

**Dr. James E. Stine, Jr., Associate Professor**  
**ES 303D, 744-9244**

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**Office Hours:** TR 11:30 AM – 12:30 PM or whenever you see me. Questions or requests for appointments via email are always welcome.

*Due to my full schedule, it's usually quicker if you direct most questions first to your TA when possible.* The TA is available during each lab session in ES101F (when he isn't otherwise busy helping other students) and often at other times. Contact information for the TA is included at the end of this document as well as in the lab syllabus you will receive during your first lab session. The TA will also have their own office hours that will be set at a later time.

**Prerequisites:** None. This course is suitable for any student in ECEN/CEAT who has a basic understanding of electricity (Physics II or Electrical Science, etc.) and is willing to spend the necessary time to learn.

**Text:** D. M. Harris and S. L. Harris, *Digital Design and Computer Architecture*, Elsevier, 2007

**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. The laboratory experience is an essential part of the course.

**Course Notes:** The class lecture slides will be made available as modules 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. We will occasionally deviate in lecture from the order in which the slides are posted so you should print modules ahead as they are posted.

**Software:** *Xilinx Foundation Tools Version 10.1i (or most current version):* the student edition of the software is available online. The full version (10.1i) is installed in the lab (ES 101F) 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 design, prototyping and testing of digital circuits. You will learn these things while studying 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 methods 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 somewhat unique feature of the course 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 by hand from discrete logic devices alone – circuits that were impractical to consider previously 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 nearly all laboratory projects. You will be graded both on individual and group assignments. Both individual and group work contributes to any one student's final grade. Dr. Stine will assign the groups or teams 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. Your group members will rate your contributions on a scale determined by the TA and your grade will be modified by this peer rating. Thus, in class as in real life, it is very important that you carry your weight and participate fully in all team activities. Your TA will have more information regarding the peer-evaluation methodology. Dr. Stine reserves the right to modify this scale in the student's favor, as appropriate.

Dr. Stine assigns groups, 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 may also want to choose a company name.

**Exams:** There will be two one-hour exams and a comprehensive final examination. During the one-hour exams, 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 hour exams will be distributed approximately equally across the semester – the actual dates 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. Stine as soon as possible (prior to the exam, if possible) so that arrangements can be made. Make-up exams will not in general be administered, but it is sometimes possible to schedule an exam early.

**Quizzes:** You will be asked to complete a short quiz before or at the beginning of class period every Tuesday except the first week. Missed quizzes may not be made up. You can, however, drop the lowest two quiz grades.

**Reading Assignments:** There will be a reading assignment for most class periods. You probably want to read the assigned reading to help you with lecture and comprehending the lecture. Experience has shown that if you do not pick up the material until the day of the exam, you are destined not to do well. Research has shown consistent learning works best! Reading assignments will be posted on the class web site.

**Homework:** A few out of class assignments will be assigned periodically. These will most often be group assignments that are to be completed as a team. Late homework will not be accepted.

**Recitation:** There will be an optional recitation held every Friday from 5:00 PM – 6:00 PM in Engineering South (please consult class lecture for approved location). This session, conducted by the TA, will be held to answer questions related to assignments, laboratory, etc. The TA will usually be available at other times as well (for example, during each scheduled lab session) – contact 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<sup>+</sup>%"A", 80<sup>+</sup>%"B", 70<sup>+</sup>%"C", and 60<sup>+</sup>%"D". The approximate weighting for each type of assignment is as follows:

Hour Exams (x2)	25%
Final Exam	20%
Homework	10%
Quizzes and other assignments	10%
Labs	35%

**Table 1 : Grade Weighting**

**Final Exam, Tuesday, 5 May 2009, 10:00-11:50 AM in ES201B**

**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 or on the web site. 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 are usually not accepted without an approved excuse. An assignment is considered late if it is not turned in at the time it is scheduled to be collected. Missed in-class assignments, tests, and quizzes may not be made up – a grade of zero will be assigned in those cases.

**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! 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 room ES101F. 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 should 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 TAs. For more information, see the lab syllabus available on the class website.

***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)**

**Harsha Choday**

harsha.choday@okstate.edu