STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

ELEC 225 – TELECOMMUNICATIONS

Prepared By: Stephen E. Frempong

SCHOOL OF ENGINEERING TECHNOLOGY
ELECTRICAL ENGINEERING TECHNOLOGY & ENGINEERING
SCIENCE DEPARTMENT
FALL 2018

A. TITLE : TELECOMMUNICATIONS

B. COURSE NUMBER: ELEC 225

C. CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

Credit Hours: 3
Lecture Hours: 2 per week
Lab Hours: 2 per week

Course Length: 15 Weeks

D. WRITING INTENSIVE COURSE: NO

E. GER CATEGORY: NONE

F. SEMESTER OFFERED: SPRING

G. COURSE DESCRIPTION: An intermediate course designed to give students theoretical and hands-on experience in telecommunications technology. Topics include how information is processed and transmitted, medium of transmission, Switching Hierarchy of North America (PSTN), Wave propagation, Line devices, Modulations, Multiplexing, Noise, Error detection, correction, and control, Transmission lines and ISDN/DSL.

H. PRE-REQUISITES: Electronic Circuits (ELEC 231),
Calculus 1 (MATH 161), or permission of instructor.

CO-REQUISITES: NONE

I. STUDENT LEARNING OUTCOMES:

Institutional Student Learning Outcomes (SLO's)
(1) Communications (2) Critical Thinking (3) Foundational Skills
(4) Social Responsibility (5) Industry, Professional, Discipline-Specific Knowledge

ABET Student Outcomes (a-k)

Course Objectives	Institutional (SLO's)	ABET Student Outcomes (a-k)
Understand how information is processed and transmitted via physical connectivity and radio.	5. Industry, Professional, Discipline-Specific Knowledge and Skills	(j) A knowledge of the impact of engineering technology solutions in a societal and global context.

Understand and perform calculations in noise in communication transmissions.	2. Critical Thinking	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.
Understand Modulations (AM/FM) and perform calculations.	5. Industry, Professional, Discipline-Specific Knowledge and Skills 2. Critical Thinking	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.
Understand Error Detection and Correction Through Hamming Code and Cyclic Redundancy Checking binary calculations.	5. Industry, Professional, Discipline-Specific Knowledge and Skills 2. Critical Thinking	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.
Build and test AM/FM Communications Receiver.	5. Industry, Professional, Discipline-Specific Knowledge and Skills	(a) An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

J. **APPLIED LEARNING COMPONENT**: CLASSROOM/LAB

K. TEXTS:

Warren Hioki, *Telecommunications,* 4th Edition. Upper Saddle River, New Jersey: Prentice-Hall, 2001.

LABORATORY MANUAL:
David Heiserman, *Principles of Electronic Communication Systems*, 2nd Edition. New York: McGraw-Hill, 2004.

L. REFERENCES:
Wayne Tamasi, *Electronic Communications Systems,* 5th Edition. Upper Saddle River, New Jersey: Prentice-Hall, 2004.

M. EQUIPMENT: Regular EET laboratory will be used

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Final grade is based on the following: Quizzes, Tests, Midterm Exam, Team Lab Projects/Reports, Homework, Team Final Project, and Final Exam.

P. DETAILED COURSE OUTLINE:

I. Introduction to Telecommunications
   a. Employment Opportunities in Telecommunications
   b. Voice and Data Communications
   c. Role of the Communication Systems
   d. Future Trends in Telecommunications
   e. Modulation and Communication Systems
   f. The dB in Communications
   g. Noise and Measurements
   h. Information and Bandwidth
   i. Resonance and Oscillators

II. Amplitude Modulation

   a. Amplitude Modulation Fundamentals
   b. Percentage Modulation
   c. AM Analysis
   d. Circuits for AM Generation
   e. AM Transmitter Systems
   f. Receiver Characteristics
   g. AM Detection
   h. AM Receivers

III. The Telephone Network

a. The Public Switched Telephone Network
b. Transmission Media for Trunks
c. Central Office Switching Systems
d. Multiplexing
e. North American Digital Multiplex Hierarchy

IV. The Telephone Set and Subscriber Loop Interface

a. Basic Functions of the Telephone Set
b. Rotary Dialing with the Bell 500 Telephone
c. Electronic Pulse Dialing Telephone
d. Dual-Tone Multi-frequency
e. The Local Loop
f. Line Characteristics
g. Line Conditioning

V. Error Detection, Correction, and Control

a. Parity
b. Parity Generating and Checking Circuits
c. The Disadvantage with Parity
d. Vertical and Longitudinal Redundancy Checks
e. Cyclic Redundancy Checking
f. Checksums
g. Error Correction

VI. Frequency Modulation

a. Angle Modulation
b. A Simple FM Generator
c. FM Analysis
d. Noise Suppression
e. Direct FM Generation
f. Indirect FM Generation
g. Phase-Locked-Loop FM Transmitter
h. FM Transmissions
i. FM Receivers

VII. Noise

a. Effects of Noise
b. Noise Measurements
c. Types of Noise

VIII. Modems

a. Modem Features

b. Modem Techniques
c. Bell Family of Modems
d. ITU-TS Modems and Recommendations
e. Cable Modem

IX. Local Area Networks

a. LAN Topology
b. Channels Access
c. Polling
d. Contention
e. Token Ring Passing
f. Transmission Media
g. Baseband Versus Broadband Transmission

Q. LABORATORY OUTLINE:

1. Amplitude Generation
2. Diode AM Detection
3. FM Generation
4. FM Detection
5. Frequency Modulation Transmitter
6. Pulse Width Modulation
7. DTMF Tone Generator Circuit
8. Project