Spring 2016 Course Syllabus

INSTRUCTOR

Mr. Ben Heard, PE  
bdheard@ncsu.edu  
(919) 816-2753 (leave a message)

COURSE

ECE310: Design of Complex Digital Systems  
Monday, Wednesday: 4:30 PM – 5:45 PM 1230 EB2

PREREQUISITES

Grade of C- or better in ECE 212.

GOALS

By the end of this course, you should be able to do the following:

1. Describe combinational and sequential circuits using the Verilog Language both structurally and behaviorally.
2. Create test-benches and simulate your descriptions to verify their correctness.
3. Determine the function of a description by simulating it.
4. Use synthesis tools to generate hardware from your descriptions.
5. Design a complex system consisting of data-path and control logic, managing the complexity with hierarchy.
6. Design systems with simple bus-protocols and interfaces.

TEXT & OTHER COURSE MATERIALS

There is no required text for this class. The instructor uses the following texts in establishing the flow of the semester and the particular style of explaining certain topics. On occasion the instructor may have sections of the following texts made available in electronic format through the NC State library.


These other resources may be useful references:

- Sutherland Verilog HDL Quick Reference Guide (and Sutherland Verilog-2001 Paper part 1 and part 2)

1/10/2016
COURSE REQUIREMENTS

Examinations
There will be two 75 minute in-class exams and a comprehensive final exam. No make-up exams will be given. If you have a conflict with a scheduled exam, you must notify me in advance to arrange an alternative. Likewise, if you are unable to take an exam due to illness or emergency, you must notify me immediately. Failure to notify prior to the exam time will result in a test grade of zero. You may find out more about absences at Attendance Regulations.

Homework
Assignments will be issued at least one week ahead of the assignment due date. Though collaboration is sanctioned, direct copying is not. Realize that mastery of the material in the homework assignments will be essential for good performance in the exams. You may view the homework assignments and solutions, when posted, at the course website.

Wolfware Submissions
In addition to a paper copy, some assignments will require online submission of Verilog files with the Wolfware Submit facility. For these assignments, the naming of your submitted files is important, because electronic tools will be used to help grade them. Please collect all code pertaining to each problem into one file that includes the letters "hw" (lower case) followed by the number of the homework, a hyphen "-", and the problem number. For example: "hw1-1.v", "hw3-2.v", etc.

Labs
There will be 3 laboratory sessions this semester. These are designed to further your understanding of the synthesis process and how an Verilog description becomes a functioning piece of hardware. The week of the lab sessions will be posted on the class calendar. Each student must be registered for a particular lab session. However, if another section better suits your schedule you may attend at that time to complete the assignment. Note that the students actually registered for a particular lab session will have priority during that labs’ meeting time; this includes access to the TA and any lab resources such as development boards and workstations.

Projects
There will be two short projects that will constitute 30% of your grade. These projects require a short report, the format of which will be placed on the course website where the project assignment is located.

POLICIES

GRADING POLICY
Your grade will be based upon:

- the two semester exams (15% each for a total of 30%)
- a comprehensive final exam (20%)
- homework (10%)
- labs (10%)
- the two projects (15% each for a total of 30%)

Based on your unweighted numeric grade you shall never receive a letter grade for lower than its corresponding grade in the table below. However, it is my policy to look for better groupings of grades on which to assign letter grades so you may end up with a grade better than what your numeric grade indicates.

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<thead>
<tr>
<th>Numeric Grade</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>100-97</td>
<td>A+</td>
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<tr>
<td>97-93</td>
<td>A</td>
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<tr>
<td>93-90</td>
<td>A-</td>
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<td>90-87</td>
<td>B+</td>
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<td>70-60</td>
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<td>&lt; 60</td>
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</tbody>
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**LATE HOMEWORK POLICY**

I will not accept late homework nor will I accept paper copy homework that is expected to be physically turned in over email. If an assignment is to be physically turned in it is due in my hands by the time that I walk out the door following lecture. If you know that you will be unable to attend class to turn it in you may turn it in during an earlier meeting of either the lecture or lab. Assignments submitted online are due by the end of the open window for submitting assignments.

**LATE PROJECT POLICY**

Late projects will be accepted up to 120 hours following the due date and time of the assignment. This works out to be 5 24-hour days. Ten percent (10%) will be removed from the maximum possible score for each 24-hour period that elapses following the due date and time. Following 5 days and a reduction to a maximum of 50% attainable the project will not be accepted.

**AUDITING**

Auditing this course requires the approval of your adviser and the ECE department (see REG 02.20.04). Auditors will be expected to complete both in-semester exams, the final exam, and both projects with a cumulative grade of C- or better to satisfactorily complete the audit requirements and receive a grade of AU. Auditing is provided as a means for students to refresh knowledge after having taken a class for credit or to explore a course without application towards grade point average or graduation requirements. To that end attendance to the class, participation in labs, and submission of homework are not required; they are, however, recommended as they provide additional insight into the course content.

**STUDENTS WITH DISABILITIES**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 1900 Student Health Center, Campus Box 7509, 515-7653. [http://www.ncsu.edu/provost/offices/affirm_action/dss/](http://www.ncsu.edu/provost/offices/affirm_action/dss/).
NON-DISCRIMINATION POLICY
NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

ACADEMIC INTEGRITY
All the provisions of the Code of Student Conduct (Academic Integrity) apply to this course. In addition, it is my understanding and expectation that your signature on any test or assignment means that you neither gave nor received unauthorized aid.

This course is about design and I want to instill a team effort when it comes to understanding architectures that solve the problems identified for homework, labs, and projects. However, implementation is another matter entirely. Taking a design to an implementation in Verilog is an important skill and one that needs individual development. You may not leverage another person's Verilog source. To that end there are only 3 people allowed to see your Verilog source: you, the TA(s), and me.

EXCUSED ABSENCES
Please refer to the university's definition of excused absences at http://policies.ncsu.edu/regulation/reg-02-20-03 for detail about what constitutes an excused absence. Please notify me as soon as possible and in advance if you have an excused absence for any date on which an assignment must be turned in or a data on which there will be an exam.

COURSE COMMUNICATION
Modes of communication in use for this course include email, telephone, Collaborate and Moodle discussion forums. Moodle discussion forums and scheduled Collaborate sessions will be used to facilitate class discussion. I will respond to weekday e-mails within 24 hours. Email messages left after 4 pm Friday will be responded to on the following Monday.

COURSE EVALUATIONS
A formal evaluation is conducted by the University at the end of the semester and the goal is to achieve 100% class participation in this survey. Online class evaluations will be available for students to complete during the last two weeks of class. Students will receive an email message directing them to a website where they can login using their Unity ID and complete evaluations. All evaluations are confidential; instructors will never know how any one student responded to any question, and students will never know the ratings for any particular instructor.
TECHNOLOGY

UNITY ID AND PASSWORD
Students need to be familiar with their Unity ID and Password to login to the Moodle course site or to access library materials and other university-provided resources. Refer to online information at http://oit.ncsu.edu/unityid or contact the NCSU HELP desk at (919) 515-HELP or HELP@ncsu.edu for assistance.

EMAIL ACCOUNT
NC State provides all students with free email accounts. Please be aware that ALL email correspondence from the university and department will be sent to your NCSU Unity email account. If you do not regularly use your ncsu.edu account, there are settings within Gmail that allow you to forward your e-mail to another account. For more information see http://google.ncsu.edu/what-best-way-forward-my-nc-state-gmail-non-nc-state-e-mail-address.

HARDWARE AND SOFTWARE REQUIREMENTS
We will be using the Mentor Graphics ModelSim tool suite for the bulk of this course. It is provided as a tool available on the Eos system. All submitted assignments shall be graded with the version available on the Eos system; if you choose to verify your design with an alternative Verilog simulator it is your obligation to be certain that your implementation will function with the ModelSim simulator as that will be the tool used for grading. The ModelSim tool is available as a limited free version that can be installed on your personal machines. More details are available at the course website. Irrespective of whether you use ModelSim installed on your personal machines your designs will be evaluated against the Eos installed version.

As a synthesis tool we will use the Xilinx Vivado tool suite. This, too, is available both on the Eos machines and for individual download. Recommended use follows the same guidelines as for the ModelSim tools above.

MOODLE COURSE WEBSITE
We will be using the Wolfware learning management system (http://courses.ncsu.edu) for course content and online assignment submission. We will be using the message board feature of Moodle (http://wolfware.ncsu.edu) in support of the course. You will login using your Unity ID/PW for Moodle’s Username and Login boxes. After the beginning of the semester, you will see a link to our course site. Once in the site, you can Bookmark or add the site as a Favorite in your web browser so that you can return directly to that page. Students new to Moodle should complete the text or audio orientation found at the Learning with Moodle link on the right side of the Moodle login page.

COLLABORATE
Blackboard’s Collaborate web conferencing application is available for NCSU students, faculty or staff. In this course it is available for the instructor’s Office Hours. The office hours will be prefaced with the text "ECE310" for easy searching. There will be individual sessions established for each office hours session.

Prior to logging in for your first Collaborate session, you will need to follow a few steps to properly configure your computers to function properly with Collaborate. The initial 3-step process is described at http://go.ncsu.edu/configuration.