

ECE 521: Satellite Communication

Spring 2021

Day/Time/Room: Tuesdays and Thursdays, 3.30pm – 4.45pm

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 hydro meteors

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%