ECE 331: Digital System Design

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Course Website: http://ece.gmu.edu/~clorie/ECE_331/
(Please note, there is an underscore between “ECE” and “331”)

Note when contacting Dr. Lorie: Include “ECE 331” in the subject line of all emails (followed by the actual subject) so that they will be filtered into the correct email folder.

Course Objectives
The primary objective of this course is to provide the student with the fundamental concepts and skills necessary to analyze and design combinational and sequential logic circuits. It also introduces the student to the use of a Hardware Description Language (VHDL) to describe both types of logic circuits. The material covered in the lecture is reinforced through practical experience in the associated lab (ECE 332), including the use of VHDL to synthesize several logic circuits.

Topics to be covered in this course:
1. Introduction to Logic Circuit Design
2. Introduction to VHDL
3. CMOS implementation of Logic Gates
4. Electrical characteristics of Logic Gates
5. Power Dissipation and Propagation Delay
6. Boolean Algebra and Karnaugh Maps
7. Switching Circuit Design
8. Number Systems and Representations
9. Binary Arithmetic and Binary Codes
10. Single-bit and Multi-bit Adder Circuits
11. Multiplexers, Decoders, and Encoders
12. Hazards
Course Syllabus

13. Latches and Flip-Flops
14. Registers and Counters
15. Sequential Circuits (State Machines)

A more detailed schedule of the topics covered in lecture are provided in a separate document.

Textbook
Title: “Fundamentals of Digital Logic with VHDL Design”, 3rd Edition
Authors: Stephen Brown and Zvonko Vranesic

Lecture and Recitation Sections
<table>
<thead>
<tr>
<th>Lecture</th>
<th>Monday, Wednesday</th>
<th>5:55 – 7:10 pm</th>
<th>Dr. Craig Lorie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recitation Sect. #1</td>
<td>Friday</td>
<td>1:30 – 2:20 pm</td>
<td>TA</td>
</tr>
<tr>
<td>Recitation Sect. #2</td>
<td>Thursday</td>
<td>1:30 – 2:20 pm</td>
<td>TA</td>
</tr>
<tr>
<td>Recitation Sect. #3</td>
<td>Wednesday</td>
<td>3:30 – 4:20 pm</td>
<td>TA</td>
</tr>
</tbody>
</table>

Office Hours
<table>
<thead>
<tr>
<th>Dr. Craig Lorie</th>
<th>Tuesday</th>
<th>12:00 – 1:00 pm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monday</td>
<td>4:30 – 5:30 pm</td>
</tr>
<tr>
<td>Shaunak Shah</td>
<td>Monday</td>
<td>5:30 – 7:30 pm</td>
</tr>
<tr>
<td></td>
<td>Wednesday</td>
<td>1:20 – 3:20 pm</td>
</tr>
<tr>
<td>Ahmad Salman</td>
<td>TBD</td>
<td></td>
</tr>
</tbody>
</table>

If you cannot attend the provided office hours, please feel free to contact the TA's or myself via email with questions that you have, or to schedule an alternate meeting time.
Course Syllabus

The Lab (ECE 332)
The lab must be taken in conjunction with the lecture, or must have been completed previously with a grade of C or better.

<table>
<thead>
<tr>
<th>Lab Sect.</th>
<th>Day</th>
<th>Time</th>
<th>TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Wednesday</td>
<td>10:30 am – 1:20 pm</td>
<td>TA</td>
</tr>
<tr>
<td>#2</td>
<td>Tuesday</td>
<td>1:30 – 4:20 pm</td>
<td>TA</td>
</tr>
<tr>
<td>#3</td>
<td>Monday</td>
<td>1:30 – 4:20 pm</td>
<td>TA</td>
</tr>
</tbody>
</table>

Recommended background for ECE 331: ECE 280 – Electric Circuit Analysis

Attendance
Attendance in lecture is highly recommended. You are expected to be adults and, as such, make decisions that give you the best chances for success. The material covered in the lectures will supplement that which is covered in the textbook, provide additional examples to aid in the learning of the material, and offer you opportunities to ask questions to clarify the material. Thus, it will benefit you to attend lecture. However, I reserve the right to have “pop quizzes” if attendance falls below an unacceptable level.
You are responsible for all material covered in lecture.
Attendance in lab is mandatory.

Homework
Homework will be assigned on a weekly basis, covering the material of the previous week. It is due at the beginning of class on Monday. No late submissions will be accepted. If you have a problem with the submission deadline you must speak to me in advance to make alternate arrangements.
Homework is essential to learning the material. You should make an honest and conscientious effort on all of the homework assignments.

Quizzes
To help encourage you to read the textbook, there will be bi-weekly quizzes. The quizzes will be very short (approximately 10 minutes), and consist of one or two example problems from the textbook. No makeup quizzes will be given. Period. You will, however, be allowed to drop the lowest quiz grade.

Exams
There will be two (2) exams during the course of the semester, as well as a Final exam at the conclusion of the semester. All exams are closed book. You will, however, be allowed to use one side of an 8.5” x 11” sheet of paper on which to write your own notes.
There will be NO make-up exams. (See Dr. Lorie for an exception). Students who are more than 15 minutes late for an exam may not be admitted and will be assigned a grade of zero for the exam.

Exam #1: Monday, September 28, 2009
Exam #2: November 2, 2009
Final Exam: Monday, December 14, 2009, 4:30 – 7:15pm
Grading
Your final grade will be the weighted average of the homework, quizzes, two semester exams, and the final exam, as calculated from the formula below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>5%</td>
</tr>
<tr>
<td>Exam #1</td>
<td>25%</td>
</tr>
<tr>
<td>Exam #2</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
</tr>
</tbody>
</table>

Honor Code
All rules of the GMU Honor Code system will be enforced in both the lecture and the lab. You must review the rules of the GMU Honor Code and be familiar with them.

You are encouraged to discuss homework problems with other students and/or obtain the assistance of the lecture or recitation instructor. Nevertheless, please write down your own solutions which represent your understanding of the material. Duplicating another student's homework solutions, hardware/software designs, diagrams, source code, prelab assignment and exam notes is considered cheating. If you use material from other sources such as but not limited to the web, books, journals, data sheets, etc. you must reference the source.

Honor code violations will be pursued and prosecuted to the fullest extent.

Classroom Etiquette
Cellphones are to be turned off during class; minimally they must be silenced. Emergency calls may be taken, but must be taken outside of the classroom.

Texting, using your laptop for something other than lecture-related work, etc. is considered a distraction to me and to the other students trying to learn in the class, and will not be tolerated.

Students with Disabilities
If special assistance is required or special accommodations need to be made, please contact me as soon as possible so that the proper arrangements can be made.