State University of New York - New Paltz
Department of Electrical and Computer Engineering

Course Title: Digital Logic Fundamentals **Course Number**: ECE 45230	**Instructor**: Dr. Baback Izadi
Days: Monday and Wednesday **Time**: 10 AM - 11:15 AM **Room**: REH 111	**Office**: 203 Resnick Engineering Hall **Phone**: (845) 257-3823 **FAX**: (845) 257-3730
Office Hours: Monday 12:00 - 2:00 PM Wednesday 12:00 - 2:00 PM and by appointment	**Email**: bai@engr.newpaltz.edu **URL**: http://www.engr.newpaltz.edu/~bai **Course**:http://www.engr.newpaltz.edu/~bai/CSE45230/cse45230.html

Teaching Assitant:

- TBA (See the course web site for the up to date information)

- **Course Tutor:**
  Mr. Leon Steiner (retired design engineer from Philips)
  Time: TBA (See the course web site for the up to date information)
  WSB 105A (This is the CSTEP office)

Course Objectives:

The principal goal of this course is to provide an introduction to digital logic design, which is the basis for computer hardware development. The student, at the completion of the course, should be able to analyze and design logic circuits by understanding formal foundations and selected design techniques. The course is made of three main topics. The first topic examines the number representations used in today's digital systems and discusses their arithmetic properties and conversion techniques. The second topic deals with combinational switching theory. Here, students learn to analyze and synthesize networks of digital elements in which no feedback is present. The third subject area deals with analysis and design of clocked sequential circuits, in which feedback is present. An introduction to modern programmable logic devices is also presented.

i. Students will learn the number representations used in today's digital systems and their arithmetic properties and conversion techniques.

ii. Students will learn to analyze and synthesize networks of combinatorial, digital logic elements.

iii. Students will learn to analyze and design digital, clocked sequential circuits.

iv. Students will enhance professional writing and participate in a teamwork process by performing engineering design using modern computer tools and writing a corresponding technical report.

Text: (required)
Digital Design 3rd edition, by M.M. Mano, & Xilinx 6.3XSE PKG, Prentice Hall
ISBN: 0-13-1678485 , ISBN for Book only : 0-13-062121-8

References:
1. *Fundamentals of Digital Logic with VHDL Design*, 2nd Edition, S. Brown and Z. Vranesic, McGraw Hill
2. *VHDL Starter's Guide*, S. Yalamanchili, Prentice Hall
3. Contemporary Logic Design, 2nd Edition, Prentice Hall
4. *Digital Design Principles and Practices*, 3rd Edition, J. Wakerly, Prentice Hall
5. *An Engineering Approach to Digital Design*, W. I. Fletcher, Prentice Hall

Lecture Topics	***Reading***
Digital computers, number systems	1-1, 2
Arithmetic, base conversion	1-3, 4, 5, 6
Codes	1-7
Boolean algebra and gates	1-9, 2-1, 2, 3, 4
Standard forms	2-5, 6, 7
Karnaugh map simplification	3-1, 2
EXAM 1 -- Feb. 22, 2006 *	
Karnaugh map simplification	3-3, 4, 5
Gates and logic implementation	3-6, 8
Combinational logic design	4-1, 2, 3
Adders and subtractors	4-4, 5, 6
Decoders and encoders	4-7, 8, 9
Multiplexers and demultiplexers	4-10
Programmable logic devices	7-5, 6, 7, 8, Handout
EXAM 2 -- March 29, 2006 *	
Introduction to VHDL	Handout and tutorial
Sequential circuits and flip-flops	5-1, 2, 3
Ripple counters	6-3
Analysis of sequential circuits	5-4
Sequential circuit design	5-7
EXAM 3 -- May 3, 2006 *	
Registers	6-1, 2
Counters	6-4, 5
Design of a simple controller	Handout
FINAL -- Wednesday, May 17, 2006	08:30-10:30AM

* Tentative dates, actual dates will be announce at least one week prior to each exam.

Grading:

Homework	70 Points
Course Project	30 Points
3-tests	300 Points
Final	100 Points

Web Pages:

- The course web page is http://www.engr.newpaltz.edu/~bai/CSE45230/cse45230.html. You should bookmark the page for easy access. Class information and assignments will be posted on that page. You are responsible for checking the web page every week.

- For information on Xilinx tools, you can check http://university.xilinx.com/univ/xds1.htm

Special dates:

February 20	President's Day (no classes)
March 13	Mid-Point of Spring 2006 semester
March 20-March 24	Spring Break. Classes resume 8:00 a.m. March 27, 2006.
March 31	Undergraduates: Last day to withdraw from College without failing grades for the semester
April 13	Passover (no classes)
May 9	No Tuesday classes. Thursday classes meet this day.
May 10	Last day of classes for Spring 2006.
May 11	Study Day
May 12	Common Exam Day
May 17	Final examinations (8:30-10:30AM)

Course Rules and General Comments:

- The examinations in this course are closed book, closed notes, and no calculator. The lowest test score will be dropped. The specified dates are tentative; one week's notice will be given to announce the exact date of each exam. Should an exam schedule conflict occur, you should bring it to the instructor's attention as soon as possible. Once you begin an exam, no makeup or other score adjustments will be permitted. Please note the date and time of the final exam and do not schedule any event that will not permit you to take the final at that time.

- Homework assignments are generally from the textbook and are given on a weekly basis; the assignments will be posted on the course web site. The due date is one week from the distribution date (unless otherwise specified). Once the homework is graded and returned to class, the solutions will be posted on the class web page. No late homework set is accepted except under extreme non-academic condition and with the prior approval of the instructor.
- A course project will be assigned to carry out simulation and design verification using the student edition of Xilinx design tools. Upon completion of the project, each student is required to submit a formal report. The due date for the report is **May 10, 2006**.
- Any disputed grade must be resolved within 7 days of the return of the graded item. Please check with the teaching assistant first and then with the instructor if needed.
- You are responsible for all the course materials and all lecture contents unless specified otherwise by the instructor. If you miss a class, it is your responsibility to obtain assignments and other information given on that day.
- All your coursework (homework, project, and exams) is expected to be your own. Evidence indicating copying of work or other cooperation will be dealt with based on university academic conduct rules. General instructions such as assisting in problem interpretation, and giving of occasional hints on problem attack (i.e., the kind of help you would get from the instructor or a teaching assistant in the course!), however, are permitted. On the other hand, you are encouraged to form informal study groups to work out homework problems.

- If you have questions on course materials, both the instructor and teaching assistant will be available for consultation. Please try to get answers before serious difficulties in your understanding of course material arise. In particular, it is much better to get your questions answered before an exam than after!

- Save your graded homework, tests, and project report. I may ask for them in case of any grade discrepancy.

Please pay attention to the following requirements regarding your homework assignments:

- Always use standard size (8½ × 11) paper. Do not use papers torn-off from spiral bound notebooks. (maximum penalty 10%)
- Write the course #, homework set #, and your name on top of the first page, as shown below: (maximum penalty 10%)

Course # Homework set # your name

- Write clearly, neatly, and in an orderly fashion. (maximum penalty 10%)
- Draw schematics and circuit diagrams when applicable. (maximum penalty 20%)
- Show steps involved getting to the final answer, no credit may be given for the work not shown.
- Box-in your final answers. (maximum penalty 10%)
- Staple all homework pages together before you turn them in. (maximum penalty 10%)

Project Guideline

Late projects are not accepted. If your project is not complete by the due date, you should hand in the incomplete project for a partial credit. Project reports should be professionally documented and should consist of following. You should use a word processor and a CAD tool to document your work. Your report should be properly placed in a folder. The report should have the following sections:

- Cover sheet indicating title of the project, course name and number, date (semester and year), and your name.
- Table of contents.
- Introduction - describing the project for a practicing engineering.
- Procedure - your complete design including the circuitry.
- Simulation results.
- Conclusion (problems encountered, lessons learned, etc.).

Your report should be free of grammatical and spelling errors. Your project should reflect your own work. If unreasonable similarities are recognized between the turned in projects, they will receive failing grades.