Course Syllabus
Wayne County Community College District
EE 111 Solid State Fundamentals

CREDIT HOURS: 3.00

CONTACT HOURS: 60.00

COURSE DESCRIPTION:
This course will cover diodes, transistors, power supplies, limiters, clippers, clampers, voltage multipliers, biasing, amplifiers and frequency effects. Students will assemble and test electronic circuits discussed in the course. Instruments such as DC power supplies, multimeters, oscilloscope, signal generators, transistors and diode testers will be used.

PREQUISITES: EE 101

EXPECTED COMPETENCIES:
Upon successful completion of this course, the student will:

- Discuss the basic structure of atoms
- Discuss semiconductors, conductors, and insulators and how they basically differ
- Discuss covalent bonding in silicon
- Describe how current is produced in a semiconductor
- Describe the properties of n-type and p-type semiconductors
- Describe a pn junction and how it is formed
- Discuss the bias of a pn junction
- Analyze the current voltage (I-V) characteristic curve of a pn junction
- Discuss the operation of diodes and explain the three diode models
- Explain and analyze the operation of a half-wave rectifier
- Explain and analyze the operation of full-wave rectifiers
- Explain and analyze the operation and characteristics of power supply filters
- Explain and analyze the operation of diode limiting and clamping circuits
- Explain and analyze the operation of diode voltage multipliers
- Interpret and use a diode data sheet
- Troubleshoot diode circuits using accepted techniques
- Describe the characteristics of a zener diode and analyze its operation
- Explain how a zener is used in voltage regulation and limiting and analyze zener circuits
- Describe the variable-capacitance characteristics of a varactor diode and analyze its operation in a typical circuit
- Discuss the operation and characteristics of LED’s and photodiodes
- Discuss the basic characteristics of the current regulator diode, the Schottky diode, the pin diode, the step-recovery diode, the tunnel diode, and the laser diode
- Troubleshoot zener diode regulators
- Describe the basic structure of the bipolar junction transistor
- Explain how a transistor is biased and discuss the transistor currents and voltages
- Discuss transistor parameters and characteristics and use these to analyze a transistor circuit
- Discuss how a transistor is used as a voltage amplifier
- Discuss how a transistor is used as an electronic switch
- Identify various types of transistor package configuration
- Troubleshoot various faults in transistor circuits
- Discuss the concept of dc bias in a linear amplifier
• Analyze a base bias circuit
• Analyze an emitter bias circuit
• Analyze a voltage-divider bias circuit
• Analyze a collector-feedback bias circuit
• Troubleshoot various faults in transistor bias circuits
• Understand the concept of small-signal amplifiers
• Identify and apply internal transistor parameters
• Understand an analyze the operation of common-collector amplifiers
• Understand an analyze the operation of common base amplifiers.
• Discuss multistage amplifiers an analyze their operation
• Troubleshoot amplifier circuits.
• Explain and analyze the operation of large-signal class A amplifiers
• Explain an analyze the operation of class B and Class AB amplifiers
• Discuss and analyze the operation of class C amplifiers
• Troubleshoot power amplifiers
• Explain the operation of JFETs
• Define, discuss, and apply important JFET parameters
• Discuss and analyze JFET bias circuits
• Explain the operation of MOSFETs
• Define, discuss, and apply important MOSFET parameters
• Discuss and analyze MOSFET bias circuits
• Troubleshoot FET circuits.
• Explain the operation of FET small-signal amplifiers
• Describe the amplification properties of an FET
• Explain and analyze the operation of common source FET amplifiers
• Explain and analyze the operation of common-drain FET amplifiers
• Explain and analyze the operation of common gate FET amplifiers
• Troubleshoot FET amplifiers
• Describe the basic structure and operation of the Shockley diode
• Describe the basic structure and operation of an SCR
• Discuss several SCR application
• Describe the basic operation of an SCS
• Describe the basic structure and operation of diacs and triacs
• Describe the basic structure and operation of the UJT
• Describe the structure and operation of the PUT
• Describe the phototransistor and its operation
• Describe the LASCR and its operation
• Discuss the various types of optical couplers
• Describe the basic op-amp and its characteristics
• Discuss the differential amplifier and its operation.
• Discuss several op-amp parameters
• Explain negative feedback in op-amp circuits
• Discuss op-amp compensation
• Analyze three basic op-amp configurations
• Describe impedances of the three op-amp configurations
• Describe impedances of the three op-amp configurations
• Troubleshoot op-amp circuits.

ASSESSMENT METHODS:
Student performance may be assessed by examination, quizzes, case studies, oral reports, group discussion, written reports or presentations. The instructor reserves the option to employ one or more of these assessment methods during the course.

GRADING SCALE:
A = 94% to 100%
B = 87% to 93%
C = 80% to 86%
D = 73% to 79%
\[ E = \text{less than 72\%} \]