FALL 2013
ELEC 5200/6200– COMPUTER ARCHITECTURE AND DESIGN
(Required for ECPE, Elective for ELEC)

Bulletin Data: **ELEC 5200. COMPUTER ARCHITECTURE AND DESIGN (3)** LEC. 3. Pr., ELEC 4200. Structural organization and hardware design of digital computers; register transfers; micro-operations, control units and timing; instruction set design; input/output devices, multiprocessors, automated hardware design aids.

ELEC 6200. COMPUTER ARCHITECTURE AND DESIGN (3) LEC. 3. Structural organization and hardware design of digital computers; register transfers; micro-operations, control units and timing; instruction set design; input/output devices, multiprocessors, automated hardware design aids.

Textbook: *Computer Organization & Design: The Hardware/Software Interface*, 4th Ed., *REVISED PRINTING*, D. A. Patterson & J. L. Hennessy, Morgan Kaufmann Publishers (Elsevier), 2008, ISBN 0123744937.

References: On course web page: *http://www.eng.auburn.edu/~nelsovp/courses/elec5200_6200/*

Coordinator: Victor P. Nelson, Professor of Electrical & Computer Engineering

Course Goals:
1. To become familiar with computer instruction set architectures.
2. To become familiar with computer system design principles.
3. To be able to design, model and implement digital computer hardware.

Prerequisites by topic:
1. Combinational and sequential logic circuit design
2. Computer organization
3. Assembly and machine language programming

Topics:

1.	Introduction	(1 class)
2.	History of computers	(2 classes)
3.	Hardware modeling with VHDL	(4 classes)
4.	Theory of computing and instruction set	(5 classes)
5.	Preparing a program to run	(1 class)
6.	Support for modular software design	(1 class)
7.	Computer arithmetic	(4 classes)
8.	Symbol representation and floating point arithmetic	(2 classes)
9.	Datapath and control	(4 classes)
10.	Control unit: Hardwired and microcoded	(2 classes)
11.	Performance of a computer	(2 classes)
12.	Pipelining	(3 classes)
13.	Pipelined control	(2 classes)
14.	Memory organization	(5 classes)
15.	Multi-core CPUs	(2 classes)
16.	Review and examinations	(3 classes)

Typical method for evaluating student performance:

Category	**5200**	**6200**
Homework	25%	20%
CPU Design Project	25%	20%
Exams (2)	25%	25%
Final exam	25%	25%
Research paper		10%

Justification for Graduate Credit in ELEC 6200: Graduates students are challenged with a more intensive design project and are also expected to research and report on a modern multi-core computer architecture.

Computer usage: A small RISC CPU will be designed in the VHDL modeling language, verified via a VHDL simulator, and implemented on a supplied FPGA board. The project will be due on the last class day. Parts of it will be assigned, collected, and graded throughout the semester. 80% of the project grade will be from these individual parts; the other 20% will be for the final project and simulation. Project grades will include components for correctness of design, modeling technique, testing, and documentation.

Academic Honesty Policy: All portions of the Auburn University student academic honesty code (Title XII) found online at http://www.auburn.edu/academic/provost/academicHonesty.html apply to this class.

Every student is expected to do his/her own project. Discussion of various aspects of the project with fellow students is acceptable, provided that designs are not copied. Copying of another student's project will be considered a violation of the academic honesty code by both students.

Class attendance: Class attendance and its effect on course grade are the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

Policy on unannounced quizzes: Unannounced quizzes and their effect on course grade are the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

Accommodations: Students who need accommodations should initiate the process by first making an appointment with The Program for Students with Disabilities, 1244 Haley Center, 844-2096 (V/TT).

Contribution of the course ELEC 5200 to meeting the professional component:

Engineering science: 20%
Engineering design: 80%

Primary student outcomes related to the course ELEC 5200:

Outcome 1: Ability to apply knowledge of math, science and engineering to solve problems.
Outcome 2: Ability to apply in-depth knowledge of one or more disciplines within electrical engineering to the solution of engineering problems.
Outcome 3: Ability to design an electrical component or system to meet desired needs.
Outcome 6: Proficiency in the use of computers and other modern tools to solve engineering problems.

Prepared by: Victor P. Nelson Date: 8/21/13