ISET-2220: FUNDAMENTALS OF ELECTRONICS AND INSTRUMENTATION

Cuyahoga Community College

Viewing: ISET-2220 : Fundamentals of Electronics and Instrumentation

Board of Trustees:
2006-05-25

Academic Term:
Fall 2018

Subject Code
ISET - Integrated Systems Engineering

Course Number:
2220

Title:
Fundamentals of Electronics and Instrumentation

Catalog Description:
Concepts of electronics circuitry and instruments including purpose, function, and operation of diodes, transistors, Silicon Controlled Rectifiers (SCRs), DIACs, TRIACs, Field Effect Transmitters FETs), and other solid state devices used in live dynamic electronic circuits. Extensive guided instruction and practice provided.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
ISET-1420 Applied Electricity II, ISET-2200 Industrial Motor Controls; and departmental approval.

Outcomes

Course Outcome(s):

A. Apply the fundamental building blocks of solid-state devices including concepts of semiconductors materials (germanium and silicon), doping, current carriers, and direct current (DC) biasing to stop or establish current flow in solid-state devices when repairing, maintaining, and troubleshooting electronic circuits and instrumentation.

Objective(s):

1. 1. Identify the major solid state devices by their symbol configuration.
2. 10. Discuss Doping materials (creating current carriers in P N materials)
3. 11. Define a PN junction
4. 12. define the role of a anode and cathode
5. 13. Define a Zener Diode
6. 14. Discuss the Uses of diodes in rectification, clipping, clamping circuits etc.
7. 2. Explain the operational characteristics and circuit application of various types of solid-state devices.
8. 3. Define industry terms and references.
9. 4. Label design components of bias, amplification, and feedback circuits for amplifier circuits using various circuit configurations (common base, emitter, and collector).
10. 5. Interpret solid-state symbolism and organize information (parameters) from manufacturers specification sheets.
11. 6. Assemble electronic components, from sketches or drawings, into dynamic circuits.
12. 7. Implement proper safety procedures and laboratory etiquette.
13. 8. Define the basic materials of solid-state devices
14. 9. Explain Semi-conductors

Course Outcome(s):

B. Maintain and troubleshoot Thyristors (on/off devices), operational amplifiers, instrumentation, and control signals.

Objective(s):

1. 1. Describe the action of Silicon controlled rectifier (SCR)
2. 2. Illustrate the use of Gates and shut-off
3. 3. Identify a Diac
4. 4. Identify a Triac
5. 5. Explain the operation of a Unijunction transistor
6. 6. Define the Characteristics of Operational amplifiers
7. 7. Define High input impedance, low output impedance, high gain, has inverting inputs
8. 8. Discuss Biasing (BJT?s and FET?s, common emitter, base, and collector configurations)
9. 9. Review Manufacturers specification sheets
10. 10. Review Safety procedures and lab etiquette
11. 11. Explain the purpose of instrumentation and control signals
12. 12. Define process variables
13. 13. Discuss an analog and discrete signal
14. 14. Explain signal transmission
15. 15. Discuss control devices
16. 16. Identify line, instrument, and function symbols
17. 17. Explain A to D signal processing

Course Outcome(s):

C. Calibrate instrumentation.

Objective(s):

1. 1. Identify calibration standards
2. 2. Define accuracy, repeatability, and error
3. 3. Discuss the principles of gain
4. 4. Identify pressure, flow, temperature, and fluid level devices

Methods of Evaluation:

1. Completion of homework assignment
2. Written and verbal quizzes covering homework and in class demonstrations
3. Demonstration of application of theories and methods
4. Project completion
5. Final exam

Course Content Outline:

1. CONCEPTS
   a. Terminology
   b. Matter (electron movement)
   c. Ohm’s Law
   d. PN Junction
   e. Biasing
   f. Doping methods and materials
   g. Process variables
   h. Electromagnetics
   i. Conductors
   j. Overcurrent Protection
   k. KVL
   l. KCL
   m. AC Basic
   n. DC Basics
   o. Transformation
   p. Principles of Amplification
   q. Gain

r. Meters types and applications
s. Work (NEC)
t. Safety (codes)
u. Grounding
v. Line diagrams
w. Troubleshooting
x. Hand tools
y. Principles of Inductance, Capacitance, and Impedence
z. Measurement systems (U.S. Customary & Metric)
aa. Maintenance procedures

2. SKILLS
   a. Printed circuit Installation
   b. Assembling electronic circuits
   c. Calculating component values and power usage
   d. Installing Power Supplies
   e. Soldering
   f. Reading instrumentation (meters)
   g. Troubleshooting (fundamentals)
   h. Creating troubleshooting flow charts
   i. Communication skills
   j. Safety rule application
   k. Customer Service
   l. Interpreting electrical schematics and drawings
   m. Interpreting National Electric Code (NEC)
   n. Locating additional resources for materials & troubleshooting
   o. Interpreting drawings & schematics that are dimensions in U.S customary & metric units.
   p. Identifying measuring and hand tools for specific jobs.
   q. Mounting Techniques
   r. Calibrating Instrumentation
   s. Following Maintenance procedures
3. ISSUES
   a. Infrastructure
   b. Safe installations
   c. Repeatability
   d. Error Rate
   e. Design for future growth
   f. Taking concept and applying it
   g. Troubleshooting
   h. Environmental considerations EPA

Resources

Boylestad R. and Nashelsky, L. *Electronic Devices and Circuit Theory.* 8th ed. Prentice Hall, Upper Saddle, New Jersey, 2002.

Herrick, Robert. *DC/AC Circuits and Electronics.* 2nd ed. Thomson Learning Publishing,Clifton Park, NY, 2001.

Rockis, Gary. *Solid State Fundamentals.* 3nd ed. American Technical Publishers, Homewood, Ill., 2003.

Resources Other

1. Amatrol Software

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