Course Name: **Fundamentals of Digital Circuit Design**  
Course Number: **ES 112**  
Section: 001  
Credit Hours: 1.0  
Semester Offered: Spring 2016  
Course Meeting Days/Time: **M 1:00 PM – 3:50 PM**  
Classroom: **Salazar 2003**

Instructor: Dr. Sara Kassis  
Office: Salazar 2008A  
Telephone: 707-664-2030  
Email: sara.kassis@sonoma.edu *(preferred method of contact)*  
Office Hours: M 10:45 AM – 11:45 AM, or by appointment

**Course Description** (1 Unit; 3-Hour Lab): Review of set theory and binary system, digital logic, Venn diagram, logic gates, minimization techniques, combinatorial logic and design of simple combinatorial logic circuits such as 1-bit adder; concept of coders, decoders, and integrated circuits.

**Prerequisite:** ES 110, or consent of instructor

**Course Learning Objectives:** Upon successful completion of this course, students will be able to:  
- Apply knowledge of math, science and engineering.  
- Design and conduct experiments, as well as analyze and interpret data.  
- Design a system, component, process to meet desired needs within realistic constraints.

**Course Outcomes:** The objectives of this course are to:  
- Introduce the basic concept of digital and binary systems  
- Give students the concept of digital logic design  
- Give students the basic tools for the design and implementation of digital modules and subsystems  
- Reinforce theory and techniques taught in the classroom through project and laboratory assignments.

**Required Materials:**  
- Breadboard, capacitors, resistors, inductors, tackle box, etc. as described in my email and in Moodle.  
- Student Lab Notebook, graph ruled.  
- Pen, calculator, etc., as needed.
Textbook References: I will be using these texts for reference. You do not need to purchase any copies, unless you would like to.

Moodle Page: I use Moodle for uploading documents and recording grades. You will find the syllabus and all your Pre-Labs here. I will also post notes about the class and I will email you through Moodle. Please check Moodle and your Sonoma State email often.

Moodle can be accessed through your Seawolf Login:
- Log into SSU Online Services
- Click on Moodle
- Under ‘Navigation’ click on ‘My Courses’
- Click on ‘ES-112’
- You can even use Moodle Mobile through your smart device with Moodle Mobile

Course Grade Evaluation Policy:
The class grade will be based upon the following activities.

1) Grading

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Pre - Labs</td>
<td>15%</td>
</tr>
<tr>
<td>Lab Reports (includes effort, participation, and teamwork)</td>
<td>60%</td>
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<tr>
<td>Attendance</td>
<td>10%</td>
</tr>
<tr>
<td>Project/Presentation</td>
<td>15%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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</tbody>
</table>

Your final grade is based on the percentage of points earned. In borderline cases, effort and participation may also count. Don’t miss anything! Try your best!

2) Late Work: Any late work submitted will receive a 10% grade reduction. After one week, the instructor may refuse to accept it. Let the instructor know as soon as possible about extenuating circumstances.

3) Missed work: One missed lab can be made up during the last week of classes. Otherwise, more than one missing lab will be graded as zero. To pass this course you cannot miss more than 2 classes.

Pre – Labs: The topic of these assignments will be what will be covered in the lab for that day. You will have to download and print them from our Moodle page, complete the assignment, and hand it in at the beginning of each class.
**Lab Notebooks:** You will need to keep your notebook for every lab experiment you conduct in class. A specific format for keeping notes is required. Good note keeping habits are important! A well-kept notebook provides a reliable reference for writing up materials, methods, and results. It is a legally valid record that preserves the rights of an inventor. Notes need to be organized and legible.

The lab book format is as follows:

- Title of the experiment, date, and all partners’ names
- Purpose of the experiment
- Brief procedure
- Simple sketch of the experiment labeled with important information
- Include data and statistical results with units. A result and its experimental error is given to the same lowest decimal place: 2.3 ± 0.1; 0.0045 ± 0.0004; 23.55 ± 0.05
- Brief summary, conclusions, sources of error and answers to any questions posed
- Any needed printouts to be cut down and stapled to your notebook

Your experiment must be checked by and signed by the instructor at the completion of the lab before you leave. If this is not signed, it will result in a loss of points and/or a refusal of acceptance by the instructor.

**Lab Reports:** A formal report of your experiments will be required for every experiment that is completed. You have one week to turn in your lab report after the experiment is complete. It is to be saved as a PDF and uploaded to Moodle before the beginning of the lab on the day it is due (as found on the schedule below).

Your name, the course name, date and names of laboratory partner(s) should appear on first page. You may include a title page if you wish but it is not necessary. Label each section with the section title. The following are the sections:

- Abstract
- Theory and Procedure
- Diagrams with Labels
- Data/Graphs/Tables
- Discussion and Conclusion

**Project and Presentation:** Every group will work on a project that is due at the end of the semester using what you’ve learned in class. The group will present the project to the whole class during the last two weeks, giving a demonstration of a working product and a Power Point presentation. Include all the sections of the lab report format when putting together your presentation. Be creative and, above all, have fun!

**Academic Status Forms:** It is essential to have a solid knowledge of mathematics and a firm understanding of fundamental engineering principles (e.g. conservation of mass, momentum, energy) introduced in calculus-based physics. Therefore, it is essential that you succeed in your physics and calculus courses prior to taking your upper-level engineering courses.
To ensure that you are succeeding in your Math and Physics classes, all EE students enrolled in ES 110 & ES 112 must complete this form and have it signed by the current Math and Physics instructors TWO times during the semester. This form is **required** and is to be handed in to me on **March 7, 2016** and on **April 4, 2016**. Failure to turn in the forms on the designated dates will result in a letter grade reduction from your overall score. Please be sure to turn in the forms regardless of if you are not taking Math and Physics this semester.

**Tutoring:** We encourage all our engineering students to take advantage of the **free** Math and Physics tutoring sessions throughout School of Science and Technology. The schedule is may be found at [http://www.sonoma.edu/engineering/activities/tuturing.html](http://www.sonoma.edu/engineering/activities/tuturing.html)

**Advising:** A group advising session is scheduled for the first 30 minutes of class on Monday, March 21, led by the EE Chair and a GE Advisor. Please be sure to attend class to receive important information about your engineering degree.

**Extra Credit:** An opportunity for extra credit is available simply by getting involved in the EE clubs and attending the meetings. We have the [Electrical Engineering Club](http://www.sonoma.edu/engineering/activities/tuturing.html) and the [Society of Women Engineers](http://www.sonoma.edu/engineering/activities/tuturing.html). A maximum of 3% may go towards the total class grade.

**Never miss an opportunity to ask me a question. Please come to my office hours or email me!**

**Class Schedule:** Tentative

<table>
<thead>
<tr>
<th>Date</th>
<th>Lab No.</th>
<th>Notes</th>
<th>No. Notes</th>
<th>Reports Due</th>
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<tbody>
<tr>
<td>Jan 25</td>
<td></td>
<td>Introduction</td>
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<tr>
<td>Feb 1</td>
<td>1</td>
<td>Testing the Breadboards</td>
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<td>Feb 8</td>
<td>2</td>
<td>Basic Logic Circuits</td>
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<td>Feb 15</td>
<td>3</td>
<td>Simple Combination Circuits</td>
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<td>Feb 22</td>
<td>4</td>
<td>Not-So-Simple Combination Circuits</td>
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<tr>
<td>Feb 29</td>
<td>5</td>
<td>Simplifying Circuits</td>
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<tr>
<td>Mar 7</td>
<td>6*</td>
<td>Karnaugh Map 1</td>
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<tr>
<td>Mar 14</td>
<td></td>
<td>Spring Break – No Classes</td>
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<tr>
<td>Mar 21</td>
<td>7</td>
<td>Karnaugh Map 2</td>
<td></td>
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<tr>
<td>Mar 28</td>
<td>8</td>
<td>Karnaugh Map 3</td>
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<tr>
<td>Apr 4</td>
<td>9*</td>
<td>Code Converters</td>
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<td>Apr 11</td>
<td>10</td>
<td>1-bit Adders</td>
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<td>Apr 18</td>
<td>11</td>
<td>Coders &amp; Decoders</td>
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<tr>
<td>Apr 25</td>
<td>12</td>
<td>Multiplexers</td>
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</table>
May 2 | Make-Up Lab
---|---
May 9 | Project Presentations – 15 min each group
May 16 | Finals Week

*Project Updates: I need to know your progress on your projects during these times

**Important Dates**

2/1: Final deadline to file for graduation in Spring 2016 and August 2016
2/5: Last day to Drop a course
2/18: Last Day to Drop with a "W" *(done on-line)*
3/14 – 3/18: Spring Break
4/15: Last day to file a full term withdraw (no refunds)
5/13: Last day of instruction
5/16 – 5/20: Finals Week
5/21: Commencement