Course Number & Name: ELC 218 Pulse and Digital Circuits

Credit Hours: 3.0  Contact Hours: 4.5  Lecture: 2.0  Lab: 2.5  Other: N/A

Prerequisites: Grade of “C” or better in ELC 115

Co-requisites: None  Concurrent Courses: None

Course Outline Revision Date: Fall 2010

Course Description: This course is an introduction to computer electronics. It includes Boolean Algebra, fundamentals of logic, logic circuits, and digital logic systems. Laboratory work is closely allied with theory and includes computer simulation.

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

1. perform computations in various number systems;
2. apply various techniques for logic circuit reduction;
3. design and construct various logic circuits; and
4. use state-of-the-art technology to solve digital circuits.

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

1. Perform computations in various number systems:
   1.1 convert between binary, octal, decimal, and hexa-decimal number systems;
   1.2 describe how memories may be constructed from basic digital components; and
   1.3 explain and use at least one popular family of digital ICs

2. Apply various techniques for logic circuit reduction:
   2.1 given either a truth table, a logic circuit, or a Boolean algebraic function, derive the corresponding other two;
   2.2 apply principles of Boolean Algebra to simplify logic circuits;
   2.3 use Karnaugh maps to simplify logic circuits;
   2.4 design logic circuits to perform useful functions and solve practical problems; and
   2.5 investigate the equivalence of apparently different algebraic statements (or logic circuits)
Measurable Course Performance Objectives (MPOs) (continued):

3. Design and construct various logic circuits:
   3.1 construct logic circuits using discrete or integrated circuits;
   3.2 design and analyze combinational systems;
   3.3 design and analyze sequential systems; and
   3.4 interpret and explain the manufacturer’s specifications for digital integrated circuits

4. Use state-of-the-art technology to solve digital circuits:
   4.1 use an application software package such as Multisim or PSpice to solve DC diode and transistor bias circuits; and
   4.2 use a scientific calculator to solve digital electronics problems

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 and participate in classroom discussions.
2. Complete homework assignments and lab reports 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:

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<tr>
<th>Grading Components</th>
<th>% of final course grade</th>
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<tbody>
<tr>
<td>Homework, quizzes, class participation, and attendance</td>
<td>25 – 30%</td>
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<tr>
<td>A perusal of homework problems and quizzes and an analysis of class discussion will indicate the extent to which students master course objectives.</td>
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<tr>
<td>8 or more Laboratory Reports</td>
<td>20 – 25%</td>
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<td>Students will be expected to show that they have read assigned lab manual sections, can follow written procedures, and can apply theoretical content learned in the course to complete the assigned tasks. Lab reports will provide evidence of the extent of student mastery of course objectives.</td>
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Methods of Evaluation (continued):

<table>
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<tr>
<th>Grading Components</th>
<th>% of final course grade</th>
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<tr>
<td><strong>Midterm Exam</strong></td>
<td>20 – 25%</td>
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<td>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.</td>
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<tr>
<td><strong>Final Exam (comprehensive)</strong></td>
<td>25 – 30%</td>
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<td>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.</td>
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**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.

<table>
<thead>
<tr>
<th>Week</th>
<th>Content/Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Number System: Binary, Hexadecimal, Decimal, and BCD (Chapter 1)</td>
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</tbody>
</table>
| 2    | Switching Algebra, Implementation of Functions with AND, OR, and NOT Gates (Chapter 2)  
  **Lab 1**: Implementation of Functions using AND, OR, and NOT Gates (exp.1) |
| 3    | Truth Table, DeMorgan’s Theorem, Consensus, Absorption (Chapter 2)  
  **Lab 2**: Implementation of Functions using NAND Gates (exp.2) |
| 4    | Minimization of Functions Karnaugh Map (Chapter 3) |
| 5    | Minterm, Literal, SOP and POS Forms, Don’t Cares (Chapter 3) |
| 6    | Delay in Combinational Logic Circuits, Adders, Subtractor, Comparators (Chapter 5)  
  **Lab 3**: 8-bit Adder (exp.5) |
| 7    | Decoders, Encoders, Multiplexers, Three-State Gates, ROM, PLA, PALs (Chapter 5)  
  **Lab 4**: Seven-Segment Display Decoder (exp.13) |
| 8    | Review and **Midterm Exam** |
| 9    | Introduction to Sequential Systems, Latches and Flip-Flops (Chapter 6)  
  **Lab 5**: D-Flip Flop (exp.15) |
| 10   | Analysis of Sequential Systems, Designing Sequential Systems (Chapter 6)  
  **Lab 6**: JK-Flip Flop (exp.16) |
| 11   | Sequential Circuit Design with F/F, The Design of Counters (Chapter 7)  
  **Lab 7**: Synchronous Counter (exp.20) |
| 12   | Derivation of State Tables and State Diagrams, Finite State Machines (Chapter 7) |
| 13   | Registers, Programmable Logic Devices (PLDs) (Chapter 8)  
  **Lab 8**: Shift Register (exp.23) |
| 14   | State Reduction Using Tabular Method, State Reduction Using Partitions (Chapter 9) |
| 15   | **Final Exam** |