Digital Systems
Engineering 3343/3043 – Spring 2024

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Phone: 936-468-2097
Office: Zoom and STEM 207N

Office Hours
MW 11:00 am – 1:00 pm (STEM 207N )
F 10:00 am – 12:00 pm (STEM 207N )
T/TH by appointment via Zoom

Office hours meetings through Zoom can be accommodated based on prior appointment requests.

Department: Department of Physics, Engineering, and Astronomy

Class meeting time and place: Lecture MW 10:00 – 10:50 AM, STEM 108
Lab M 3:00 – 5:50 PM, STEM 111

Course Description
Introduction to theory and design of digital logic, circuits, and systems. Number systems, operations and codes; logic gates; Boolean Algebra and logic simplification; Karnaugh maps; combinational logic; functions of combinational Logic; flip-flops and related devices; counters; shift registers; sequential logic; memory and storage. Co-Requisite: ENGR 3043 Lab

Text and Materials
Lab Manual: Engineering 3343 lab manual (Available in the Student Center Bookstore)

Course Calendar (Tentative)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Chapter</th>
<th>Reading</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 15</td>
<td>CH1 : Introduction</td>
<td>1</td>
<td>Chapter 1</td>
<td>No Lab</td>
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<tr>
<td>2</td>
<td>Jan 22</td>
<td>CH1: Introduction</td>
<td>1-2</td>
<td>2.1-2.9</td>
<td>No Lab</td>
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<tr>
<td></td>
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<td>CH2:Combinational Systems</td>
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<tr>
<td>3</td>
<td>Jan 29</td>
<td>CH2:Combinational Systems CH3: Karnaugh Maps</td>
<td>3</td>
<td>3.1-3.6</td>
<td>Lab1</td>
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<td>4</td>
<td>Feb 5</td>
<td>CH3: Karnaugh Maps</td>
<td>4</td>
<td>4.1-4.2</td>
<td>Lab 2</td>
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<td></td>
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<td>CH4: Function Minimization Algorithms</td>
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<td>5</td>
<td>Feb 12</td>
<td>CH4:Function Minimization Algorithms /Exam1</td>
<td>4</td>
<td>4.2-4.6</td>
<td>Lab 3</td>
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<td>6</td>
<td>Feb 19</td>
<td>CH5:Designing Combinational Systems</td>
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<td>5.1-5.2</td>
<td>Lab 4</td>
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<td>7</td>
<td>Feb 26</td>
<td>CH5:Designing Combinational Systems</td>
<td>5</td>
<td>5.2-5.4</td>
<td>Lab 5</td>
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<td>8</td>
<td>Mar 4</td>
<td>CH5:Designing Combinational Systems</td>
<td>5</td>
<td>5.4-5.6</td>
<td>Lab 6</td>
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<td>9</td>
<td>Mar 11</td>
<td>Spring Break</td>
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<td>10</td>
<td>Mar 18</td>
<td>Analysis of Sequential Systems / Exam2</td>
<td>6</td>
<td>6.1-6.2</td>
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<tr>
<td>Day</td>
<td>Month/Date</td>
<td>Topic</td>
<td>Chapter</td>
<td>Sections</td>
<td>Lab</td>
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<tr>
<td>11</td>
<td>Mar 25</td>
<td>Analysis of Sequential Systems</td>
<td>6</td>
<td>6.2-6.4</td>
<td>Lab 7</td>
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<td>12</td>
<td>Apr 1</td>
<td>Design of Sequential Systems</td>
<td>7</td>
<td>7.1-7.4</td>
<td>Lab 8</td>
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<tr>
<td>13</td>
<td>Apr 8</td>
<td>Design of Sequential Systems</td>
<td>7</td>
<td>7.1-7.4</td>
<td>Lab 9</td>
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<tr>
<td>14</td>
<td>Apr 15</td>
<td>Solving Large Sequential Problems / Exam 3</td>
<td>8</td>
<td>8.1-8.2</td>
<td>Lab 10</td>
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<tr>
<td>15</td>
<td>Apr 22</td>
<td>Solving Large Sequential Problems</td>
<td>8</td>
<td>8.3-8.4</td>
<td>Lab 11</td>
</tr>
<tr>
<td>16</td>
<td>Apr 29</td>
<td>Simplification of Sequential Circuits</td>
<td>9</td>
<td>9.1-9.4</td>
<td>Lab TBA</td>
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<tr>
<td>17</td>
<td>May 6</td>
<td>Final Exam (Monday, May 6, 10:30 am - 12:30 pm)</td>
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### Exam I
- Chapters 1-3 Introduction
- Combinational Systems
- The Karnaugh Map

### Exam II
- Chapter 4-5 Function Minimization Algorithms
- Designing Combinational Systems

### Exam III
- Chapter 6-7 Analysis of Sequential Systems
- Design of Sequential Systems

### Exam IV
- Chapter 8-9 Solving Larger Sequential Circuits
- Simplification of Sequential Systems

### Assignments:
There will be assignments almost every week. These assignments are due one week after they have been posted. Assignments will be submitted using D2L Dropbox. Keep in mind that the HW should be clean and organized, for more details about HW submission refer to “Homework Guidelines” in this document. Once you finish the HW scan the work and upload it to D2L.

### Quizzes:
Quizzes will be posted on D2L. The idea is to reinforce knowledge from lectures and reading assignments. Some quizzes are required to be completed in the class period.

### Exams:

Lab 1: Number Systems, and Logic Circuits
Lab 2: Switching Logic, Truth Tables, and System Design
Lab 3: Karnaugh Maps
Lab 4: Quine-McCluskey, Iterative Systems
Lab 5: Arduino Microcontroller Exercises
Lab 6: Decoders and Flip Flops
Lab 7: Design of Sequential Systems – Elevator Problem
Lab 8: Design of Sequential Systems, and Counters
Lab 9: Shift Registers
Lab 10: Counters
Lab 11: Introduction to PIC16F877A Programming
There will be a total of three regular exams during the semester, and one final exam. The exams will be based on the homework/quizzes, and the materials covered during the lecture. See the course calendar above for the weeks of these exams. Students will have one week after each exam to review the exams and discuss the grades. No make-up exams will be given except in the case of an excused absence. A written and signed notice is required for an excused absence within three days of the exam. Any makeup exam must be taken within three days of the missed exam.

**Laboratory Procedures:**
They will need to be submitted to the teaching assistant.

**Grading Policy:**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Lab Procedures</td>
<td>15%</td>
</tr>
<tr>
<td>Attendance/Participa</td>
<td>5%</td>
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<tr>
<td>Quizzes</td>
<td>15%</td>
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<tr>
<td>Exams</td>
<td>35%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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</table>

**Late Policy**
Any assignment should be returned in time. Late assignments can be accepted if you have an excused absence. Grading will be affected by the following policy:

<table>
<thead>
<tr>
<th>Time Late</th>
<th>Deduction^</th>
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<tbody>
<tr>
<td>Less than 24 hours</td>
<td>5</td>
</tr>
<tr>
<td>More than 24 hours less than 48</td>
<td>15</td>
</tr>
<tr>
<td>More than 48</td>
<td>Not accepted</td>
</tr>
</tbody>
</table>

*No late submission is accepted for in-class assignments/quizzes unless otherwise stated by the instructor.

**Homework Guidelines**
As engineers you should learn how to be organized, you will need to present reports and results to your superiors and these need to be professional. For that reason, you will need to start learning how to be organized. The homework should be returned complying with the following format:

1. Use clean paper that will scan properly
2. The name should be on the top left corner
3. Pages should be numbered on the top right corner using the following format “3/10”
4. Problems should be organized and in order
5. The problem number should be clear and readable
6. Only one document should be submitted in PDF format

Failing to comply with any of these will result in a **10 points** deduction.

**Attendance Policy:**
Attendance will be taken at the beginning of each class. Five points had been allocated for attendance. I understand that things happen, and you are not able to attend class a couple of times. Therefore, you are allowed to miss only 3 lectures without deduction.

Classroom Policies
For the benefit of your fellow students and your instructor, you are expected to practice common courtesy concerning all course interactions. For example:

- Be considerate toward your classmates and instructor and arrive to class on time.
- Do not leave class early and do not rustle papers in preparation to leave before class is dismissed.
- Avoid classroom distractions. Be attentive in class: stay awake, do not read newspapers, etc.
- If you are late to class or must leave early please inform your instructor in advance (enter or leave quietly, don’t walk across the front of the classroom (use the side aisles) and don’t walk in front of the projector).
- Cell phones, pagers and other communication devices must be turned off during class.
- Play well with others. Be kind and respectful to your fellow students and your teachers.

Topics Covered

Course Learning Outcomes
By the end of the course, a successful student will be able to:

1. Employ different number systems. (SO-1)
2. Construct truth tables for digital systems. (SO-1)
3. Write a function using AND, OR, and NOT gates. (SO-1)
4. Implement Karnaugh Maps to simplify digital systems. (SO-1)
5. Implement Quine-McCluskey to simplify digital systems. (SO-1)
6. Design combinational systems. (SO-2)
7. Analyze sequential systems. (SO-4)
8. Design sequential systems. (SO-2)
9. Solve larger sequential systems. (SO-1)
10. Simplify sequential circuits. (SO-1)
11. Write effective laboratory reports (Lab). (SO-3)
12. Construct basic logic circuits (Lab). (SO-6)
13. Simulate basic logic circuits (Lab). (SO-6)
14. Construct sequential systems (Lab). (SO-2)

Student Outcomes:
Graduates of the program will:

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 judgements, which must consider the impact of engineering solutions in global, economic, environmental, and social 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

General Education Core Curriculum Objectives/Outcomes (EEO)
There are no specific general education core curriculum objectives in this course. This course is not a general education core curriculum course.

Academic Integrity (A-9.1)

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp

Withheld Grades Semester Grades Policy (A-54)

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.