COURSE OUTLINE

ELEC 225 – TELECOMMUNICATIONS

Prepared By: Stephen E. Frempong
A. **TITLE:** TELECOMMUNICATIONS

B. **COURSE NUMBER:** ELEC 225

C. **CREDIT HOURS:** 3

D. **WRITING INTENSIVE COURSE:** NO

E. **WEEKS PER SEMESTER:** 15

F. **SEMESTER OFFERED:** FALL

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:** 3- Hours Lecture and 2- Hours Lab

H. **CATALOG 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, ISDN/DSL and Antennas.

I. **PRE-REQUISITES/CO-COURSES:** Electronic Circuits (ELEC 231), Calculus 1 (MATH 161), or permission of instructor.

J. **GOALS (STUDENT LEARNING OUTCOMES)**

**Institutional Student Learning Objectives (SLO)**

(1) Communications  (2) Critical Thinking  (3) Professional Competence

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<tr>
<th>Course Objectives / ABET (SLO)</th>
<th>Institutional (SLO)</th>
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<td>An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.</td>
<td>3. Professional Competence</td>
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<tr>
<td>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.</td>
<td>2. Critical Thinking</td>
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<td>An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.</td>
<td>3. Professional Competence</td>
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<td>A commitment to quality, timeliness, and continuous improvement.</td>
<td>3. Professional Competence</td>
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K. **TEXTS:**  

L. **LABORATORY MANUAL:**  

M. **REFERENCES:**  

N. **EQUIPMENT:** Regular EET laboratory will be used

O. **GRADING METHOD:** A-F

P. **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.

Q. **DETAILED TOPICAL 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

R. 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