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

DEPARTMENT: Electrical and Telecommunications Engineering Technology

SUBJECT CODE AND TITLE: TCET 2220/TC 410 Transmission Systems

Required course

COURSE DESCRIPTION:

Introduction to the analysis of microwave communications and systems. Transmission line theory, the Smith chart, and mathematical analysis are incorporated. Various transmission media, such as two-wire, twisted telephone wires, coaxial cable, waveguides, fiber, and satellite are studied. Study of microwave components, Tee connectors, attenuators, slotted lines, and cavities are included. Antenna design and radio-wave propagation are also covered (introduced). Concludes with a study of microwave applications and systems.

PREREQUISITE: EET 2140,
PRE-or COREQUISITE MAT1475

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TEXTBOOK: Lines and Fields in Electronic Technology
By Stanley & Harrington, 1995

COURSE OBJECTIVES/
COURSE OUTCOMES:
(ETAC/ABET Criteria 3, Program Criteria)

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

1. Explain and Analyze Electromagnetic Fields and Waves.(3a, 3b, 3e, PC a, PC b)
2. Explain the types of transmission systems used in telecommunications. (3a).
3. Analyze a given transmission line (3a, 3b, 3e, 3f, 3i, PC a, PC b).
4. Analyze the behavior of a transmission lines by using the Smith Chart. (3a, 3b, 3d, 3f, 3g, 3h, 3i, PC a, PC b).
5. Explain the characteristics of optical fiber communications and satellite communications (3a, 3b, 3e, 3f, 3g, 3h, PC a, PC b).

TOPICS:

Topics include electromagnetic field propagation, transmission lines properties, lossless and lossy transmission lines, fiber optics, satellite communications, microwave, coaxial cable, and wirelines, analysis of transmission lines using Smith Chart, and microwave components, Tee connectors, attenuators, slotted lines, and cavities.

CLASS HOURS: 3

CREDITS: 3

PREPARED BY: Professor Viviana Vladutescu, April 4, 2013

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Contribution of course to meeting the requirements of Criterion 5:
TCET2220 meets Criterion 5 by providing students with a strong foundation of the theoretical principles needed to analyze transmission communications systems through different methods. Academic benchmarks, course outcomes, and assessment requirements have been established to ascertain student comprehension of fundamental concepts of various transmission media. Through critical thinking, communications and teamwork, students develop skills needed to solve problems in a classroom, which later serve them in the workplace.

Relationship of course to Student Outcomes:
TCET 2220 contains relevant components to Student Outcomes 3a, 3b, 3d, 3e, 3f, 3g, 3h, 3i, PC a, PC b.

GRADING POLICY: TCET 2220/TC 410

Homework and class participation	10%
Exams:	60%
Project	30%

Letter Grade	Numerical Grade Ranges	Quality
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

Assessment

The following assessment techniques are correlated to the course objectives as follows: In addition, each assessment technique incorporates one or more of the following ABET Criterion 3 outcomes (3a, 3b, 3d, 3e, 3f, 3g, 3h, 3i, PC a, PC b).

Course Objectives **For the successful completion of this course, the students should be able to:**	**Assessment** **Evaluation Methods and Criteria:**
1. Explain the types of transmission systems used in telecommunications.	Students are given an in class exercise a task of designing a telecommunication infrastructure for a given geographical area and are asked to specify which system would be best suitable for different part of this region and the reasons why.
2. Analyze a given transmission line in terms of reflections from the source and the load, initial and steady-state values of voltages and currents on line, Bounce diagram demonstrating multiple reflections, in case of unmatched line, and the resulting voltage and current at the source and the load for a dc and pulse input signal.	Students are given in class and homework problems in which they need to go through the analysis of a transmission line with reflections at the source and the load and asked to draw the corresponding Bounce diagram and voltage and current at the source and the load for different types of input signals.
3. Analyze the behavior of a transmission lines by using the Smith Chart and show the impedance, admittance, reflection coefficients, and VSWR for half wavelength, quarter wavelength and general cases of transmission line, using the Smith Chart.	Students are give the Smith Chart and are asked to show the impedance, admittance, reflection coefficient and the VSWR for different types of transmission lines as an in class exercise and homework problems.
4. Explain the characteristics of optical fiber communications and satellite communications as two of the transmission systems used in telecommunication infrastructures, world wide.	Students are asked to specify under what circumstances they would use optical fiber and satellite communications when designing a telecom system.

Week	Topic	Reading Assignments	Homework Problems
1&2	Electromagnetic fields, Maxwell's equations, field propagation, permittivity and permeability, polarization.	Chapter 6	6-1 to 6-23
3&4	Transmission line properties, wavelength and frequency relationship, propagation delay, velocity of propagation, lossless lines, characteristics impedance, permittivity and permeability.	Chapter 1	1-1, 1-5, 1-17,1-21, 1-23, 1-26
5&6	Transients on a lossless line, load and source reflection coefficients, voltage and current Bounce diagrams for dc and pulse inputs.	Chapter 2	2-2, 2-5, 2-7, 2-8
7	Steady-State ac transmission lines, propagation constant, attenuation constant, phase constant, velocity of propagation, characteristic impedance, decibels and Nepers	Chapter 3	3-1, 3-2, 3-17, 3-20, 3-24, 3-25
8	Radio frequency lossless lines, calculations of reflection coefficients and VSWR, input impedance calculations, load power calculations, short-circuited and open circuited lossless lines.	Chapter 4	4-1, 4-8,4-15, 4-22
9	Review and Midterm Exam.	**----------**	**----------**
10	Smith Chart applications, plotting impedance and admittance, rotation on the Smith Chart, determining input impedance from load impedance and vise versa, voltage and current maximum and minimum.	Chapter 5	5-1, 5-3, 5-7
11	Propagation of electromagnetic waves, reflection and refraction, isotropic transmitting and receiving antennas, receiver sensitivity, ground wave propagation, sky wave propagation.	Chapter 10	10-1, 10-4, 10-17, 10-19
12&13	Fiber Optics technology, optical spectrum, fiber optic transmission lines, dispersion in fiber optics, LED, optical receiving & transmitting devices.	Chapter 11	11-1, 11-5, 11-13
14	Satellite Communications, frequency allocations, types of services and coverage, earth station, space segment and the link analysis.	Chapter 12	12-1, 12-7, 12-10
15	Review and Final Exam	**----------**	**----------**

New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, invention, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the college recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.