ESSEX COUNTY COLLEGE
Engineering Technologies and Computer Sciences Division
ELC 230 – Circuits and Systems for Engineering
Course Outline

Course Number & Name: ELC 230 Circuits and Systems for Engineering

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

Prerequisites: Grades of "C" or better in MTH 122, PHY 104, and CSC 112 or CSC 121

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

Course Outline Revision Date: Fall 2010

Course Description: This is a calculus-based course in electric circuit theory and analysis for Engineering AS degree program students interested in pursuing computer or electrical engineering. It includes DC and AC principles with an emphasis on Kirchhoff's Laws, network theorems for resistive, capacitive, and inductive networks, mesh and nodal analysis, and sinusoidal steady-state analysis. Also, power, resonance, and ideal transformers are studied. The theory is reinforced with instructor-run demos. Assignments include the use of circuit analysis computer software.

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

1. analyze passive electric circuits to predict their behavior;
2. identify, analyze, and solve technical problems in linear systems; and
3. use state-of-the-art technology to solve problems in linear systems.

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

1. Analyze passive electric circuits to predict their behavior:
   - 1.1 *use mesh analysis to calculate the voltages and currents in a circuit with two or more voltage sources;*
   - 1.2 *use nodal analysis to calculate the voltages and currents in a circuit with two or more current sources;*
   - 1.3 *calculate and graph the transient response (to a source discontinuity) of a linear system containing capacitive or inductive elements;*
   - 1.4 *calculate the upper and lower critical frequencies for single reactive element passive linear circuits;*
   - 1.5 *calculate the cutoff frequencies for electronic amplifiers using either bipolar or field effect transistors;* and
   - 1.6 *calculate the gain and frequency response of operational amplifiers with negative feedback*

Measurable Course Performance Objectives (MPOs) (continued):

2. Identify, analyze, and solve technical problems in linear systems:

   2.1 *plot frequency response curves for amplitude and phase using either linear or logarithmic scales;*
   2.2 *plot Bode diagrams for compound linear systems;*
   2.3 *apply stability criteria to linear systems;* and
   2.4 *analyze simple operational amplifier circuits*

3. Use state-of-the-art technology to solve problems in linear systems:

   3.1 *use the RREF function of a graphing calculator to find the solution of a system of linear equations with 3 or more unknowns;* and
   3.2 *use Multisim or PSpice to measure the voltages and currents in a linear system*

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

Outcomes Assessment: Quiz, test, and exam questions are blueprinted to 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 and participate in classroom discussions.
2. Complete homework assignments on time.
3. Sit for all quizzes, tests, and exams as scheduled.
4. Read all assigned textbook pages.

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, class discussion, and attendance will indicate the extent to which students master course objectives.	**10 – 20%**
• **3 or more Tests** (dates specified by the instructor) Tests 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.	**50 – 60%**

Methods of Evaluation (continued)**:**

Grading Components	% of final course grade
• **Final Exam** (comprehensive) The same objectives apply as with tests, but it is anticipated that students will provide increased evidence of synthesizing a combination of concepts.	**20 – 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 **Engineering Circuit Analysis**, 7th edition, by William Hayt, Jr, Jack Kemerly & Steven Durbin; published by McGraw Hill

Week	Content/Topics
1	Circuits and Circuit Elements, Ohm's Law
2	Kirchoffs's Voltage and Current Laws
3	Single Loop and Single Node-pair Analysis
4	Resistors in Series and Parallel, Voltage and Current Division, **Test 1**
5	Nodal Analysis
6	Super Node
7	Mesh Analysis
8	Super Mesh, **Test 2**
9	Linearity and Superposition, Source Transformations
10	Thevenin's and Norton's Theorems
11	Properties of Inductors and Capacitors
12	Inductance and Capacitance Combinations, Linearity and Duality, **Test 3**
13	Source Free R/C Circuit and Generalizations
14	Unit Step and Related Functions, Complete Response of Single Time Constant Circuits
15	**Final Exam**