Course Name: **Fundamentals of Digital Logic Design Laboratory**  
Course Number: **EE 112**  
Section: 001  
Credit Hours: 1.0  
Semester Offered: **Spring 2019**  
Course Meeting Days/Time: **M 1:00 PM – 3:50 PM**  
Classroom: **Salazar 2003**

Instructor: Dr. Sara Kassis  
Office: Salazar 2010A  
Telephone: 707-664-4438  
Email: sara.kassis@sonoma.edu *(preferred method of contact)*  
Office Hours: Tuesdays from 9:00 – 10:30 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, digital gates kit, tackle box, etc. as described in my email and on Canvas.  
- 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.


Canvas Page: I use Canvas 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 Canvas. Please check our Canvas page and your Sonoma State email often.

Canvas can be accessed through your Seawolf Login:

- Log into SSU Online Services
- Click on Canvas
- In the Dashboard, click on ‘EE 112’
- It is recommended to download the Canvas app on your smartphone

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>Attendance</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>
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<tr>
<td>Quizzes/Practicums</td>
<td>15%</td>
</tr>
<tr>
<td>Project/Presentation</td>
<td>15%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>≥93%</td>
</tr>
<tr>
<td>A-</td>
<td>≥90% &lt;93%</td>
</tr>
<tr>
<td>B+</td>
<td>≥87% &lt;90%</td>
</tr>
<tr>
<td>B</td>
<td>≥83% &lt;87%</td>
</tr>
<tr>
<td>B-</td>
<td>≥80% &lt;83%</td>
</tr>
<tr>
<td>C+</td>
<td>≥77% &lt;80%</td>
</tr>
<tr>
<td>C</td>
<td>≥73% &lt;77%</td>
</tr>
<tr>
<td>C-</td>
<td>≥70% &lt;73%</td>
</tr>
<tr>
<td>D+</td>
<td>≥67% &lt;70%</td>
</tr>
<tr>
<td>D</td>
<td>≥60% &lt;67%</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60%</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 count. Don’t miss anything! Try your best!
2) **Late Work:** Any work submitted after the end of class is considered late and 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 your own time prior to the end of the semester. Otherwise, more than one missing lab will be graded as a zero. Please note that a failing grade will be given for two or more missing labs.

**Pre – Labs:** The topic of these pre-lab assignments will be covered in the lab for that day. Students must download and print them from our Canvas page, complete the assignment, and hand it in at the beginning of each class.

**Quizzes & Practicums:** Quizzes will occasionally be given to reinforce topics and assess student understanding of topics. They may or may not be announced in advance. Practicums are hands-on building of digital circuit’s examinations used to assess a students’ knowledge for the semester.

There will be a written quiz and hands-on practicum at the end of the semester during Finals Week on Monday, May 13 from 2 – 3:50 PM. Both the quiz and the practicum will be an individual exam with each student using his or her own hardware supplies for the practicum. If a student does not arrive for the Final or does not bring their hardware supplies, it will result in a zero grade.

**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. If you do not bring in the proper notebook, you will be asked to purchase the appropriate one. Points will be deducted if the correct supplies are not obtained in a timely manner.

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, Lab#, 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 notebook 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 Procedure:** The laboratory manual is found online on our Canvas page. It is the student’s responsibility to be familiar with the lab for the day and carefully read through the lab instructions upon implementing the experiment.

**Lab Data Sheets:** Along with keeping your notebook, when conducting an experiment students will input the data from the lab experiment into the Lab Data Sheets. These are found at the end of the lab procedure in the lab manual. It is the student’s responsibility to print out the Lab Data Sheet in advance, bring it with you to class, fill it out with the results of the experiment, and hand it to the instructor at the completion of the lab to obtain points for the lab.

**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. It is recommended to use digital gates but it is not required. (40% of grade)
- 5 minute Power Point presentation (show materials used, perhaps a schematic diagram, anything else you deem useful to explain your project; talk about what you learned, what was challenging) (20% of grade)
- Points will be given for overall quality of presentation, including explanation of what you are doing and how it works (40% of grade)
- Be creative and, above all, have fun!

You may select your project idea from the internet, book, etc. I will post website references for you to look through for ideas.

Students are required to show proof of the SETE (more details below) before presenting. Students will be required to submit their notebooks during this time and attendance will be recorded. Notebooks will be handed back to the students at the earliest possible time.

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 March 11 and April 22, 2019. 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. Your academic advising session will take place during class on Monday, April 8. You will be asked to set aside 10 minutes of lab time to have an individual academic advising session with an academic advisor. Please be sure not to miss class on Advising Day!

**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](http://www.sonoma.edu) and the [Society of Women Engineers Club](http://www.sonoma.edu). 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>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 28</td>
<td>1</td>
<td>Introduction &amp; Testing the Breadboards</td>
<td></td>
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<tr>
<td>Feb 4</td>
<td>2</td>
<td>Basic Logic Circuits</td>
<td></td>
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<tr>
<td>Feb 11</td>
<td>3</td>
<td>Simple Combination Circuits</td>
<td></td>
</tr>
<tr>
<td>Feb 18</td>
<td>4</td>
<td>Not-So-Simple Combination Circuits</td>
<td></td>
</tr>
<tr>
<td>Feb 25</td>
<td>5</td>
<td>Simplifying Circuits</td>
<td></td>
</tr>
<tr>
<td>Mar 4</td>
<td>6</td>
<td>Simplifying Circuits 2</td>
<td></td>
</tr>
<tr>
<td>Mar 11</td>
<td>7</td>
<td>Universality of NAND and NOR Gates</td>
<td>Academic Status Form Due</td>
</tr>
<tr>
<td>Mar 18</td>
<td></td>
<td>Spring Break – No Class</td>
<td></td>
</tr>
<tr>
<td>Mar 25</td>
<td>8</td>
<td>Karnaugh Maps</td>
<td></td>
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<tr>
<td>Apr 1</td>
<td></td>
<td>Campus Closed</td>
<td></td>
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<tr>
<td>Apr 8</td>
<td>9</td>
<td>XOR and XNOR</td>
<td>Group Advising</td>
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<tr>
<td>Apr 15</td>
<td>10*</td>
<td>Half Adders</td>
<td></td>
</tr>
<tr>
<td>Apr 22</td>
<td>11</td>
<td>Designing Logic Circuits</td>
<td>Academic Status Form Due</td>
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<tr>
<td>Apr 29</td>
<td>12*</td>
<td>Code Conversion</td>
<td></td>
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<tr>
<td>May 6</td>
<td></td>
<td>Project Presentations – 5 min each person</td>
<td>SETE is due</td>
</tr>
</tbody>
</table>
| May 13     |         | Finals Week  
Monday, May 13 from 2 – 3:50 PM      | Quiz & Practicum – bring your supplies     |

*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 (project presentations). 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) prior to presenting your project. Failure to do so will result in loss of points.

Important Dates

1/22 Instruction Begins
2/1 Final Deadline to submit graduation Applications for Spring and Summer
2/4 Last Day to Add/Drop
   Priority Deadline for Contract Courses
2/15 Last day to add Contract Courses
   Last Day to Petition to Add with $20 administrative fee
   Last day to drop with a “W” – done on-line
3/18 – 3/22 Spring Break
4/1 Cesar Chavez Birthday (campus closed)
4/21 Last day to Petition to Withdraw from a class with $20 administrative fee
4/29 – 5/31 Registration for Fall 2019 – by appointment only
5/10 Last day of instruction
5/13 – 5/17 Finals

University Policies

There are important University policies that you should be aware of, such as the add/drop policy; cheating and plagiarism policy, grade appeal procedures; accommodations for students with disabilities and the diversity vision statement. See Important Policies and Procedures for Students http://www.sonoma.edu/uaffairs/policies/studentinfo.shtml.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. How to Add a Class http://www.sonoma.edu/registration/addclasses.html has step-by-step instructions. Registration Information http://www.sonoma.edu/registration/regannounce.html lists important deadlines and penalties for adding and dropping classes.

Campus Policy on Disability Access for Students

If you are a student with a disability, and think you may need academic accommodations, please contact Disability Services for Students (DSS), located in Salazar Hall, Room 1049, Voice: (707) 664-2677, TTY/TDD: (707) 664-2958, as early as possible in order to avoid a delay in receiving accommodation services. Use of DSS services, including testing accommodations, requires prior authorization by DSS. See SSU’s policy on Disability Access for Students http://www.sonoma.edu/uaffairs/policies/disabilitypolicy.htm.
Emergency Evacuation
If you are a student with a disability and you think you may require assistance evacuating a building in the event of a disaster, you should inform your instructor about the type of assistance you may require. You and your instructor should discuss your specific needs and the type of precautions that should be made in advance of such an event (i.e. assigning a buddy to guide you down the stairway). We encourage you to take advantage of these preventative measures as soon as possible and contact the Disability Services for Students office if other classroom accommodations are needed.

Academic Integrity
Students should be familiar with the University’s Cheating and Plagiarism policy http://www.sonoma.edu/UAffairs/policies/cheating_plagiarism.htm. Your own commitment to learning, as evidenced by your enrollment at Sonoma State University and the University’s policy, require you to be honest in all your academic course work. Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified.

Counseling and Psychological Services (CAPS)
CAPS is a unit of the division of Student Affairs of Sonoma State University. CAPS offers confidential counseling to students experiencing personal problems that interfere with their academic progress, career or well being. The CAPS website http://www.sonoma.edu/counselingctr provides information only. If you would like to talk with someone or make an appointment, please call (707) 664-2153 between 8 a.m. - 4:30 p.m., Monday-Friday.

ABET Student Outcomes Criteria: The students will attain:

| 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics |
| 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors |
| 3. an ability to communicate effectively with a range of audiences |
| 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts |
| 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives |
| 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions |
| 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies |
EE Program Specific Criteria:

- The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.
- The curriculum must include **probability and statistics, including applications appropriate to the program name; mathematics through differential and integral calculus; sciences (defined as biological, chemical, or physical science); and engineering topics (including computing science) necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.**
- The curriculum for programs containing the modifier “electrical,” “electronic(s),” “communication(s),” or “telecommunication(s)” in the title **must include advanced mathematics, such as differential equations, linear algebra, complex variables, and discrete mathematics.**

**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 data sheets
   b. Quizzes, Pre-Labs
   c. Project

B. Design and conduct experiments for combinatorial logic gates
   a. Student lab data sheets
   b. Quizzes, Pre-Labs
   c. Project

C. Design and conduct experiments using minimization techniques to simplify circuits
   a. Student lab data sheets
   b. Quizzes, Pre-Labs
   c. Project

**Course quality Assessment**

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