ITT Technical Institute

ET1210

DC-AC Electronics

Onsite and Online Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

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

Prerequisite or Corequisite: MA1210 College Mathematics I or equivalent

Course Description:

This course examines properties and operations of electronics systems and circuits. Topics include types of circuits, electromagnetism, frequency, capacitance, transformers and voltage. Students apply electronics laws to solve circuit problems.

COURSE SUMMARY

COURSE DESCRIPTION

This course examines properties and operations of electronics systems and circuits. Topics include types of circuits, electromagnetism, frequency, capacitance, transformers and voltage. Students apply electronics laws to solve circuit problems.

MAJOR INSTRUCTIONAL AREAS

1. Introduction to electrical and electronic systems
2. DC and AC circuits
3. Electrical sources and materials
4. Basic electronics test equipment usage and circuit prototyping
5. Ohm's law, Watt's law, and Kirchhoff's Law
6. Series circuits, Parallel circuit, and Series-Parallel circuit
7. Magnetism and electromagnetism
8. Capacitance and capacitive reactance
9. Inductance and inductive reactance
10. RC, RL, and RLC circuit analysis for AC and pulse response
11. Passive filter circuits, including RC, RL, and resonant filters

COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Describe the real-world and career-oriented applications of DC/AC circuits and systems.
2. Demonstrate knowledge and application of engineering units and the properties of electronic materials.
3. Demonstrate the use of fundamental DC circuit principles and associated components in electronic systems.
4. Analyze fundamental DC/AC circuit principles, using PC simulation tools.
5. Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
6. Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.

7. Diagnose circuit anomalies by applying electronic problem-solving techniques.
8. Demonstrate the use of fundamental AC circuit principles and associated components in electronic systems.
9. Demonstrate the use of fundamental magnetic circuit principles and associated components in electronic systems.

COURSE OUTLINE

MODULE 1: INTRODUCTION TO ELECTRONICS

COURSE LEARNING OBJECTIVES COVERED

- Describe the real-world and career-oriented applications of DC/AC circuits and systems.
- Demonstrate knowledge and application of engineering units and the properties of electronic materials.
- Demonstrate the use of fundamental DC circuit principles and associated components in electronic systems.
- Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
- Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.
- Diagnose circuit anomalies by applying electronic problem-solving techniques.

TOPICS COVERED

- DC/AC Circuits, Systems, Quantities, and Units
- Voltage, Current, Resistance, and Color Codes

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Floyd and Buchla, Chapters 1 and 2	No	5.5 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Exercise: Submit the exercise titled “Engineering Units, Energy, and Color Codes.”	Yes	2 hours
Lab: Complete the lab titled “Resistance, Voltage, and Circuits.”	Yes	N/A
Quiz: Prepare for Quiz 1.	No	2 hours

Total Out-Of-Class Activities: 11 Hours

MODULE 2: CIRCUIT FUNDAMENTALS

COURSE LEARNING OBJECTIVES COVERED

- Describe the real-world and career-oriented applications of DC/AC circuits and systems.
- Demonstrate the use of fundamental DC circuit principles and associated components in electronic systems.
- Analyze fundamental DC/AC circuit principles, using PC simulation tools.
- Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
- Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.
- Diagnose circuit anomalies by applying electronic problem-solving techniques.

TOPICS COVERED

- Ohm's Law, Energy, Power, and Kirchhoff's Laws
- Series Circuits
- Parallel Circuits

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Floyd and Buchla, Chapters 3, 4, and 5	No	6.5 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Quiz: Prepare for Quiz 2.	No	2 hours
Discussion: Participate in the discussion titled "Ohm's Law and Its Importance."	Yes	N/A
Exercise: Submit the exercise titled "Series and Parallel Circuits."	Yes	4.5 hours
Lab: Complete the lab titled "Power in Circuits, Series-Parallel Connections, and Circuit Simulation."	Yes	N/A
Quiz: Take Quiz 1.	Yes	N/A

Total Out-Of-Class Activities: 14.5 Hours

MODULE 3: COMPLEX CIRCUITS AND MAGNETISM

COURSE LEARNING OBJECTIVES COVERED

- Describe the real-world and career-oriented applications of DC/AC circuits and systems.
- Demonstrate the use of fundamental DC circuit principles and associated components in electronic systems.
- Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
- Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.
- Diagnose circuit anomalies by applying electronic problem-solving techniques.
- Demonstrate the use of fundamental magnetic circuit principles and associated components in electronic systems.

TOPICS COVERED

- Series-Parallel Circuits
- Magnetism and Electromagnetism
- Thevinin's Theorem
- Superposition

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Floyd and Buchla, Chapters 6 and 7	No	5 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Quiz: Prepare for Quiz 3.	No	2 hours
Exercise: Submit the exercise titled "Complex Circuits and Magnetism."	Yes	4 hours
Lab: Complete the lab titled "Series-Parallel Circuits, Thevenin's Theorem, Wheatstone Bridge, and Magnetic Relays."	Yes	N/A
Quiz: Take Quiz 2.	Yes	N/A

Total Out-Of-Class Activities: 12.5 Hours

MODULE 4: AC AND CAPACITOR FUNDAMENTALS

COURSE LEARNING OBJECTIVES COVERED

- Analyze fundamental DC/AC circuit principles, using PC simulation tools.
- Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
- Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.
- Diagnose circuit anomalies by applying electronic problem-solving techniques.
- Demonstrate the use of fundamental AC circuit principles and associated components in electronic systems.

TOPICS COVERED

- Alternating Current and Voltage, Sine Waves, and AC Circuits
- Types of Capacitors
- Capacitor Applications
- Capacitive Reactance and Impedance
- RC Circuits
- Analysis of Series and Parallel RC Circuits

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Floyd and Buchla, Chapters 8, 9, and 10	No	8 hours
Lesson: Study the lesson for this module.	No	2 hours
Quiz: Prepare for Quiz 4.	No	2 hours
Discussion: Participate in the discussion titled "Faraday's Law of Induction."	Yes	N/A
Exercise: Submit the exercise titled "Magnetic Induction and Capacitors."	Yes	5 hours
Lab: Complete the lab titled "Oscilloscope, Sine Wave Measurement, Capacitors, Reactance, and Series RC Circuits."	Yes	N/A
Quiz: Take Quiz 3.	Yes	N/A

Total Out-Of-Class Activities: 17 Hours

MODULE 5: INDUCTANCE AND RESONANCE

COURSE LEARNING OBJECTIVES COVERED

- Describe the real-world and career-oriented applications of DC/AC circuits and systems.
- Analyze fundamental DC/AC circuit principles, using PC simulation tools.
- Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
- Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.
- Diagnose circuit anomalies by applying electronic problem-solving techniques.
- Demonstrate the use of fundamental AC circuit principles and associated components in electronic systems.

TOPICS COVERED

- Inductors
- Inductive Reactance and Impedance
- RL Circuits
- RLC Circuits and Resonance

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Floyd and Buchla, Chapters 11, 12, and 13	No	7 hours
Lesson: Study the lesson for this module.	No	2 hours
Discussion: Participate in the discussion titled "Resonant and Tank Circuits."	Yes	N/A
Exercise: Submit the exercise titled "Inductance and Resonance."	Yes	4 hours
Lab: Complete the lab titled "Inductors, Inductive Reactance, Series RL Circuits, Resonance, and Thermocouple."	Yes	N/A
Quiz: Take Quiz 4.	Yes	N/A
Final Exam: Prepare for the final exam.	No	5 hours

Total Out-Of-Class Activities: 18 Hours

MODULE 6: PASSIVE FILTERS AND TRANSFORMERS

COURSE LEARNING OBJECTIVES COVERED

- Demonstrate proper circuit construction, breadboarding, and laboratory techniques.
- Construct, analyze, and diagnose circuit operations using physical or virtual multimeters, power supplies, oscilloscopes, and function generators.

- Diagnose circuit anomalies by applying electronic problem-solving techniques.
- Demonstrate the use of fundamental AC circuit principles and associated components in electronic systems.
- Demonstrate the use of fundamental magnetic circuit principles and associated components in electronic systems.

TOPICS COVERED

- Transformers
- Impedance Matching
- Time Response of Reactive Circuits
- Integrators and Differentiators

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: Floyd and Buchla, Chapters 14 and 15	No	4.5 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Lab: Complete the lab titled "Passive Filters."	Yes	N/A
Final Exam: Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 6 Hours

EVALUATION AND GRADING

EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Discussion	10%
Exercise	20%
Lab	30%
Quiz	20%
Final Exam	20%
TOTAL	100%

GRADE CONVERSION

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

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

)	
F (0.0)	<60%

LEARNING MATERIALS AND REFERENCES

REQUIRED RESOURCES

COMPLETE TEXTBOOK PACKAGE

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

OTHER ITEMS

- Student Toolkit

RECOMMENDED RESOURCES

- Professional Associations
  - Basic Electronics
    - http://science-ebooks.com/electronics/basic_electronics.htm
  - International Association for Radio, Telecommunications and Electromagnetics
    - http://www.narte.org
  - Wisc-Online: Online Learning Object Repository: Basic Electronics:
    - http://www.wisc-online.com/ListObjects.aspx
- ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu) School of Study> School of Electronics Technology
  - Recommended links
    - All About Circuits: LESSONS IN ELECTRIC CIRCUITS http://www.allaboutcircuits.com/
    - Alternating Current Circuit Concepts http://hyperphysics.phy-astr.gsu.edu/hbase/electric/accircon
  - Tutorial links
    - Electronics for Beginners and Intermediate Electronics

INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as hands-on labs, exercises and discussions .Your progress will be regularly assessed through a variety of assessment tools including discussions, exercises, labs, quizzes, and the final exam.

OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

INSTRUCTOR DETAILS

Instructor Name	
Office Hours	
Contact Details	

(End of Syllabus)