Eastern WV Community & Technical College
Master Course Record

Course Prefix and Number: ELM 227

Course Title: Electronic Communication Systems I

Recommended Transcript Title: Electronic Communication Systems I

Date Approved/Revised: June 18, 2008

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

Prerequisite:
Corequisite:
Pre/Corequisite: ELM 207 – Fundamentals of Digital electronics or permission of Academic Program Director for Industrial Technologies.

Grading Mode: Letter grade

Catalog Description: This course introduces the student to analog and digital electronic communications. Students will study actual circuits used in AM, FM and television receivers and transmitters. HD television will also be covered. An introduction to time-domain and frequency-domain analysis will be provided. Components such as amplifiers, oscillators and detectors will be studied and the student will learn standard troubleshooting techniques.

Course Outcomes:

1. Sketch a block diagram for a simple radio system.
2. Calculate wavelength from frequency.
3. Describe the need for modulation.
4. Calculate a signal power from a measured voltage signal.
5. Draw a diagram of a sine wave in both the frequency and time domains.
6. Calculate Fourier coefficients for various complex waveforms.
7. Contrast internal and external noise sources; and methods for noise reduction.
8. Calculate the signal-to-noise ration in decibels (dB).
9. Calculate the noise figure for a communications-electronics system.
10. Sketch a frequency domain representation of complex waveforms (i.e. square wave).
11. Calculate the modulation index of an AM waveform from oscilloscope measurements.
12. Compare the time-domain waveforms of AM, FM and PM modulation schemes.
13. Sketch a frequency domain representation of an AM carrier and side-band frequencies.
14. Calculate the required bandwidth for an AM signal.
15. Sketch a simplified block diagram for a spectrum analyzer.
16. Sketch a block diagram for a low-level AM transmitter.
17. Sketch a block diagram for a high-level AM transmitter.

18. Compare the advantages and disadvantages for low-level and high-level AM transmitters.
19. Calculate the frequency of oscillation for a LC based oscillator.
20. Calculate the series and parallel resonant frequencies of a quartz crystal from manufacturer's data.
21. Calculate the Quality factor of a tuned circuit.
22. Compare the function of crystal controlled versus LC based oscillators.
23. Compare the function of the Class A, B and C RF amplifiers.
24. Calculate the resonant frequencies from schematic diagrams of various amplifier configurations.
25. Compare the function of the collector-injected Class C and base-injected Class A modulators.
26. Sketch a time domain waveform of an AM signal as it passes through a crystal detector circuit.
27. Contrast the operations of the tuned-radio frequency versus the superhetrodyne receiver.
28. Calculate the output frequencies of a mixer.
29. Calculate the frequency of the various tuned circuits in a superhetrodyne receiver.
30. Calculate the image frequency of a signal.
31. Sketch a functional block diagram of a superhetrodyne receiver.
32. Describe the alignment procedures for an AM radio.
33. Describe the procedure for troubleshooting an AM radio.
34. Contrast the advantages and disadvantages with conventional AM, DSB-SC and SSB signals.
35. Sketch a block diagram of a SSB transmitter.
36. Compare various methods for SSB signal generation.
37. Calculate LO frequency required for a desired operating frequency for a SSB transmitter.
38. Sketch a block diagram of a SSB transmitter that provides frequency agility capabilities.
39. Compare the operation of a SSB receiver versus that of a conventional AM receiver.
40. Compare the function of single conversion and multiple conversion SSB receivers.
41. Calculate the signal frequency through the RF, IF and AF stages of a SSB receiver.
42. Sketch a functional block diagram of a SSB transceiver and identify common sections.
43. Trace the signal pass through a SSB transceiver.
44. Compare the advantages/disadvantages of LC, crystal and PLL methods fro frequency generations.
45. Sketch a functional block diagram of phase locked loop.
46. Use an oscilloscope to determine the phase locked loop state.
47. Sketch a functional block diagram of PLL synthesizer.

48. Compare the function of direct digital synthesis with that of the phase locked loop.
49. Calculate the bandwidth of an FM signal using Carson's rule.
50. Sketch a functional block diagram of a PLL FM transmitter.
51. Describe the function of FM pre-emphasis and de-emphasis.
52. Sketch a functional block diagram of an FM stereo transmitter.
53. Sketch a spectral plot of an FM signal showing mono, stereo and SCA signal.
54. Compare the operation of the Foster-Seeley, ratio, PLL and Quadrature detector.
55. Sketch a functional block diagram of an FM stereo decoder.
56. Draw a block diagram of an FM receiver, showing the frequency and type of signal at major test points.
57. Sketch a spectral plot of an NTSC TV signal.
58. Sketch a functional block diagram of an NTSC TV receiver.
59. Sketch a functional block diagram of a simple color signal demodulator.
60. Compare the characteristics of NTSC with HD television signals.

Implementation Cycle: Fall

Role in College Curriculum:

□ **General Education Core**

□ **Technical Core**

Ξ **Restricted Elective:** Electromechanical Technology

□ **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 hi-frequency circuits used in electronic communications. Radio frequency (RF) circuits used to generate AM and FM signals used in radio and television communications will be covered. The course will include analog and digital transmitters and receivers, Local Area Networks, Wide Area Networks and telephones. Interfacing devices such as modems, multiplexing, and multiple-access techniques will also be studied.

Prepared by:

Name, Title Date

Approved Per LOT Minutes

Dean, Academic and Student Services Date