Course Name: **Fundamentals of Digital Logic Design Laboratory**
Course Number: **EE 112**
Section: 001
Credit Hours: 1.0
Semester Offered: Fall 2017
Course Meeting Days/Time: **M 1:00 PM – 3:50 PM**
Classroom: **Salazar 2001**

Instructor: Dr. Sara Kassis
Office: Salazar 2010A
Telephone: 707-664-4438
Email: sara.kassis@sonoma.edu *(preferred method of contact)*
Office Hours: M/T 10:00 AM – 11:00 AM or by appointment

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

**Course Learning Objectives:** Upon successful completion of this course, students will be able to:
- A. Design and conduct experiments to understand functions of basic logic gates
- B. Design and conduct experiments for combinatorial logic gates
- C. Design and conduct experiments using minimization techniques to simplify circuits

**Course Outcomes:** The objectives of this course are to:
1. Introduce the basic concept of digital and binary systems
2. Give students the concept of digital logic design
3. Give students the basic tools for the design and implementation of digital modules and subsystems
4. 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, bound and 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, Pre-Labs, and the Lab Manual 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 ‘EE-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></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance/ Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Pre - Labs</td>
<td>15%</td>
</tr>
<tr>
<td>Labs (includes effort, participation, teamwork, and correct results)</td>
<td>40%</td>
</tr>
<tr>
<td>Lab Reports</td>
<td>15%</td>
</tr>
<tr>
<td>Project/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</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 pre-lab assignments 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.
**Quizzes:** Quizzes will occasionally be given to reinforce topics and assess student understanding of topics.

**Lab Notebooks:** You will need to keep your notebook for every lab experiment you conduct in class. **It must be a bound, graph-ruled notebook.**

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, should you want to patent an invention. 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.
- 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 Data Sheets:** Along with keeping your notebook, you will input the data from the experiment into the Lab Data Sheets, which are found at the end of the lab procedure. **It is your responsibility to print out the Lab Data Sheet, fill it out with the results of the experiment, and hand it to the instructor at the completion of the lab.**

**Lab Reports:** A formal report of your experiments will be required for two of the experiments from the entire semester. **You have one week to turn in your lab report after the experiment is complete.** It can either be submitted as a hard copy or you may hand in a soft copy (if it is a soft copy, it must be saved as a PDF file and uploaded to Moodle). In either case, it is to be submitted **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

**Hardware:** This semester will be the inception of using a new instrument in the classroom called the Analog Discovery 2. This device has the capability of being a function generator, oscilloscope, and power
supply all in one compact unit, giving a student the possibility to conduct their experiments on any computer in any location. This semester you will be loaned out one unit with its components for free. Students must sign a user agreement and are responsible for returning the unit and all the components in good condition and in working order. If the student fails to return the unit, this will reflect in their grade. We have a limited number of units so please treat each unit with care and return them before the semester is finished.

**Project and Presentation:** Every student will work on an individual project that is due at the end of the semester. The student will present the project to the whole class during the last day of class. This is what I am looking for in a project and presentation:
- Product must be working and fully functioning during the presentation
- 10 minute Power Point presentation
- Points will be given for overall quality of presentation, including explanation of what you are doing and how it works
- Be creative and, above all, have fun!
More details will be given later in the semester.

**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**. If you are not taking any Math or Physics classes, then you will still need to fill out the form and circle the appropriate options. This form is **required** and is to be handed in to me on **October 9, 2017** and on **November 6, 2017**. **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:** It is observed that a better understanding of the engineering requirements, as found on the [Engineering Academic Roadmap](http://www.sonoma.edu/engineering/activities/tuturing.html), results in a smoother process when pursuing the Electrical Engineering degree.

A group advising session will be scheduled during class on Monday, October 9th led by the EE Chair. Additionally, students will be asked to set aside 10 minutes of their lab time to have an individual academic advising session. Please be sure not to miss class on October 9th!
**Extra Credit:** An opportunity for extra credit is available simply by getting involved in the departments’ student engineering clubs and attending the meetings. We have the Electrical Engineering Club and the Society of Women Engineers Club. 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>Notes</th>
<th>Reports Due</th>
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</thead>
<tbody>
<tr>
<td>Aug 28</td>
<td>1</td>
<td>Introduction &amp; Testing the Breadboards</td>
<td></td>
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<tr>
<td>Sep 4</td>
<td></td>
<td>Labor Day – No Class</td>
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<tr>
<td>Sep 11</td>
<td>2</td>
<td>Basic Logic Circuits</td>
<td></td>
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<tr>
<td>Sep 18</td>
<td>3</td>
<td>Simple Combination Circuits</td>
<td></td>
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<tr>
<td>Sep 25</td>
<td>4</td>
<td>Not-So-Simple Combination Circuits</td>
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<td></td>
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<tr>
<td>Oct 2</td>
<td>5</td>
<td>Simplifying Circuits</td>
<td></td>
<td></td>
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<tr>
<td>Oct 9</td>
<td>6</td>
<td>Simplifying Circuits 2</td>
<td>Group Advising &amp; Academic Status Form Due</td>
<td></td>
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<tr>
<td>Oct 16</td>
<td>7</td>
<td>Universality of NAND and NOR Gates</td>
<td></td>
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<tr>
<td>Oct 23</td>
<td>8</td>
<td>Karnaugh Maps</td>
<td></td>
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<tr>
<td>Oct 30</td>
<td>9</td>
<td>XOR and XNOR</td>
<td></td>
<td></td>
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<td>Nov 6</td>
<td>10*</td>
<td>Half Adders</td>
<td>Academic Status Form Due</td>
<td></td>
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<tr>
<td>Nov 13</td>
<td>11</td>
<td>Designing Logic Circuits</td>
<td></td>
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<td>Nov 20</td>
<td>12*</td>
<td>Code Conversion</td>
<td>Lab 11</td>
<td></td>
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<td>Nov 27</td>
<td></td>
<td>Make-Up Lab/ Work on Projects</td>
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<tr>
<td>Dec 4</td>
<td></td>
<td>Project Presentations – 10 min each person</td>
<td>SETE</td>
<td>Project Report</td>
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<tr>
<td>Dec 11 – 15</td>
<td></td>
<td>Finals Week – No Final in this class</td>
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*Project Updates: I need to know your progress on your projects during these times

**Online Class Survey (online SETE)**

All students must complete the Online Class Survey (online SETE) prior to the last class. Information given by the student to assess a course and the instructor is essential in maintaining quality instruction at our department and at SSU. You must provide evidence of the submission (such as a screen shot). Failure to do so will result in points deducted.

**Important Dates**

9/4: Labor Day Holiday  
9/5: Last day to Drop a course  
9/6 – 9/16: Last Day to Drop with a "W" (done on-line)  
11/22 – 11/24: Thanksgiving Break
12/8: Last day of instruction
12/11 – 12/15: Finals Week

**ABET Requirements:**

<table>
<thead>
<tr>
<th><strong>Student Learning Outcomes vs. Course Learning Objectives:</strong></th>
<th><strong>Course Learning Outcomes</strong></th>
<th><strong>Level of Support</strong></th>
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<tbody>
<tr>
<td><strong>ABET Student Outcomes</strong></td>
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<tr>
<td>(a) an ability to apply knowledge of mathematics, science, and engineering</td>
<td>A, B, C</td>
<td>3</td>
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<tr>
<td>(b) an ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td>A, B, C</td>
<td>4</td>
</tr>
<tr>
<td>(c) an ability to design a system, component, or process to meet desired needs</td>
<td>A, B, C</td>
<td>4</td>
</tr>
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<td>(d) an ability to function on multi-disciplinary teams</td>
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<tr>
<td>(e) an ability to identify, formulate, and solve engineering problems</td>
<td>A, B, C</td>
<td>3</td>
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<td>(f) understanding of professional and ethical responsibility</td>
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<td>(g) an ability to communicate effectively</td>
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<tr>
<td>(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context</td>
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<tr>
<td>(i) a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>(j) a knowledge of contemporary issues</td>
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<tr>
<td>(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>A, B, C</td>
<td>3</td>
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**Assessment Methods:**

**Assessment of student learning for each of the Course Learning Objectives:**

- **A.** Design and conduct experiments to understand functions of basic logic gates
  - a. Student lab reports
  - b. Quizzes, Pre-Labs
  - c. Project
- **B.** Design and conduct experiments for combinatorial logic gates
  - a. Student lab reports
  - b. Quizzes, Pre-Labs
  - c. Project
- **C.** Design and conduct experiments using minimization techniques to simplify circuits
  - a. Student lab reports
b. Quizzes, Pre-Labs

c. Project

Course quality Assessment

1. Student survey of the course
2. Peer instructors feedback