

# CLEVELAND INSTITUTE OF ELECTRONICS SYLLABUS

## DC-AC, Audio, and Radio Frequency Circuit Course

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### COURSE DESCRIPTION:

The course is designed to explore the principles of DC-AC circuits with emphasis on steady state AC circuits, along with relationships between frequency, impedance, and resonance. This course is also designed to explore principles of operation of solid state devices such as diodes and transistors. It is also designed to explore principles of operation of operational amplifiers and other analog circuits and subsystems commonly found in the field of industrial controls and communications. This course is designed to explore the application of semiconductors in practical circuits with emphasis on power supplies. This course is designed to explore measurement techniques and usage of electronic test equipment in troubleshooting. Also included in this course are troubleshooting steps and methods, and their application to electronics circuits.

### LEARNING ACTIVITIES:

This course consists of seventeen lesson assignments. Each lesson requires you to read topics, or portions thereof, and to answer questions based on the assigned readings. You should solve all the problems in the exercise sections before continuing to the next topic.

### PERFORMANCE REQUIREMENTS:

Master the concepts presented within each reading assignment and solve all problems in all exercise sections.

### STUDENT EVALUATION AND GRADING METHOD:

Students are required to complete all performance requirements above. Each of the seventeen assignments concludes with an examination comprising of a multiple-choice test. The assignment examinations are open book

The minimum passing grade is 70%. If you receive a 69%, you must take the exam again. The final grade will be based 100%.

### READING LIST:

Textbook: Using Semiconductor Diodes (2401)

Author: Fred E Eberlin

Publisher: Cleveland Institute of Electronics

Goal: Upon the completion of this lesson the student will understand the operation of diodes and their limitations.

Textbook: Operation of Semiconductor Devices (2402)

Author: Fred E Eberlin

Publisher: Cleveland Institute of Electronics

Goal: Upon the completion of this lesson the student will be able to recognize the various types of diodes. A discussion of atomic theory is followed by regions within the diodes, then a description of the various types such as the Zener, thermistors and other semiconductor devices is presented.

Textbook: Simplifying Circuits Analysis by Using Kirchhoff's Laws (2314)

Author: Joe Hart

Publisher: Cleveland Institute of Electronics

Goal: Upon the completion of this lesson the student will be familiar with current and voltage calculations in both simple and complex DC circuits. Current and voltage laws of Kirchhoff are analyzed.

Textbook: Operation of Tubes and Transistors (2404)

Author: Angelo C. Gillie

Publisher: Cleveland Institute of Electronics

Goal: Upon the completion of this lesson the student will be able to construct and analyze the simple transistor amplifier. The student is lead from the 2 terminal diode to the elementary 3 terminal transistor. JFET and MOSFET types are also described. The various types of vacuum tubes are also presented.

Textbook: Currents and Voltages in AC Circuits (2315)

Author: Michael V. Malone

Publisher: Cleveland Institute of Electronics

Goal: Upon the completion of this lesson the student will have a good understanding of AC circuit analysis.

Textbook: Resonant Circuits (2316)

Author: Michael V. Malone

Publisher: Cleveland Institute of Electronics

Goal: Upon the completion of this lesson the student will understand resonant circuits and their characteristics.

Textbook: Oscillators (2407)  
Author: Darrell L. Geiger  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be able to analyze op amp and tuned tank oscillator circuits.

Textbook: How to Work with Transistors (2412)  
Author: Darrell L. Geiger  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be familiar with the characteristics of a transistor and how transistors operate. The characteristics include configuration, stabilization, leakage currents, amplifying stages, coupling, noise, drift, and frequency performance. The student will also be introduced to FETs.

Textbook: Operational Amplifiers (2431)  
Author: George Rutkowski  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will understand the fundamental and practical operational amplifiers and the basic applications such as open and closed loop gain, voltage follower, input and output resistance, nulling the op amp, and frequency response of op amps.

Textbook: Regulated Power Supplies (3610)  
Author: CIE's technical staff  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be familiar with principles of regulation and with regulated power supplies such as switching, current source, current limiting, IC, shunt and series pass regulators.

Textbook: Audio Amplifiers and Equipment (2601)  
Author: Joseph H. DeFrance  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be familiar with interstage coupling methods, distortion, power amplifiers, input and output devices such as microphones, preamps, speakers and headphones of audio amplifiers and their equipment.

Textbook: Radio-frequency Amplifiers (2406)  
Author: John M. Doyle  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be familiar with radio-frequency amplifier characteristics and how to troubleshoot R-F amplifiers.

Textbook: Measuring and Measuring Instruments (2201)  
Author: George Rutkowski / John Timar, Jr.  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be more familiar with test equipment such as VOM meters, dB meters, and frequency meters.

Textbook: Understanding and Using the Oscilloscope (2202)  
Author: Irvin Bingham  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be able to understand the internal composition of oscilloscopes. The horizontal and vertical deflection plates and positioning are explained as is the focus controls, intensity, modulation, probes, and making AC and DC measurements. The student then is exposed to laboratory and industrial type scopes.

Textbook: Systematic Troubleshooting (2607)  
Author: Darrell L. Geiger  
Publisher: Cleveland Institute of Electronics  
Goals: Upon the completion of this lesson the student will be able to systematically troubleshoot digital circuits by determining the problem area, tracing the problem area, narrowing the problem by isolating the area, and then performing the checks of the area.

Textbook: Unregulated Power Supplies (2503)  
Author: CIE Technical Staff  
Publisher: Cleveland Institute of Electronics  
Goal: Upon the completion of this lesson the student will be able to construct and analyze half-wave and full-wave power supplies. Power transformers begin the lesson, followed by rectifier circuits and filtering. Voltage doublers and triplers are presented, along with inverters and converters. The lesson concludes with testing and troubleshooting power supplies.

Textbook: Amplifiers (2405)  
Author: CIE Technical Staff  
Publisher: Cleveland Institute of Electronics  
Goal: Upon the completion of this lesson the student will be able to understand the various types of amplifiers, impedance and distortion associated with them, their frequency response and noise.