COURSE OUTLINE

ELEC 146 – ELECTRONIC SYSTEMS FOR TELECOMMUNICATIONS I

Prepared By: Stacia Dutton
A. **TITLE:** ELEC 146 – ELECTRONIC SYSTEMS FOR TELECOMMUNICATIONS I

B. **COURSE NUMBER:** ELEC 146

C. **CREDIT HOURS:** 4

D. **WRITING INTENSIVE COURSE (OPTIONAL):** NO

E. **COURSE LENGTH:** 15 Weeks

F. **SEMESTER(S) OFFERED:** FALL

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:** 4 HOURS LECTURE

H. **CATALOG DESCRIPTION:** This course covers the analysis and application of advanced electronic circuits as applied to the telecommunications industry. Topics include frequency response of filters, op-amps, oscillators, amplitude modulation, noise and LC circuits.

I. **PRE-REQUISITES:** ELEC 145 – Electrical Circuits, PHYS 108 – Technical Physics

J. **GOALS (STUDENT LEARNING OUTCOMES):**
By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a. Explain advanced telecommunication techniques and principles.</td>
<td>1. Communication</td>
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<td>2. Crit. Thinking</td>
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<td>b. Explain current and future integrated communication services and their applications.</td>
<td>1. Communication</td>
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<td>c. Identify sources of information and reference material for current and emerging technologies.</td>
<td>2. Crit. Thinking</td>
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<td>d. Articulate concepts of advanced networks and services.</td>
<td>1. Communication</td>
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<td>2. Crit. Thinking</td>
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<td>e. Perform advanced calculations in inductive and capacitive circuits</td>
<td>2. Crit. Thinking</td>
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<td>f. Design electrical circuits and perform simulations using a computer</td>
<td>2. Crit. Thinking</td>
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L. REFERENCES: Course management software and the web are to be incorporated as an integral part of the course delivery process.

M. EQUIPMENT: Verizon will supply any equipment needed for this course.

N. GRADING METHOD: A-F

O. MEASUREMENT CRITERIA/METHODS: Quizzes, Midterm, Lab Projects, Homework and Final Exam

P. DETAILED TOPICAL OUTLINE:

I. Circuit Analysis Techniques
   1. Superposition
   2. Source conversions
   3. Thevenin’s Theorem
   4. Application of Thevenin’s Theorem
   5. Norton’s Theorem

II. Frequency Response and Passive Filters
    1. Frequency Response: Curves and Measurements
    2. Amplitude Measurements: dB Power Gain
    3. Amplitude Measurements: dB Voltage and Current Gain
    4. Low-Pass Filters
    5. High-Pass Filters
    6. Bandpass and Notch Filters

III. Amplifier Overview
     1. Differential Amplifiers and Op-Amp Specifications
     2. Inverting Amplifiers
     3. Noninverting Amplifiers
     4. Op-Amp Frequency Response
     5. Op-Amp Circuits

IV. Active Filters
    1. Tuned Amplifiers Characteristics
    2. Active Filters: Overview
    3. Low-Pass and High-Pass Filters
    4. Bandpass and Notch Filters
    5. Active Filter Applications

V. Oscillators and Switching Circuits
   1. Introduction to Oscillators
   2. Basic Switching Circuits: Practical Considerations
   3. Schmitt Triggers
   4. Multivibrators: The 555 timer

VI. Spectrum and Frequency Domain Overview
    1. Time Domain and Frequency Domain – Spectrum Analyzer
    2. Sine Wave Spectrum
3. Square Wave Spectrum
4. Triangle Wave Spectrum
5. Telecom Applications

VII. Modulation and Data Encoding
   1. Analog data, analog signal
   2. Analog data, digital signal
   3. Digital data, analog signal
   4. Digital data, digital signal

VIII. Noise
   1. dB in Communication
   2. Noise
   3. Noise Designation and Calculation
   4. Noise Measurement
   5. Signal-to-Noise Ratio
   6. Noise Filters
   7. Troubleshooting

IX. Amplitude Modulation: Transmission
   1. Amplitude Modulation Fundamentals
   2. Percent Modulation
   3. AM Analysis
   4. AM Transmission Systems
   5. Single-Sideband Characteristics
   6. Troubleshooting

X. Amplitude Modulation: Reception
   1. AM Detection
   2. Superheterodyne Receivers, Tuning, and Analysis
   3. Automatic Gain Control
   4. AM Receiver Systems
   5. Troubleshooting

XI. Power Supplies and Voltage Regulation
   1. Voltage Regulation: Overview
   2. Series Voltage Regulators
   3. Shunt Voltage Regulators
   4. Linear IC Voltage Regulators
   5. Switching Regulators