Miami Dade College

Course Description

EET1141C| Electronics 1 | 4.00 credits

This course is intended for students majoring in Electronics Engineering Technology or related fields. Students will learn how to apply electronic principles to analog circuits and systems, including semiconductor diodes, applying the fundamental theory of transistors and other solid-state devices; analysis of amplifiers, oscillators, and other applications using a sinusoidal wave. Students also learn basic safety procedures to follow when working in an electronics laboratory and with electronic circuits and systems. Prerequisite: EET1025C and MAC 1114 or MAC 1147.

Course Competencies

Competency 1: The student will demonstrate basic competency in reading and writing by:

1. Selecting technical material and interpreting the impact of that information on a given problem.
2. Reading text and current technical materials.
3. Using glossaries, tables of contents, indexes, etc. to locate information.
4. Writing clear, well-organized, and grammatically correct sentences.
5. Writing an interpretation to given questions and problems and writing reports.

Competency 2: The student will demonstrate the ability to perform laboratory procedures by:

1. Using measuring equipment to conduct specified tests and analyses.
2. Listing specified published data sheets for solid state devices.
3. Comparing measured values with published values on data sheets.
4. Interpreting schematics and data tables to construct circuits….
5. Performing Ohm's Law calculations.
6. Producing graphs of diodes and transistors.
7. Preparing written reports of results and analyses.
8. Reading and interpreting data sheet specifications for electronic components.
9. Using multimeters to measure voltages and currents.
10. Using oscilloscopes to observe waveforms.

Competency 3: The student will demonstrate an understanding of semiconductors by:

1. Explaining the theory of semiconductors.
2. Defining the essential properties and characteristics of semiconductor devices.
3. Identifying and defining the properties of semiconductor materials.
4. Identifying different types of semiconductor devices.
5. Describing the components, properties, and materials of various semiconductor devices.

Competency 4: The student will demonstrate an understanding of diode operations by:

1. Describing the properties and characteristics of diodes.
2. Identifying and defining the operating characteristics and applications of junction diodes.
3. Identifying and defining the operating characteristics and applications of special diodes.
4. Identifying and defining the operating characteristics and applications zener diodes.
5. Constructing diode circuits.
6. Analyzing and troubleshooting diode circuits.

Competency 5: The student will demonstrate the application of diode and transistor characteristics by:

1. Measuring and plotting the V-I (Voltage- Current) characteristics of a forward biased diode.
2. Connecting a transistor in the three common configurations (i.e. common- collector, common-base, and common- emitter) and biasing the transistor to operate at a specific "Q" point, applying a signal, measuring the gain and phase shift of the amplifier and comparing with the calculated gain.

3. Connecting a transistor in the three common configurations (i.e. common-collector, common-base, and common-emitter), calculating and measuring the input and output resistance, and comparing the calculated value with the measured value.
4. Describing the theory and operation of voltage doublers.

Competency 6: The student will demonstrate the ability to analyze transistors by:

1. Measuring properties using ammeters, voltmeters, and oscilloscopes.
2. Analyzing, comparing, and interpreting results based on measured and calculated data.
3. Using graphical analysis from a family of collector V-I characteristic curves to calculate alpha/beta for AC and DC operation.

Competency 7: The student will demonstrate the ability to measure and plot semiconductor circuit properties by:

1. Observing rectifier circuit waveforms.
2. Calculating the output voltage waveforms of bridge and full wave rectifiers.
3. Using an oscilloscope to measure input and output voltages by verifying the theory of series and parallel clipper circuits.
4. Applying the theory of clamper circuits using an oscilloscope to measure input and output voltage wave forms and plotting them to the same time base.
5. Calculating and plotting the load line for a specific power supply and load resistor.

Competency 8: The student will demonstrate an understanding of Field-Effect Transistors (FETs) by:

1. Describing the operation of JFETs and MOSFETs.
2. Defining important JFET parameters and MOSFET parameters
3. Analyzing JFET and MOSFET bias circuits.
4. Describing the ohmic region.
5. Analyzing the operation of common- source, common-drain, and common-gate FET amplifiers.
6. Describing how MOSFETS are used in switching applications.
7. Discussing the operation of a class D amplifier.

Competency 9: The student will demonstrate an understanding of the practical considerations for Electrostatic Discharge (ESD) by:

1. Explaining how static electric charges occur.
2. Identifying the damaging voltage levels within ESD.
3. Detecting ESD in sensitive equipment and components.
4. Reviewing ESD standards set forth by the Electrostatic Association.
5. Discussing and implementing industry standard ESD procedures and equipment.
6. Identifying and interpreting industry standard symbols for ESD.
7. Applying ESD procedure in the classroom environment.
8. Using ESD methods to prevent damage to lab components and laboratory equipment.
9. Observing ESD prevention practices when handling CMOS integrated circuits.

Competency 10: The student will demonstrate an understanding of safety procedures in an electronics laboratory by:

1. Showing how to operate the main room power disconnect.
2. Identifying the location of the fire extinguishers.
3. Handling equipment in accordance with stated manufacturers' instructions.
4. Describing safe work practices around potential electric circuit hazards.
5. Describing electrical shock symptoms and the proper response to an electrical shock victim.
6. Explaining the inspection requirements for commonly used electrical components.
7. Explaining the importance of removing power from the circuit or equipment prior to working on it and verifying that the power is off.
8. Setting and making connections to the direct current power supplies and function generator.

9. Reading the over current indicator and interpreting the significance of the measurement.
10. Using the voltmeter to check for the presence of voltage.
11. Verifying that capacitors are discharged in electrical circuits.

Competency 11: The student will demonstrate an understanding of BJT amplifiers by:

1. Describing the amplifier concept.
2. Identifying and applying internal transistor parameters.
3. Analyzing the operations of common- emitter, common-collector and common- base amplifiers.
4. Designing common-emitter, common- collector and common-base amplifiers.
5. Constructing common-emitter, common- collector and common-base amplifiers.
6. Discussing multistage amplifiers.
7. Comparing and contrasting different amplifier classifications (i.e. Class A, B, AB, C, D).

Competency 12: The student will demonstrate the ability to design a transistor-based system to perform an engineering application by:

1. Developing a transistor project proposal.
2. Analyzing, designing, building and testing a transistor-based project that performs an engineering application that has been reviewed and accepted by the instructor.
3. Presenting and validating that the project functions to the original specifications.
4. Writing a project document that includes the following sections: introduction, background/theory, design explanation, schematics and code, testing, discussion and conclusion.

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning