ESSEX COUNTY COLLEGE
Engineering Technologies and Computer Sciences Division
ELC 115 – Electric Circuits: DC and AC
Course Outline

Course Number & Name: ELC 115 Electric Circuits: DC and AC

Credit Hours: 4.0 **Contact Hours:** 6.0 **Lecture:** 3.0 **Lab:** 3.0 **Other:** N/A

Prerequisites: None

Co-requisites: MTH 113 **Concurrent Courses:** None

Course Outline Revision Date: Fall 2010

Course Description: This introductory course in circuit analysis defines the electrical quantities, current, and voltage, and examines their relationship in various components and circuits. Circuits comprised of resistance, capacitance, and inductance which are energized by both DC and AC sources are considered. The theory includes Ohm's Law, Kirchhoff's Laws, series and parallel circuits, and several network theorems. In the laboratory the student performs electrical measurements which confirm his/her grasp of the theory. A circuit simulation computer software package is introduced and used as an analytical tool.

Course Goals: Upon successful completion of this course, students should be able to do the following:

1. use correct technical vocabulary;
2. analyze and solve problems in basic electrical circuits using correct theory, laws, and formulas; and
3. correctly follow laboratory procedures to assemble, test, and troubleshoot basic circuits using state-of-the-art instruments and record the measurements.

Measurable Course Performance Objectives (MPOs): Upon successful completion of this course, students should specifically be able to do the following:

1. Use correct technical vocabulary:
   - 1.1 *define basic electrical vocabulary such as current, voltage, energy, power, and electrical resistance;*
   - 1.2 *identify and use standard letter symbols for fundamental electrical quantities, engineering prefixes, and schematic symbols for electrical components;*
   - 1.3 *identify and distinguish between series-connected components and parallel-connected components;*
   - 1.4 *given the analytical expression for an arbitrary sinusoidal function of time, identify its amplitude, frequency, and phase;* and
   - 1.5 *represent impedance by complex numbers and express these numbers in both rectangular and polar form*

Measurable Course Performance Objectives (MPOs) (continued):

2. Analyze and solve problems in basic electrical circuits using correct theory, laws, and formulas:

   2.1 *analyze circuits (e.g., calculate current and voltage values) that are configured with series- and parallel-connected resistors, capacitors, and inductors;*
   2.2 *state Ohm's Law and apply it to a circuit;*
   2.3 *state Kirchhoff's Voltage Law and Kirchhoff's Current Law and apply both to circuits;* and
   2.4 *calculate reactance and impedance for series-parallel circuits comprised of resistance, capacitance, and inductance*

3. Correctly follow laboratory procedures to assemble, test, and troubleshoot basic circuits using state-of-the-art instruments and record the measurements:

   3.1 *construct circuits using breadboard, power supply, and function generator;*
   3.2 *measure and record currents and voltages using analog and digital multi-meters and an oscilloscope;* and
   3.3 *use basic electronic test and measurement instruments to troubleshoot electronic devices*

Methods of Instruction: Instruction will consist of a combination of lectures, class discussions, classroom demonstrations, laboratory experiments, board work, group work and individual study.

Outcomes Assessment: Quiz, test, and exam questions are blueprinted to course objectives. Checklist rubrics are used to evaluate the laboratory reports for the presence of course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives. The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

Course Requirements: All students are required to:

1. Maintain regular attendance.
2. Complete homework assignments and laboratory reports on time.
3. Sit for all quizzes, tests, and exams as scheduled.
4. Read all assigned textbook pages.
5. Participate in classroom discussions.

Methods of Evaluation: Final course grades will be computed as follows:

Grading Components	% of final course grade
• **Homework, quizzes, class participation, and attendance** A perusal of homework problems and quizzes and an analysis of class discussion will indicate the extent to which students master course objectives.	**25 – 30%**
• **8 or more Laboratory Reports** Students will be expected to show that they have read assigned lab manual sections, can follow written procedures, measure and record data, perform calculations and write reports including all specified components. Lab reports will provide evidence of the extent of student mastery of course objectives.	**20 – 25%**
• **Midterm Exam** The midterm exam will show evidence of the extent to which students meet course objectives, including but not limited to identifying and applying concepts, analyzing and solving problems, estimating and interpreting results and stating appropriate conclusions using correct terminology, based on course material covered during the first half of the semester.	**20 – 25%**
• **Final Exam** (comprehensive) The same objectives apply as with the Midterm Exam, but it is anticipated that students will provide increased evidence of synthesizing a combination of concepts covered throughout the semester.	**25 – 30%**

NOTE: The instructor will provide specific weights, which lie in the above-given ranges, for each of the grading components at the beginning of the semester.

Academic Integrity: Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College. Academic dishonesty includes, but is not limited to, the following:

- plagiarism – the failure to acknowledge another writer's words or ideas or to give proper credit to sources of information;
- cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
- interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
- fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions. Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

Student Code of Conduct: All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time for all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College's Code of Conduct and attendance requirements.

Course Content Outline: based on the text **Introductory Circuit Analysis,** 12th edition, by Boylestad; published by Prentice Hall, 2010; and the **Laboratory Manual** to accompany **Introductory Circuit Analysis,** 11th edition, by Boylestad and Kousourou; published by Prentice Hall, 2006; ISBN #: 0132196158

Week	Content/Topics
1	Systems of Units, Significant Figures, Engineering Notations, Conversion Tables
2	Atomic Structure, Voltage, Current, Conductors, Insulators, Semiconductors
3	Resistance of Circular Wires, Wire Tables, Types of Resistors, Color Coding **Lab 1**: Resistors & Color Code (dc2)
4	Ohm's Law, Power, Energy, Efficiency **Lab 2**: Ohms Law (dc3)
5	Series Resistors, Kirchhoff's Voltage Law, Voltage Divider Rule
6	Parallel Resistors, Kirchhoff's Current Law, Current Divider Rule
7	Series/Parallel DC Circuits, Ladder Networks **Lab 3**: Series DC Circuits (dc5) **Lab 4:** Parallel DC Circuits (dc7)
8	Review and **Midterm Exam**
9	Superposition Theorem
10	Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem **Lab 5**: Thevenin's Theorem (dc11)
11	Complex Numbers, Conversion between Rectangular Form and Polar Form
12	Sinusoidal Waveform, General Format for Sinusoidal Voltage or Current, Phasors **Lab 6**: Oscilloscope (ac2) **Lab 7:** Sinusoidal Circuits (ac8)
13	Frequency Response of Basic Elements, Average Value and Effective Value
14	Impedance and Phasor Diagram, Analysis of AC circuits **Lab 8**: RLC Components (ac3)
15	**Final Exam**