ITT Technical Institute

ET115T

DC Electronics

Onsite Course

SYLLABUS

Credit hours: 4

Contact/Instructional hours: 60 (36 Theory Hours, 24 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Corequisite or Prerequisite: GE127T College Mathematics I or equivalent

Course Description:

A study of electronic laws and components in DC circuits, emphasizing the study and application of network theorems interrelating voltage, current and resistance. Students apply practical mathematics as it supports understanding the principles of electronics. A laboratory provides practical experience using both physical components and computer-generated simulations.

Syllabus: DC Electronics

Instructor: _____
Office hours: _____
Class hours: _____

Major Instructional Areas

1. Introduction to electrical and electronic systems
2. Types of circuits
3. Electrical quantities and components
4. Electrical sources and materials
5. DC electric circuits
6. Basic test equipment
7. Ohm's law and Watt's law
8. Series circuits
9. Parallel circuits
10. Series-parallel circuits
11. Magnetism and electromagnetism
12. Multisim simulations

Course Objectives

1. Perform conversions and calculations on electrical units of measure using metric prefixes, scientific notation, and engineering notation.
2. Explain standard electrical safety procedures.
3. Explain the Bohr model for atomic structure and how it relates to electrical concepts such as insulators and conductors including solids, liquids, and gases.
4. Identify electronic schematic symbols related to DC circuits.
5. Describe how to use components and sources such as resistors, rheostats, potentiometers, switches, batteries, and power supplies.
6. Explain what resistance is and its importance in electrical circuits
7. Apply Ohm's Law and Watt's Law to basic DC circuits.
8. Analyze series, parallel, and series-parallel circuits.
9. Apply Kirchhoff's voltage and current laws to analyze DC circuits.
10. Apply voltage and current division rules to DC circuits.
11. Calculate the effect of a load on a voltage-divider.
12. Apply Thevenin's theorem to simplify network circuits.
13. Explain the maximum power transfer theorem.
14. Analyze circuit operation with multiple voltage sources using the superposition theorem.
15. Describe principles of operation for magnetic devices.
16. Use proper prototype board wiring and test procedures for DC resistive circuit components including using the digital multimeter.

17. Simulate and test DC circuits using Multisim.

SCANS Objectives

SCANS is an acronym for Secretary's Commission on Achieving Necessary Skills. The committee, created by the National Secretary of Labor in the early 1990s, created a list of skills and competencies that the committee feels are necessary for employees to function in a high-tech job market.

1. Competently perform the tasks of acquiring data and evaluating information to determine specific information needs.
2. Determine which set of procedures, tools, or machines will produce the desired results.
3. Demonstrate competence in applying technology.
4. Approach practical problems by choosing appropriately from a variety of mathematical techniques.
5. Understand the overall intent and the proper procedures for setting up and operating machines.
6. Organize and process symbols, pictures, graphs, objects or other information.

Course Outline

Note: All graded activities, except the Final Exam, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Labs: 3.2 refers to the second lab activity in Unit 3.

Unit	Activities
1— Quantities, Units, and Electrical Safety	• Content Covered: *DC/AC Fundamentals: A Systems Approach*: o Chapter 1, "Systems, Quantities, and Units" Handout: Utility Voltages • Assignments: 1.1, 1.2 • Labs: 1.1
2— Voltage, Current, and Resistance	• Read from *DC/AC Fundamentals: A Systems Approach* o Chapter 2, "Voltage, Current, and Resistance" • Read from Handout: o Conventional Current versus Electron Flow • Assignments: 2.1, 2.2 • Labs: 2.1, 2.2 • Quizzes: 2.1
3— Ohm's Law	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 3, "Ohm's Law, Energy, and Power," pp. 82-91 • Assignments: 3.1, 3.2 • Labs: 3.1, 3.2 • Quizzes: 3.1
4— Energy and Power	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 3, "Ohm's Law, Energy, and Power," pp. 92-

Unit	Activities
	109 • Assignments: 4.1 • Labs: 4.1, 4.2 • Quizzes: 4.1
5— Series Circuits	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 4, "Series Circuits" • Assignments: 5.1, 5.2 • Labs: 5.1, 5.2 • Unit Exams: 5.1
6— Parallel Circuits	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 5, "Parallel Circuits" • Assignments: 6.1, 6.2 • Labs: 6.1, 6.2 • Quizzes: 6.1
7— Series-Parallel Circuits	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 6, "Series-Parallel Circuits," pp. 217-242 (Sections 6.1 – 6.5) • Assignments: 7.1 • Labs: 7.1, 7.2 • Quizzes: 7.1
8— Thevenin's Theorem and Maximum Power Transfer Theorem	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 6, "Series-Parallel Circuits," pp. 242-251 (Sections 6.6 – 6.7) • Assignments: 8.1, 8.2 • Labs: 8.1, 8.2A, 8.2B • Unit Exams: 8.1
9— Superposition Theorem	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 6, "Series-Parallel Circuits," pp. 252-260 (Sections 6.8 – 6.9) • Assignments: 9.1, 9.2 • Labs: 9.1, 9.2 • Quizzes: 9.1
10— Magnetism and Magnetic Devices	• Read from *DC/AC Fundamentals: A Systems Approach*: o Chapter 7, "Magnetism and Electromagnetism," pp. 277-313 • Assignments: 10.1 • Labs: Lab Final Exam • Quizzes: 10.1
11— Course Review and Final Exam	• Review Session • Final Exam

Instructional Methods

The DC Electronics course incorporates various learning strategies such as quizzes, homework assignments, lab exercises, unit exams, a lab final, and a final exam to help you understand the concepts taught in class. Many units include a homework assignment and a quiz. Homework assignments are based on the course objectives relative to that unit's objectives and submitted to the instructor in the subsequent unit in which it is assigned. A quiz will be given each unit and will be based on the course objectives from the previous unit. These quizzes help you analyze your learning and recall previously taught concepts. Each unit has a lab exercise in which you construct circuits to reinforce theory and develop practical skills in circuit testing. Lab exercises are augmented with computer simulations using Multisim, a circuit design, analysis and simulation tool. Unit 10 includes a lab final and Unit 11 includes the final exam, which evaluate your understanding of the core concepts covered in this course.

Instructional Materials and References

Student Textbook Package

- Floyd, T. L. & Buchla, D. M. (2013). *DC/AC Fundamentals: A Systems Approach*. (1st ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Buchla, D. M. (2013). *Experiments in DC/AC Fundamentals: A Systems Approach*. (1st ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Note: An additional CD comes with the textbook that contains files using older versions of Multisim. This CD will *not* be used for this course.

Other Required Resources

In addition to the student textbook package, the following is also required in this course:

- Computer and Electronics Engineering Technology (CEET) First-Year Parts Kit
- Scientific calculator [Sharp EL-506VB or equivalent]

References

ITT Tech Virtual Library

Log on to the ITT Tech Virtual Library at https://studentportal.itt-tech.edu to access online books, journals, and other reference resources selected to support ITT Tech curricula.

- School of Study> School of Electronics Technology> Databases> Ebrary>
  - Gibilisco, Stan. *Illustrated Dictionary of Electronics*. New York: McGraw-Hill Professional, 2001.

Reference Resources

You may access the reference resources from the following path:

- School of Study> General Education Information> Recommended links> Mathematics>
  - Math.com
- School of Study> School of Electronics Technology> Recommended Links> Dictionaries>
  - Electronics Dictionary

Program Links

You may access the program links from the following path:

- School of Study> School of Electronics Technology> Professional Organizations>
  - IEEE: Institute of Electrical and Electronics Engineers
  - Society of Manufacturing Engineers
  - International Society of Certified Electronics Technicians

- School of Study> School of Electronics Technology> Recommended links>
  - All About Circuits: Lessons in Electric Circuits

Learning Guides

You may access the learning guides from the following path:

- School of Study> School of Electronics Technology> Tutorial links>
  - DC Circuits

Other References

The following resources may be found **outside** of the ITT Tech Virtual Library, whether online or in hard copy.

Book

- Horowitz, Paul and Winfield Hill. *The Art of Electronics*. 2nd ed. New York: Cambridge University Press, 1989.

Web sites

- Basic Electronics

http://science-ebooks.com/electronics/basic_electronics.htm (Last accessed February 2, 2016)
This link offers a complete basic electronics course with simulations; some chapters have MP3 audio lectures.

- International Association for Radio, Telecommunications and Electromagnetics

http://www.narte.org/ (Last accessed February 2, 2016)
This is the official Web site of iNarte a worldwide, non-profit, professional telecommunications association that certifies qualified engineers and technicians in the fields of telecommunications, electromagnetic compatibility/interference (EMC/EMI), product safety (PS), electrostatic discharge control (ESD) and wireless systems installation.

All links to Web references outside of the ITT Tech Virtual Library are always subject to change without prior notice.

Course Evaluation and Grading

Evaluation Criteria Table

The final grades will be based on the following categories:

CATEGORY	WEIGHT
Labs	30%
Assignments	25%
Quizzes	10%
Unit Exams	10%
Final Exam	15%
Lab Final	10%
Total	**100%**

Note: Students are responsible for abiding by the Plagiarism Policy.

Grade Conversion Table

The final grades will be calculated from the percentages earned in the course, as follows:

A	90–100%	4.0
B+	85–89%	3.5
B	80–84%	3.0
C+	75–79%	2.5
C	70–74%	2.0
D+	65–69%	1.5
D	60–64%	1.0
F	<60%	0.0

(End of Syllabus)