Syllabus
EE 2700 Digital Circuits
Spring 2013

Description:. An introduction to digital electronics, integrated circuits, numbering systems, Boolean algebra, gates, flip-flops, multiplexers, sequential circuits, combinational circuits, and computer architecture. Introduction to hardware description language and programmable logic devices. Lecture and lab combination. Laboratory activities to include the design, construction, analysis, and measurement of basic digital circuits.

Information: This course is required for the Electronics Engineering BS degree.

Student Learning Outcomes: By the end of the semester, students will be able to:

1. Design and build combinational circuits using gates and inverters.
2. Design and build sequential circuits using gates, inverters and flip-flops
3. Compute propagation delays and maximum clock speeds.
4. Analyze circuits that use more integrated devices such as multiplexors, decoders, shift registers, counters, addressable memories and FIFOs.
5. Convert numbers from/to binary, decimal, and hexadecimal.
6. Design logic circuits that use binary numbers.
7. Write hardware description language to describe digital circuits.
8. Program a programmable logic device.

Student Assessment: The following student assessment criteria will be used:

1. Homework assignments (20%).
2. Laboratory assignments (20%).
3. Project (20%)
4. Mid-term examinations (20%).
5. Final examination (20%)

Course Assessment: The following course assessment criteria will be used:

1. Student reviews
2. Faculty review (annually).
3. Advisory Committee review (every two years).

Credits and Contact Hours: Four semester credit hours. Six contact hours

Prerequisite: None, but knowledge of programming languages is highly recommended

Text: Brown, *Introduction to Digital Circuits* (online).

Course Coordinator: Dr. Fon Brown, 626-7781 (Office), Building 4, Room 421E, fonbrown@weber.edu

Room: Ogden Campus Building 4 Room 409.

Time: 9:00-10:15 Monday and Wednesday.

Software: This course requires the use of ISE Webpack, available in D2 Room 333 and B4 Room 418. However, since it is a free download, students are strongly encouraged to download it at http://www.xilinx.com/products/design-tools/ise-design-suite/ise-webpack.htm

Topic Outline:

1. Digital Signals
2. Numbering Systems and Arithmetic
3. Boolean Algebra
4. Combinational Logic Design
5. Karnaugh Maps and VEMs
6. Modeling and Simulation
7. Integrated Logic Circuits
8. Introduction to VHDL
9. Synthesis, Programmable Devices
10. Sequential Logic Design
11. Memory Devices
12. State Machine Design
13. Microprocessor Architecture

Homework: Homework is due at the *beginning* of the second period after it is assigned. Homework will be on 8.5 by 11 paper which is either engineering paper or a computer print-out. Only one side of the paper will be used. Work must be neat and easily followed. You must include your work where appropriate. Answers will be indicated using boxes. Papers will be folded lengthwise with the work inside. Your name, the assignment number, and the class (EE 2700) will be written on the outside. Work which does not follow the above format *will not be accepted*. Late homework is accepted and graded as time permits, but is subject to a 20% penalty. If I don't have time to grade all the late homework before the semester ends, the latest submissions will remain ungraded and will receive 0 points.

Project: As part of this course, you will design and simulate a simple microprocessor. The project develops in three phases each building upon the last. At the end of each phase, you will turn in schematics, VHDL code and simulations. Late work is penalized 20% but can be accepted up to the day of the Final Exam. No credit is given if the design does not work. You may work on the project either individually or in teams of two.

Lectures: Lectures will cover the important and difficult parts of the course material. Other topics will be left for the student to read. The homework and examinations will cover all of the material presented in lecture and all the material in the text specified in the course outline unless the instructor specifically omits it. (Some material will be presented in lecture which is not in the text.)

Specific questions about the homework will be answered at the beginning of the lecture. At the discretion of the instructor, homework problems may be solved during lecture as well. Otherwise, students may see the instructor during office hours for the solutions.

There may be any number of unannounced quizzes during the semester. Quizzes are usually given when attendance is inexplicably low. Each quiz counts as 5 homework points.

Lab: There will be eight labs during the semester. Lab work must be recorded in a lab notebook. *Work directly in your notebook. It's a workbook not a formal report.* Starting with lab 5, a circuit simulation will be required. All preliminary design work and any simulations should be completed and written or affixed to your lab book before the lab. The lab instructor will check and grade each lab (10 points each, a rubric is given for each lab). Labs may be done in teams of up to three.

Exams: There will be two in-class mid-term exams, and a final exam on April 24th at 9:00am.

Services for Students with Disabilities: Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in Room 181 of the Student Services Center. SSD can also arrange to provide course materials (including the syllabus) in alternative formats if necessary.