

Digital Logic Design
ECEN 3233
Fall 2003
TTh 10:30-11:20am
ES 201B

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WWW: <http://ecen3233.okstate.edu>

Office Hours: To Be Announced. Questions or requests for appointments via email are always welcome.

Questions regarding homework problems and lab assignments should normally be directed first to your TA when possible. The TAs are available during each lab session in ES301 (when they aren't otherwise busy helping another student). Contact information for the TAs, will be given to you during your first lab session.

Prerequisites: None. This course is suitable for sophomores and above in ECEN.

Text: John F. Wakerly, *Digital Design: Principles and Practices* (third edition), Prentice-Hall, 2000, and *Xilinx Foundation Tools version 4.2i* (included with the textbook – version 2.1i is no longer supported).

Course Format: This course uses a combination of traditional lecture and laboratory exercises along with group learning. You will have both individual and team assignments.

Course Notes: The class lecture slides will be made available on the class web site where you may view or print them. Slide modules will normally be posted at least several days before they will be used in class. You'll probably find it useful to print off the slides and bring them to class with you. Check the web site frequently for updates so you have the current handouts for class. Some material contained in the slides may be omitted, and additional material may be added in class from time to time.

Software: *Xilinx Foundation Tools Version 4.2i*: the student edition of the software is included with the textbook for you to install on your own PC if you so desire; the full version is installed in the lab (ES 301) and is also available in the CEAT PC labs. We will make extensive use of this software throughout the semester in lab. More information will be discussed in lab.

Objective: The purpose of this course is to introduce you to the fundamentals of digital logic, and the design and implementation of simple digital systems. The course begins with an introduction to digital logic, logic building blocks (simple gates – AND, OR, NOT, XOR, NAND, NOR), Boolean algebra, and two-level realization of logic functions. Karnaugh

maps (K-maps) and the Quine-McCluskey method are introduced for minimizing the complexity of logic circuits. More complicated devices, including programmable logic, complex logic building blocks, and memory devices are used in several practical design examples. During the second half of the semester we will study sequential logic design with flip-flops, along with the very important topic of finite state machines.

The central theme of the entire course is the idea of taking the logical description of a problem and synthesizing a solution in digital hardware. Consequently, your weekly lab session is a very important part of this course and must not be missed.

A recently added feature of the lab is the use of programmable devices (Field Programmable Gate Array – FPGA – devices) in the lab. This technology opens the way for designing and implementing combinational and sequential hardware systems that are much too complex to construct from discrete logic devices alone – circuits that were impractical to consider in previous semesters but that are easily designed and implemented now. You will obtain a useful understanding of the operation and application of programmable logic devices in class and in lab.

Groups: This course will use a team based approach for certain assignments and laboratory projects. You will be graded both on individual and group assignments. Both individual and group work contribute to any one student's final grade. The groups or teams will be assigned by Dr. Teague shortly after the start of the semester, and you will work with the same group all semester. The grade any student receives for any work done by the group will be modified by peer evaluation. In other words, your group members will rate your contributions on a scale of 0% to 150% and your grade will be modified by this peer rating.

The rating system will work as follows:

- To rate your team members, you will be given 100 points for each person on your team not counting yourself.
- You may assign 0 to 150 points to any one person based on what percentage of their share you feel they contributed.
- You do not have to use all your points.
- If any person gets an average team evaluation of less than 60 points they will fail the course.

An example is given on the web site.

Groups are formed by Dr. Teague and the groupings will be provided to the students during the first or second week of class. Once your team is assigned, you should choose a team leader and any other team functions that you deem appropriate. Each team will be treated like a company, so you should also choose a company name.

Exams: There will be one one-hour mid-term exam and a comprehensive final examination. During the one-hour exam, a single 8 1/2" x 11" *handwritten* and *original* sheet of notes (single-sided) will be permitted. On the final exam, two such sheets may be used.

Photocopying is not allowed on the note sheets – the writing must be original. Your mid-term exam will occur approximately midway through the semester – the actual date will be announced approximately one week prior to each exam.

If you must miss an exam due to circumstances beyond your control, you must notify Dr. Teague as soon as possible (prior to the exam, if possible) so that arrangements can be made. **Make-up exams will not be administered.**

Quizzes: You will be asked to complete a short quiz which is based on the reading assignment before or at the beginning of most class periods. These quizzes are usually on-line using WebCT and must be completed prior to the class for which they correspond. Short in-class quizzes relating to recent laboratory, homework and/or lecture topics may also be administered from time to time. Missed quizzes may not be made up.

Reading Assignments: There will be a reading assignment for most class periods. You are responsible for completing these reading assignments prior to class. On many days you will have an on-line or in-class quiz to complete related to the reading assignment. Reading assignments are posted on the class web site.

Homework: Out of class assignments will be assigned periodically. These will most often be group assignments that are to be completed as a team.

Help Session: We will try to schedule one “help session” per week, conducted by the TAs at a time to be announced, to answer questions related to homework assignments, laboratory, etc. The TAs will usually be available at other times as well (for example, during each scheduled lab session) – contact one of them to make an appointment or just drop by during a lab session if you have homework or lab questions.

Grading: Semester grades will be curved based on overall class performance. Although the final grade distribution cannot be determined before the end of the semester, a reasonable *estimate* (not guaranteed) for the distribution is 90⁺%; "A", 80⁺%; "B", 70⁺%; "C", and 60⁺%; "D". The *approximate* weighting for each type of assignment is as follows:

Midterm Exam	15%
Final Exam (Tuesday, Dec. 9, 10:00-11:50am)	25%
Quizzes and other assignments	20%
Labs / Lab Practical Exam	40%

Class Attendance and Late Assignments: Class attendance is not used in computing your final grade, but you are strongly encouraged to attend class. Students are responsible for all material discussed in class, even if it's not in the text. Important information dealing with exams, laboratory and homework assignments will often be announced in class. If you must miss class, be sure you visit with another student to determine what you missed. Late assignments will be accepted at a penalty of 20% per day. An assignment is considered late if it is not turned in at the time it is scheduled to be collected (i.e., an assignment collected at the beginning of class is late if it is turned in after class). If you must turn in an assignment late, please see Dr. Teague as far in advance as possible.

Laboratory: Laboratory attendance is **mandatory**, even in the case of "excused" absences.

The lab is an integral part of the course, reinforcing concepts from lecture and introducing new concepts. Your participation in the lab and completion of all laboratory assignments is expected! **Labs will meet the first week of class.** You should attend the lab section in which you are enrolled unless other arrangements are made with the instructor or your lab TA.

There will be **no** laboratory make-ups.

All laboratory sections meet in the back part of room ES301. A lab syllabus will be distributed your first day in lab.

Most lab assignments will consist of a pre-lab proposal assignment and a post-lab documentation assignment. A new lab assignment will usually be handed out during lab each week. The pre-lab proposal **must** be completed prior to coming into the lab to perform the in-lab assignment. The in-lab portion of each assignment will be completed individually early in the semester and in teams for the remainder of the time. The post-lab documentation is to be completed after performing the in-lab exercise, and turned in at the beginning of your lab period the following week. Late lab assignments will be assessed a penalty. The lab TA will give you specific instructions each week.

The lab TAs will handle lab grading. Questions regarding lab assignments, lab procedures, the Xilinx software, and lab grading should be directed to the TA.

A lab practical exam, worth approximately 10% of your total lab grade, will be given near the middle of the semester at a time to be announced. This is a one-hour exam that will be completed individually. The lab practical exam may not be made up if missed.

Drop and Add Policy: The instructor will follow University and School guidelines for drops and adds. Consult the class schedule book or Helen Daggs in ES202 for more information.

Academic Dishonesty/Misconduct: As an Electrical Engineering student at Oklahoma State University, you are expected to uphold the highest standard of academic honesty and integrity. *Cheating on exams or quizzes, plagiarism, and copying of labs or homework will not be tolerated.* Discussion of assignments with other students for the purpose of learning the material is encouraged; however, the work you turn in should always be your own, never copied from someone else. Copying of lab assignments and the use of lab material from prior semesters are strictly forbidden. Violations will be handled in compliance with the guidelines established by the Office of Student Conduct. The instructor will give a maximum penalty of an "F" course grade in such situations.

Disability: If any member of the class feels that he/she has a disability and needs special accommodations of any nature whatsoever, I will work with you and the University Office of Disabled Student Services to provide reasonable accommodations to ensure that you have a fair opportunity to perform in this class. Please advise me of any such disability and the desired accommodations at the earliest possible time -- on the first day of class if possible.

Class Web Site: You should check <http://ecen3233.okstate.edu> regularly for important information, assignments, laboratory projects, schedule changes, old exams, homework solutions, etc. We will try to be diligent in keeping the information up to date.

Course Teaching Assistants (TAs)	
Rob Sleezer sleezer@okstate.edu	Josh Miller millejp@okstate.edu