# CSCE 230 Computer Organization Lab
# Spring 2006 Syllabus

University of Nebraska-Lincoln
Department of Computer Science & Engineering

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| Instructor: | Eric D. Manley |
| Lab webpage: | `http://cse.unl.edu/~cse230a` |
| Meeting Time | Thursday 4:30PM-6:20PM |
| Meeting Location: | Avery 20 |
| Office Hours: | Wednesday 1:00PM-2:00PM, Thursday 2:30PM-3:30PM |
| Office Location: | Ferguson 20 |
| Email: | `emanley@cse.unl.edu` |
| Mailbox: | #97 outside Avery 256 |

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**Course Objectives:**

- Practice and reinforce concepts and techniques learned in CSCE-230. Specifically:
  - Arithmetic and Logic Level Implementation: Basic logic design of combinational and sequential logic, schematic capture, implementation of a control-datapath design.
  - Assembler Language Programming: assembling, loading, & linking in one assembler language, with simplified applications involving flow of control, arrays, loops, procedure calls, parameter passing, and floating point arithmetic.
- Introduction to team work and written & oral communication in the context of a technical design project.
- Gain experience with typical logic design tools & one assembler language programming environment.

**Topics Covered:**

Assembler language programming (approximately 5 weeks)
Logic design (approximately 5 weeks)
Group design project (approximately 5 weeks)

**References:**

- Computer Organization and Design: The Hardware/Software Interface, 3rd Edition by David A. Patterson and John L. Hennessy
- The MIPS Programmer's Handbook by Erin Farquhar and Philip Bunce

**Schedule:**

During the first 10 weeks of the course, we will be completing 10 laboratory assignments. Each assignment consists of a "prelab" portion and an "inlab" portion. The prelab should be obtained from the course website and completed prior to the lab meeting time. Prelabs will be due at the beginning of each lab meeting. The inlab portion should be completed and turned in during the lab meeting. During the final 5 weeks of the course, we will be working on a group project.

**Design Project:**

The group project involves working on a professionally appropriate written report and oral presentation in the context of the design, implementation, and verification of a multi-cycle RISC processor realizing a substantial subset of a typical instruction set. You will use the Quartus II design environment and Field Programmable Logic Arrays. Presentations will be scheduled during the final week and be open to guests from the department.

**Grading:**

Failure to attend a lab meeting will result in forfeiture of all lab points for that meeting unless special arrangements are made with the instructor prior to the meeting time.

Each lab assignment (including both the prelab and inlab portions) will be worth 20 points. The project will be worth 100 points. Thus, there are 300 total points available.

The breakdown of the project grade is as follows:

- Written team technical report (60 points total)
  - Overall quality of the report (20 points)
  - Completeness of the design of the microprocessor with all basic instructions (10 points)
  - Correctness of the microprocessor as demonstrated through simulation on Quartus II (10 points)
  - Implementation of assembly language test programs for the processor (e.g. the multiplication algorithm mentioned above) (10 points)
  - Assembler with a complete and correct set of features for converting test programs to correct MIF (10 points)
- Oral team presentation (40 points total)

- Overall quality of the presentation (20 points)
- Successfully downloading the design with correct I/O interface (10 points)
- Successfully demonstrating the functional correctness of your microprocessor design by running test program(s) and showing correct results (e.g. execute the multiplication algorithm and display the results from the register file to seven-segment display (10 points).

Features of the design not documented in the written report are assumed not to exist.

Letter scores will be assigned as follows for $x$ points earned:

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| A+ | $x \geq 290$ |
| A | $290 > x \geq 280$ |
| A- | $280 > x \geq 270$ |
| B+ | $270 > x \geq 260$ |
| B | $260 > x \geq 250$ |
| B- | $250 > x \geq 240$ |
| C+ | $240 > x \geq 230$ |
| C | $230 > x \geq 220$ |
| C- | $220 > x \geq 210$ |
| D | $210 > x \geq 200$ |
| F | $200 > x$ |

**Academic Integrity:**

You are expected to read and follow the department's academic integrity policy available at

`http://cse.unl.edu/undergrads/academic_integrity.php`.

Since this is a laboratory setting, you may discuss problems with your peers. Furthermore, you are encouraged to "appropriately share knowledge with other students about syntax errors, coding tricks, or other language-specific information that makes programming easier" and "appropriately engage, with other students, in a general discussion of the nature of an assignment, the requirements for an assignment, or general implementation strategies, so long as no one is using a writing implement (computers included) or looking at any code (with the possible exception of helping another student debug their code, if this is permitted by the instructor)" (taken from the examples section of the department's academic integrity policy). However, always independently write your own answer responses, program code, etc.; and acknowledge any assistance you receive.