

**NEW YORK CITY COLLEGE OF TECHNOLOGY**  
**The City University of New York**

**DEPARTMENT:** Electrical and Telecommunications Engineering  
Technology

**SUBJECT CODE AND TITLE:** TCET 3222/TC 611& TC611L Satellite Transmission

**COURSE DESCRIPTION:**

An overview of the basic concepts and techniques used in satellite communications is introduced. The three major segments of a satellite system: the space segment, the earth segment and the link between these segments are described. A short introduction to satellite launching, followed by a discussion of the methods of determining antenna look angles. The antenna gain and beam-width equations are examined with emphasis on the parabolic antenna. Uplink and downlink budgets are examined. Carrier to noise ratio, bit energy to noise density ratio and gain to noise temperature ratio are studied. Frequency modulation and multiphase modulation methods are investigated.

The laboratory part of this course uses several software simulation tools to analyze the different segments of the satellite communication networks. The link budget analysis, launching phase analysis and others are performed to improve understanding of the theoretical concepts. Dish antenna, transmitter/receiver, waveguides and spectrum analyzer are utilized to enhance experiments.

**PRE-COREQUISITE:** TCET 2220/TC 410, TCET 3202/TC 620

**TEXTBOOK:** Satellite Communications  
By Dennis Roddy  
Fourth Edition, 2006

**REFERENCE BOOK:** Satellite Communication Systems  
By B.G. Evans  
3<sup>rd</sup> Edition, 2000

**SUPPLEMENTARY MATERIAL:** 10 Chapters of handout notes  
Prepared by Dr. M. Razani

**COURSE OBJECTIVES/  
COURSE OUTCOMES:**

Upon the completion of this course students shall be able to:

1. Analyze the earth segment as well as the space segment (2a, 2b, 2f).
2. Analyze the link budget for a complete satellite system (2a, 2f).
3. Analyze the different modes of interference due to other satellite systems or neighboring terrestrial microwave stations (2a, 2d, 2f).
4. Carry out several satellite simulation software that includes visualization of the concepts learned in the lecture part and methods of Link Budget calculations and Interference Analysis between satellite systems and their corresponding earth stations (2a, 2d, 2f).

**TOPICS:**

Topics include space segment, earth segment, link budget calculations, antennas and wave propagations, multiple access techniques, multimedia by satellite, and domestic, regional and international communication satellite organizations. Also familiarity with different software tools used in visualizing the concepts learned in the lectures.

**CLASS HOURS:** 2

**LAB HOURS:** 3

**CREDITS:** 3

**PREPARED BY:** Professors M. Razani

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**GRADING POLICY:** TCET 3222/TC 611& 611L

Homework and class participation	10%
Midterm Exam:	20%
Final Exam;	20%
Project:	20%
Lab:	30%

<u>Letter Grade</u>	<u>Numerical Grade Ranges</u>	<u>Quality</u>
A	93-100	4.0
A-	90-92.9	3.7
B+	87-89.9	3.3
B	83-86.9	3.0
B-	80-82.9	2.7
C+	77-79.9	2.3
C	70-76.9	2.0
D	60-69.9	1.0
F	59.9 and below	0.0



WEEK	TOPIC	READING ASSIGNMENT			HOME WORK PROBLEMS	Laboratory Experiments
		Roddy	Notes	Evans		
1	Overview of satellite system and history of the satellite communications development.	Ch.1	Ch1	Ch. 2	1.1, 1.2, 1.3, 1.8	Introduction & overview of all labs for the semester.
2	Types of satellites, orbits, and launching methods.	Ch.2	Ch.2	-----	2.1, 2.10, 2.11	<b>Experiment 1.</b> SMW Link Analysis
3	International and regional satellite communications organizations.	-----	Ch.3	-----	-----	<b>Experiment 2.</b> Satellite Tracking
4	Satellite communications systems.	Ch.7 & 8	Ch.4	----	7.1, 7.2, 7.9, 8.1, 8.10	<b>Experiment 3.</b> Satellite Tool Kit (STK), part 1.
5	Review & Exam 1	-----			-----	Exam 1
6	Coverage areas, frequency band allocations, interference, & multiple access methods	Ch. 13	Ch. 5	-----	Handout Problems	<b>Experiment 4.</b> Satellite Tool Kit (STK), part2.
7	Earth station design	-----			-----	<b>Experiment 5.</b> Satellite Tool Kit (STK), part 3.
8	Earth station design, continued.	-----	Ch.6	Ch.12	12.1, 12.3, 12.5, 12.7	<b>Experiment 6.</b> Satellite Tool Kit (STK), part 4.
9	Multimedia by satellite	-----	Ch.7	Ch.24	Handout Problems	<b>Experiment 7.</b> <u>Visualize Tools software</u>
10	Review & Exam 2	-----			-----	<b>Experiment 8.</b> Satellite Earth Station Maintenance tools.
11	Students' presentations of their research work	-----			-----	Site Visit, Earth Station.
12	Satellite services	Ch.15 & 17	Ch.8	----	15.8, 17.1, 17.3	<b>Experiment 9.</b> Aurachain Software, part 1.
13	Earth Resource Satellites	-----	Ch.9		Handout Problems	<b>Experiment 10.</b> Aurachain, part 2.
14	Future directions in satellite communications, antenna, Q/A, & review for final exam	Ch.6	Ch.10	Ch.25	Handout Problems	<b>Experiment 11.</b> Modeling Satellite Transponder with STK.
15	Final Exam	-----			-----	Final Exam