Solid-State Devices and Circuits II

Course: **ELE222**	Lec + Lab **4** Credit(s) **6** Period(s) **5.4** Load
	Course Type: **Occupational**
First Term: **2014 Fall**	Load Formula:
Final Term: **Current**	

Description: Theory and application of differential and operational amplifiers. Power supplies and regulators; special devices and circuits.

Requisites: Prerequisites: A grade of C or better in ELE112 and ELE121.

MCCCD Official Course Competencies

1. Analyze differential, instrumentation and bridge amplifiers that use operations amplifiers. (I)
2. Describe the operation of circuits using operational amplifiers with positive feedback. (II)
3. Use basic analysis techniques to describe how operational amplifiers are used to generate waveforms. (II)
4. Discuss operational amplifier characteristics that may effect performance, including bias currents, offst voltages and currents, drift, frequency response and slew rate. (III)
5. Analyze basic low-pass, high-pass, notch and bandpass active filters. (IV)
6. Explain the operating characteristics of the silicon controlled rectifier (SCR) and triac in switching applications. (IX)
7. Apply the scientific method of inquiry and deduction relating the laws, theories and axioms of operational amplifiers, power supplies, and regulators to specific laboratory experiments. (I-X)
8. Discuss series, shunt and switching voltage regulators, stating the advantages and disadvantages of each. (VIII)
9. Analyze fixed and variable-voltage integrated circuits (IC) regulators in terms of ripple, regulation and thermal characteristics. (V, IX)
10. Explain the operating characteristics of the silicon controlled rectifier (SCR) and triac in switching applications. (IX)
11. Explain the concept of the transconductance and its effect on the Field Effect transistor amplifier gain. (VIII)
12. Describe the operation of common-source, common-drain, and common-gate amplifier and draw schematic diagrams for each. (VIII)
13. Determine the voltage gains and frequency-response characteristics of RC-coupled multistage amplifiers. (IX)
14. Discuss the operation, biasing, advantages, and limitations of class A, B and C

amplifiers. (X)

MCCCD Official Course Outline

I. OP-AMP Applications
  A. The instrumentation amplifier
  B. Voltage controlled current courses
  C. Differential amplifiers
II. Non-Linear OP-AMP Circuits
  A. Positive feedback
  B. Comparators
  C. Window detectors
  D. Waveform conversion
  E. Waveform generation
III. Operational Amplifier Limitations
  A. Bias currents
  B. Input offset voltage
  C. Drift
  D. Slew-rate
  E. Frequency response
IV. Active Filters
  A. Basic concepts
  B. The low-pass butterworth filter
  C. The high-pass butterworth filer
  D. Band-pass filters
  E. Notch filters
V. Regulated Power Supplies
  A. Voltage-feedback regulation
  B. Power-supply characteristics
  C. The series regulator
  D. The shunt regulator
  E. Switching regulator
VI. The IC Regulator
  A. Three-terminal IC regulators
  B. Regulator families
  C. Regulator specification and characteristics
VII. Thyristors
  A. The ideal latch
  B. The four-layer diode
  C. The SCR
  D. The triac and unijunction transistor
  E. Thyristor applications
VIII. Field Effect Transistor Amplifiers
  A. Transconductance
  B. The CS amplifier

C. The CD amplifier
D. The CG amplifier
E. Other applications

IX. Frequency Effects
A. Lead and lag networks
B. Miller`s theorem
C. High-frequency BJT analysis
D. Decibel power gain
E. Bode plots
F. Amplifier frequency response

X. Class A and B Power Amplifier
A. The AC load line
B. Class A operation
C. Class B operation
D. Power relationships for class A, B, and class C

Last MCCCD Governing Board Approval Date: **June 24, 2014**