ILLINOIS VALLEY COMMUNITY COLLEGE

Course Outline

DIVISION: Career and Technical Programs

Course: ELT 1204 – Fundamentals of Electronics: DC/AC Theory and Circuit Analysis

Date: 06/17/08

Semester Hours: 5

Prerequisite(s): None

Delivery Method:

☒	**Lecture**	**3 Credit Hours**
☐	**Seminar**	**0 Credit Hours**
☒	**Lab**	**2 Credit Hours**
☐	**Clinical**	**0 Credit Hours**
☐	**Online**	
☐	**Blended**	

Offered: ☒ **Fall** ☐ **Spring** ☐ **Summer**

IAI Equivalent –***Only for Transfer Courses***-go to *http://www.itransfer.org*:

CATALOG DESCRIPTION:
This course is an introduction to electricity and electronics. Analysis of DC circuits using Kirchhoff's laws and network theorems. This course is also an introduction to magne¬tism, inductance, capacitance and AC principles, AC electronics and introduction to solid state devices. Analysis of AC circuits, resonant circuits, and filters. Introduction to the operating principles of diodes and special purpose diodes, bipolar and FET transistors, thyristors, and op-amps.

GENERAL EDUCATION GOALS ADDRESSED

[See the last page of this form for more information.]

Upon completion of the course, the student will be able:

[Choose those goals that apply to this course.]

☒ To apply analytical and problem solving skills to personal, social and professional issues and situations.
☒ To communicate orally and in writing, socially and interpersonally.
☐ To develop an awareness of the contributions made to civilization by the diverse cultures of the world.
☐ To understand and use contemporary technology effectively and to understand its impact on the individual and society.
☒ To work and study effectively both individually and in collaboration with others.
☐ To understand what it means to act ethically and responsibly as an individual in one's career and as a member of society.
☐ To develop and maintain a healthy lifestyle physically, mentally, and spiritually.
☐ To appreciate the ongoing values of learning, self-improvement, and career planning.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

[Outcomes related to course specific goals.]

Upon completion of the course, the student will be able to:

1. analyze and troubleshoot basic resistive DC circuits.

Competency 1.1. Calculate using scientific notation.
Competency 1.2. Interpret resistor color codes.
Competency 1.3. Explain relationships between voltage current and resistance using Ohms law.
Competency 1.4. Correctly use a DMM.
Competency 1.5. Calculate and measure volts, ohms, and amps in series and parallel circuits.

2. analyze complex resistive DC circuits.

Competency 2.1. Correctly use kirchhoff's laws
Competency 2.2. Correctly design equivalent circuits.
Competency 2.3. Correctly use network theorems.
Competency 2.4. Explain the best use of each theorem.
Competency 2.5. Build and measure a complex DC circuit.

3. understand the characteristics of basic AC circuit elements.

Competency 3.1. Correctly state the relationship of time and frequency.
Competency 3.2. Calculate inductive reactance.
Competency 3.3. Explain the use of and measurements of transformers.
Competency 3.4. Calculate capacitive reactance.
Competency 3.5. Calculate and measure impedance and phase angle.
Competency 3.6. Calculate charge and discharge times.
Competency 3.7. Explain hystorisis.

4. analyze and troubleshoot an AC circuit containing resistive, capacitive and inductive

elements.

Competency 4.1. Build, measure and calculate a RCL circuit.
Competency 4.2. Correctly use Pythagorean theorem for impedance, voltage and current.
Competency 4.3. Calculate and measure phase angles.
Competency 4.4. Recognize simple XY plot curves.
Competency 4.5. Use the correct formulas to correctly calculate admittance and impedance in a complex RCL circuit.

5. Understand and be able to analyze series and parallel resonant circuits.

Competency 5.1. Derive the resonant frequency.
Competency 5.2. State the advantages of having the circuit at resonance.
Competency 5.3. Build and measure a resonant circuit.
Competency 5.4. Use an Oscilloscope correctly to confirm or deign resonance.

6. Understand and be able to analyze basic types of passive filters.

Competency 6.1. Recognize scope readings and graphs of each main filter.
Competency 6.2. Describe how to remove a DC signal from an AC signal.
Competency 6.3. Describe how a Filter separates different AC signals.
Competency 6.4. Calculate cutoff and Bandwidth of a filter circuit.
Competency 6.5. Describe how to get a band pass, band reject, low pass, and high pass filter.

7. Recognize semiconductor theory and how it relates to various solid state devices.

Competency 7.1. Correctly state what a semiconductor is.
Competency 7.2. Relate doping material to P type and N type semiconductors.
Competency 7.3. Explain a P-N junction including depletion.
Competency 7.4. Explain the basic uses of a diode.
Competency 7.5. Explain the basic uses and types of Transistors.
Competency 7.6. Correctly use a data sheet to pick correct semiconductor devices.

8. utilize beginning workplace skills

Competency 8.1 Use effective oral communication skill with small group interaction.
Competency 8.2. Explain employer expectations.
Competency 8.3 Apply teamwork skills while participating in small and large group activities.
Competency 8.4 Develop a time management plan.
Competency 8.5 Apply basic math skills to projects appropriate to coursework.

COURSE TOPICS AND CONTENT REQUIREMENTS:

I. Introduction to Electrical Circuits
   1. Nature of electricity
   2. Conductors, insulators, and resistors
   3. Circuit laws

II. DC Circuits
   1. Series
   2. Parallel

3. Series-parallel
4. Voltage and current dividers

III. DC Circuit Analysis
1. Kirchhoff's laws
2. Thevenin's theorem
3. Superposition theorem
4. Norton’s theorem
5. Delta and Why networks

IV. Alternating Current and Voltage
1. Magnetism
2. Inductance
3. AC power
5. Transformers
6. Reactance's
7. RC and LR time constants

V. AC Circuit Analysis
1. AC circuits
2. Complex numbers
3. Kirchhoff's laws
4. Thevenin's theorem
5. Norton's theorem
6. Superposition theorem

VI. Resonance
1. Series and parallel resonance
2. Analysis of parallel resonant circuits

VII. Filters
1. Filter circuits
2. Coupling
3. Low- and high-pass filters
4. Resonant filters

VIII. Electronic Devices
1. Semiconductor theory
2. Diodes and special purpose diodes
3. Bipolar and FET transistors
4. Thyristors
5. Operational amplifiers

IX. Work Place Skills
1. Teamwork
2. Time Management

3. Employer expectations

INSTRUCTIONAL METHODS:
Lecture
Lecture/demonstration
Laboratory
Think Tank Modules
Group work

INSTRUCTIONAL MATERIALS:

Text	DC/AC Foundations of electronics. R. Jesse Phagan
Study guide	DC/AC Foundations of electronics. R. Jesse Phagan
Lab Manual	DC/AC Foundations of electronics. R. Jesse Phagan

Think Tank Modules

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

Required assignments:	Methods of Evaluation:
Mandatory lab attendance	A students' grade will be based on multiple
Weekly lab assignments	measures of performance:
Short quizzes	
Assigned reading	Completion of lab assignments
Assigned homework	Quizzes based on lab and text assignments
Midterm exams	Group projects
Lab practical exam	Completion of homework assignments
Final exam	Midterm, final, and lab final exams

90% - 100%	A
80% - 89.9%	B
70% - 79.9%	C
60% - 69.9%	D
below 60%	F

Lab	30%
Quizzes and Tests	40%
Midterm and Final	30%

OTHER REFERENCES
Schaum's Outlines: Basic Mathematics for Electricity and electronics. 2nd edition. Authur Beiser

Form Revised: 3/2/05