%, Midterm 33%, Final Exam 34%