Eastern WV Community & Technical College
Master Course Record

Course Prefix and Number: ELM 205

Course Title: Fundamentals of Analog Electronics

Recommended Transcript Title: Fundamentals of Analog Electronics

Date Approved/Revised: June 18, 2008

Credit Hours: 4
Contact hours per week (Based on 15 week term):
Lecture: 3
Lab: 3

Prerequisite: ELM 106 – AC Electrical Circuits or permission of Academic Program Director for Industrial Technologies.
Corequisite:
Pre/Corequisite:

Grading Mode: Letter grade

Catalog Description: This course introduces the student to the theory and application of solid-state electronic devices. Included in this course are semi-conductor theory, diodes, transistors, thyristors, integrated circuits, amplifiers and oscillators. The operation and application of op-amps and voltage regulators will also be studied.

Course Outcomes:

1. Explain the atomic structure and covalent bonding of semiconductors.
2. Describe the difference between silicon and germanium semiconductors.
3. Draw energy diagrams for insulators, semiconductors and conductors.
4. Describe how n-type and p-type semiconductors are formed.
5. Sketch the diode characteristic curve showing the forward and reverse bias regions.
6. Describe the characteristics of an ideal and practical diode.
7. Sketch the schematic symbol for a rectifier, Zener diode, Varactor, LED and photo-diodes.
8. Sketch the output waveforms of sinusoidal-input-wave and half-wave rectifier circuits.
9. Draw a schematic diagram for a full-wave bridge rectifier circuit.
10. Sketch the VI characteristic curve for a Zener diode.
11. Troubleshoot power supply circuits.
12. Design a simple circuit using LEDs.
13. Describe the function of a photo diode.
14. Draw a simple block diagram of a BJT illustrating the 3-doped semiconductor regions.
15. Compare the atomic structure and function of the npn and pnp transistors.
16. Illustrate the 3 operating modes of a transistor with an IC versus V_{CE} curve.
17. Describe how each of the 3 transistor operating modes is used.
18. Sketch a blasting circuit for a common-base Bi-Polar Junction Transistor (BJT).
19. Sketch a biasing circuit for a common-collector BJT.
20. Sketch a biasing circuit for a common-emitter BJT.

21. Calculate voltages and currents in a BJT transistor circuit.
22. Describe the advantages and disadvantages of Class A amplifiers.
23. Sketch a voltage divider bias transistor circuit.
24. Calculate the end-points of a DC load line and determine the quiescent point for a transistor circuit.
25. Sketch a graph of signal operation on the DC load line.
26. Calculate input impedance, current-gain, voltage-gain and power-gain for a common-emitter circuit.
27. Describe the phase-inversion in a transistor amplifier.
28. Calculate the effects of a bypass capacitor on a transistor amplifier.
29. Compare the advantages and disadvantages of common-collector and common-emitter amplifiers.
30. Calculate the input impedance, current-gain, voltage-gain and power-gain for a common collector circuit.
31. Describe the main advantage and disadvantages of the Class B amplifier.
32. Calculate the efficiency of a push-pull amplifier.
33. Sketch time-domain waveforms illustrating cross-over distortion in a Class B amplifier.
34. Design a simple BJT switching circuit.
35. Sketch the schematic symbols for the BJT and FETs.
36. Compare the function of JFETs and MOSFETs.
37. Calculate the relationship between drain current, transconductance and gate-to-source voltage.
38. Sketch a schematic diagram for a common-source FET amplifier.
39. Sketch a schematic diagram for a common-drain FET amplifier.
40. Use the process of signal tracing as related to amplifier troubleshooting.
41. Sketch the schematic for a simple oscillator circuit.
42. Compare the characteristics of the ideal and practical Op-Amp.
43. Analyze the function of an Op-Amp configured in single-ended mode input.
44. Analyze the function of an Op-Amp configured with differential-mode input.
45. Analyze the function of an Op-Amp configured with common-mode input.
46. Calculate Op-Amp Common Mode Rejection Ratio (CMRR).
47. Calculate the slew-rate of an Op-Amp.
48. Compare the operation of open-loop and closed-loop Op-Amp operation.
49. Describe the effects of negative feedback an Op-Amp operation.
50. Describe why negative feedback is used with Op-Amps.
51. Describe the function of the voltage follower configuration.
52. Sketch the biasing schemes for a summing Op-Amp circuit.
53. Sketch the biasing scheme for averaging Op-Amp circuit.
54. Calculate the oscillation frequency for a Wien-bridge Op-Amp oscillator.
55. Sketch an active high-pass filter schematic and calculate the cutoff frequency.
56. Sketch an active low-pass filter schematic and calculate the cutoff frequency.
57. Analyze the output voltage of an operational transconductance amplifier used as an AM modulator.
58. Troubleshoot Op-Amp circuits.

59. Use an oscilloscope to measure peak-to-peak voltage and frequency for various waveforms. 60. Demonstrate the use of internal and external triggering sources on an oscilloscope.
Implementation Cycle: Fall
Role in College Curriculum: □ **General Education Core** Ξ **Technical Core** □ **Restricted Elective** □ **General Elective** □ **Workforce Education** □ **Other**
Course Fee: Yes
Instructor's Qualifications: BS Engineering/Technology or related discipline and/or expertise and experience in the field.
Expanded Course Description: This course introduces the student to the theory and application of solid-state electronic devices. Included in this course are semi-conductor theory, diodes, transistors, thyristors, integrated circuits, amplifiers and oscillators. The operation and application of op-amps and voltage regulators will also be studied.

Prepared by:

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Name, Title Date

Approved Per LOT Minutes

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Dean, Academic and Student Services Date