

**WEST VIRGINIA UNIVERSITY**  
**COLLEGE OF ENGINEERING AND MINERAL RESOURCES**  
**Department of Computer Science and Electrical Engineering**  
**CpE 272 Digital Logic Lab**  
**Spring 2015**

**Meeting Location:** ESB 903

**Instructor:** Laurel Pell

**Lab Times:**       **Monday**       **2:00-4:50PM**  
                          **Tuesday**       **3:30-6:20PM**  
                          **Wednesday**   **2:00-4:50PM**

**Office Hours:**   **Monday/Wednesday 1:00-2:00PM**  
I will try to be in my office during these times, but please email me if you would like to make an appointment. These hours are subject to change.

**Office:**           **ERB 208, ESB 901 Desk #6**  
**Email:**           **lpell1@mix.wvu.edu**

**Course Website:** [www.eCampus.wvu.edu](http://www.eCampus.wvu.edu)

The lab handouts, syllabus, etc will all be available through eCampus.

**Course Objective:**

The students will experiment with digital electronic circuits including number systems, design, and application of modern digital circuitry for both combinational and sequential logic circuits. The laboratory work in this class will emphasize simulation using VHDL simulation software and hardware realization using ALTERA FPGAs to demonstrate the concepts presented in CpE 271.

**Learning Outcomes:**

1. Binary Representation and Basic Logic gates.
2. Combinational logic with circuit optimization using K-Maps.
3. Implementation of circuits with GAL chips.
4. Construction of basic blocks like adder, multiplexers, demultiplexers, counters, etc.,
5. Construction of circuits using FPGA.
6. Implementation of circuits using VHDL.
7. Modular design
8. Sequential Logic design and behavior modeling
9. Functionality of Memories and Arithmetic Logic Units

**Attendance:**

Students are expected to attend every laboratory session. **Not attending a lab session will result in a grade of zero for that lab, unless an acceptable excuse is presented before the lab session.** It is the student's responsibility to contact the instructor regarding a make-up lab. Make-up labs will be handled on an individual basis at the instructor's discretion.

**Groups:**

Students will be working in groups of 2, with the exception of a single group of 3 if there is an odd number of students. Students must work with a **different** lab partner each week.

**Grading Policy:****Final Grade**

- 1) Lab Demonstration: 22 points
  - a. 11 labs each worth 2 points
- 2) Lab Reports: 33 points
  - a. 11 labs each worth 3 points
- 2) Final Project: 30 points
- 3) Final Quiz: 10 points
- 4) Lab Portfolio: 5 points

Grading will be based on the 10 point scale:

- A (100-90)
- B (89-80)
- C (79-70)
- D (69-60)
- F (59-0)

**Design Demonstration:**

During class, each group will be required to construct circuits to complete the experiment. Part of the demonstration grade will be based upon students' in-lab competency. If you are active in performing the experiment and understand the operations of it, you will receive the highest credit. Do not be discouraged from asking for help during the lab as needed. Asking for help will not affect your demonstration grade. However, students are encouraged to check the wiring of circuits and to attempt to determine where the problem might lie before requesting help. Assistance will only be offered if the circuits are wired in an acceptable fashion (i.e. no 'spaghetti' wiring).

## **Laboratory Report: Reports submitted INDIVIDUALLY!**

A Laboratory report will be required after the completion of each laboratory assignment. **A lab report cannot be submitted if the lab was not attended.** Every student must hand in an **individual** report at the **beginning of lab**. E-mailed lab reports will not be accepted. Members of the same group may share the design but they must have their own, individual answers and conclusions, including any answers to pre/post lab questions. Reports will always be due at the beginning of the next lab session. A **10% penalty** will be applied for **each day** that the report is late. Copying lab reports will not be tolerated and will result in a zero grade as well as be reported to social justice.

A Lab report should consist of the following parts and should be **WRITTEN IN YOUR OWN WORDS**:

### **1) Title Page**

The title page should include your name, experiment number and title, lab partner name, and the date the lab was performed.

### **2) Introduction**

This section should include a brief overview of the lab and should not be written in great detail. What is the problem you are trying to solve and why is it worth solving? What useful information should this experiment provide?

### **3) Experiment**

Under the experiment heading you should state what you are trying to accomplish on a particular part of the lab and **HOW** you accomplished it. What methods/techniques did you use? Design work should go in this section. This should include *schematics*, *truth tables*, *equations*, or anything else you used in designing or setting up your experiment.

### **4) Results**

The result section should contain the **results (data)** that you obtained from implementing the experiment as well as an **analysis of the results** (*Explain what the results were and if they were what you expected? How so?*). The results could be a truth table of actual results obtained, or it could be a description of what worked, what didn't work, and why it worked or didn't work. If VHDL code is used to obtain results **always** include it in this section. **Include pre/post lab questions at the end of this section.**

### **5) Conclusion**

This section should include what you learned from the lab. Please include how you think the lab could be improved for the future. Do not simply summarize the experiment. This is your chance to give feedback on the lab and voice your opinions.

The following characteristics are expected of each lab report:

- Professionalism/Neatness
- Labeled figures and tables
- Commented code
- Acceptable grammar and punctuation
- ALL wiring information/schematics (clearly labeled)
- **DO NOT copy and paste text straight from handout**

The report requires considerable thought to present the information in a logical and concise manner. All reports should be computer generated, using a word processing program and any other applications needed for plotting, drawing, and analysis. **Points will be deducted for lab reports with poorly drawn diagrams or hand-written answers.**

The “experiment” and “results” section should be based on individual parts of the lab, so it’s likely you will have multiple “experiment” and “results” sections. For example, a lab report for an experiment with three parts would be outlined as follows:

### **Title Page**

### **Introduction**

#### **Part I:**

**Experiment**

**Results**

#### **Part II:**

**Experiment**

**Results**

#### **Part III:**

**Experiment**

**Results**

### **Pre/Post Lab Questions (graded as part of the results section)**

### **Conclusion**

**Lab Notes:** Notes will be given at the beginning of each lab to aid in its completion. These should be taken along with any other personal notes that help the student complete the lab experiment.

**Lab Notebook:** A lab notebook will be required at the end of the semester. It should include:

1. Summary of what was learned
2. Table of Contents
3. Lab Handouts
4. Lab Notes
5. Lab Reports

**Academic Dishonesty:**

Dishonesty, cheating and plagiarism will not be tolerated in this laboratory or any other class at West Virginia University. Academic dishonesty takes many forms including copying coursework, cheating on exams, failure to acknowledge a contributing source, and falsely acknowledging a non-contributing source. *If dishonesty occurs in these forms or any others, it may lead to a failing grade for that assignment, failure of the class, or expulsion from WVU. Cheating will not be tolerated in any shape or form.*

**Social Justice:**

West Virginia University is committed to social justice. We concur with that commitment and expect to maintain a positive learning environment based on open communication, mutual respect, and non-discrimination. Our university does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color, or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Disability Services (293-6700).