I. CATALOG DESCRIPTION:

A. Departmental Information:

Division:	Technical
Department:	Electricity/Electronics
Course ID:	ELECTR 270
Course Title:	Linear Integrated Circuit Analysis
Units:	4
Lecture:	3 hours
Laboratory:	3 hours
Prerequisites:	ELECTR 115 and ELECTR 116

Catalog Description:

A review of bipolar transistor fundamentals and differential amplifiers with emphasis on inner connections and circuit designs using integrated circuit operational amplifiers, phase-lock loops, and current differentiating amplifiers. Includes bread boarding and evaluation of various types of active linear and pulse circuits involving operational amplifiers and phase-lock loops.

Schedule Description:

A review of bipolar transistor fundamentals and differential amplifiers.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of this course, students will be able to:

A. Explain the needs and purpose of the operational amplifier and the 555 timer.
B. Evaluate the basic characteristics of op amps, their power requirements, feedback requirements and bandwidth limitations.
C. Describe the op amps error sources, such as offsets, and the need for frequency compensation and bandwidth.
D. Apply the principles of summing amplifiers, differential amplifiers, differentiators, integrators and active filters.
E. Troubleshoot amplifier circuits.

IV. CONTENT:

A. Linear Integrated Circuits
   1. Comparing linear and digital signals
   2. Classification and numbering of linear integrated circuits
B. Operational Amplifier
   1. Operating characteristics
   2. Power supply considerations
C. Basic Operational Amplifier Circuits
   1. Noninverting
   2. Inverting
   3. Offset considerations
   4. Voltage follower
   5. Summing amplifiers
D. The Comparator
   1. Voltage comparators
   2. Schmitt trigger

E. Regulator Circuits
   1. Voltage regulators
   2. Current regulation
F. Oscillators and Wave Shaping
   1. Classification of oscillators
   2. Multivibrators
   3. Differentiators
   4. Integrators
   5. Square wave generator
   6. Sawtooth generator
   7. Function generator
G. Active Filters
   1. Bandpass filters
   2. Notch filters
H. Timers
   1. 555 timer
   2. Design considerations for 555 timer
I. Practical Considerations
J. Troubleshooting

V. METHODS OF INSTRUCTION:

Methods of instruction will vary from instructor to instructor but may include:

A. Lectures and discussions about circuit classification, characteristics, functions, and troubleshooting operational amplifiers, 555 timers and other linear integrated circuits.
B. Lectures and Discussions are complemented with handouts and laboratory projects emphasizing different circuit configurations and methods of analysis.
C. Dynamics are accented with the use of graphs and videos.
D. Homework is assigned to promote expertise, vocabulary and writing skills.

VI. TYPICAL ASSIGNMENTS:

Typical assignments will vary from instructor to instructor but may include:

A. Written homework assigned each week from the questions and problems in each chapter.
   Typical Question: Explain the operation of an inverting amplifier.
B. Calculate the circuit gain of a non-inverting amplifier with a given input resistance and a given feedback resistance.
C. Design an inverting amplifier with a gain of 10. Build the amplifier and explain how it works.

VII. EVALUATION:

A. Methods of evaluation will vary from instructor to instructor but may include:
   1. Timely tests
   2. Mid-term exam
   3. Final exam
      Typical Questions:
      a. Design and draw the completed circuit for a non-inverting amplifier whose gain is 21. The input element is 5K ohms.
      b. What are the basic operating modes of IC timers?
   4. Practical evaluations with written conclusions (graded on content and spelling)
B. Frequency of evaluation will vary from instructor to instructor but may include:
   1. Six (6) tests
   2. Six (6) practical labs
   3. One (1) mid-term exam
   4. One (1) final exam

VIII. TYPICAL TEXT:

Dungan, Op Amps & Linear Integrated Circuits for Technicians, Delmar, New York, 1995
Fiore, Op Amps & Linear Integrated Circuits, Delmar, New York, 2001
Caughlin, R., Operational Amplifiers and Linear Integrated Circuits, Prentice Hall, New Jersey, 2001

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Scientific calculator.