

## EECE 143 - DIGITAL ELECTRONICS LABORATORY

### Course Description:

Gaining experience in the design, assembly, testing, and trouble-shooting of digital electronic circuits. Experiments encompass a wide range of topics such as combinational circuits, sequential circuits, clock circuits, programmable logic devices, and microprocessors.

### Prerequisites:

EECE 112 with a minimum grade of C; EECE 041 with a minimum grade of C; and either EECE 190, COEN 030, or BIEN 185 which may be taken concurrently. It is the responsibility of the student to ensure that these pre-requisites are met. Successful completion of EECE 143 with the proper sequence of prerequisites is a requirement for graduation.

### Course Materials:

#### Required:

EECE 143 Component Kit  
EECE Tool Kit  
Engineering & Science Notebook (National 33-610)  
EECE 143 Digital Design Laboratory Manual and Class Notes  
ON Semiconductors, High-Speed CMOS Data Book  
Motorola, M68HC11 Reference Manual, 1990.

#### Optional:

Digital Design Text for EECE 112

Each student is required to purchase a component package and Notebook.  
Each student is required to bring their own breadboard and tools to lab.

### Course Goals:

- Apply theory learned in EECE 112 including combinational and sequential circuit design, decoders, multiplexors, and programmable logic devices.
- Utilize CUPL software to program programmable logic devices.
- Write programs to use a microprocessor in control applications

### Course Objectives:

*By the end of this course, you should...*

- Be able to design, build, test, troubleshoot, and evaluate digital circuits
- Be able to utilize computer software such as Electronic Work Bench (Multisim), PSPICE, and CUPL.
- Be able to evaluate and revise designs as actual performance is reviewed.
- Be able to prepare a written report that effectively communicates the objective, the design procedure, the experimental results, and the conclusion for any project design.

**Course Topics:****TENTATIVE Laboratory Schedule**

Laboratory	Title	Lecture Date	Laboratory Date
0	Introduction to Digital Lab	Jan 14	Jan 22,24
1	Boolean Implementation	Jan 14	Jan29,31
2	Standard Combinational Circuits	Feb 4	Feb 5,7
3	One shots, Clocks & Counters	Feb 4	Feb 12,14
4	Flip flops, Registers & Shift registers	Feb 11	Feb 19,21
5	Programmable Logic Devices 1	Feb 18	Feb 26,28
6	Programmable Logic Devices 2	Feb 25	Mar 5,7
7	Microprocessor 1 – Intro to Microcontrollers Written Report	Mar 4	Mar 19,21
8	Microprocessor 2 – Software Written Report Due	Mar 18,25 Mar 25	Apr 2,4
9	Microprocessor 3 – Countdown timer	Apr 8,15	Apr 16,18,23,25
10	Microprocessor 10 – Soda Machine Controller	Apr 22	Apr 30, May 2
	Evaluation & SCOT	Apr 29	

**Instructor Information:**

Mr. J. Christopher Perez  
Room: Haggerty Engineering, Rm 482A  
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E-mail: [chris.perez@marquette.edu](mailto:chris.perez@marquette.edu)  
Office: 288-3609  
Office Hours: M,W 3pm-4pm  
Course Website: <http://www.eng.mu.edu/~perezjc/eece143.html>

**Teaching Assistant Information:**

Name TBA  
Email TBA  
Lab Sections All  
Office Hours TBA

**Attendance Policy:**

Attendance is mandatory for all lectures and labs. The instructor may allow make-up work for excused absences when reported to the General Engineering Office.

Lectures are      1002    M      4:20PM-5:10PM      WW153

Laboratories are   2001    Tu      8:00AM - 10:50AM      EN365  
                             2002    Tu      11:00AM - 1:50PM      EN365  
                             2003    Th      8:00AM - 10:50AM      EN365  
                             2004    Th      11:00AM - 1:50PM      EN365  
                             2005    Th      2:00PM - 4:50PM      EN365  
                             2006    F      8:00AM - 10:50AM      EN365  
                             2007    M      8:00AM - 10:50AM      \*\*Cancelled  
                             2701    Tu      5:45PM - 8:35PM      EN365

## Grading Policy

		Grading Scale	
One Introductory Lab @ 20 pts	20 points	93.0-100.0	A
Four Discrete Logic Labs @ 30 pts	120 points	89.0-92.9	AB
Two PLD Labs @ 30 pts	60 points	85.0-88.9	B
Four Microprocessor Labs @ 30 pts	120 points	81.0-84.9	BC
Eleven laboratory written reports @ 25 pts	275 points	77.0-80.9	C
Written Report	50 points	73.0-76.9	CD
Five Quizzes @ 10 pts	50 points	70.0-72.9	D
Lab Notebook	55 points	Below 70.0	F
Total	750 points		

Each Lab consists of a series of experiments or procedures. Each Lab (except the introductory lab) will be graded on the basis of 55 total points, with 10 points assigned to the preparation, 20 points assigned to the actual Lab work and 25 points assigned for Post-Lab work. Post lab work shall include a written report.

**Lab Teams:** Lab teams consisting of two students will be formed during the first lab period. It is expected that both team members will contribute to **ALL** the lab work.

**Laboratory Preparation:** Each student is responsible for maintaining his/her own Laboratory Notebook. (National 33-610) The preliminary lab work of preparing data sheets, designing circuits, performing calculations, answering questions, etc. should be written in the Lab Notebook. Each student is required to perform pre-lab work and enter it into his/her notebook. The lab assistant will examine your notebooks during lab period and assign a grade based upon the quality and contents of your pre-lab work. At the end of the semester all notebooks will be collected for a final grade by the instructor.

**Lab Work:** Each lab team must be "checked out" by the TA. Check-out will be used to confirm that the actual lab work as recorded in the lab notebook has been completed and that the lab station has been properly cleaned up. The TA will initial and date all the data acquired during the lab period.

Each lab should be completed during the lab period. If a group is unable to complete the lab work, they may complete it in the Open Laboratory or in the digital laboratory, if granted special permission by the instructor. The work must be checked to verify that all laboratory exercises are complete. All lab work should be completed before the next laboratory period.

**Laboratory Written Reports:** Reports are due one week after the lab section that lab work is to be performed, either at the beginning of the next lab period. Each written report shall include the following: a discussion of the goals of the laboratory, a description of the design of the circuitry involved in the laboratory, complete schematic diagrams, completed data tables, an analysis of your laboratory results and conclusion. Written reports should be typed double-spaced and all drawings should be done with a computer or hand-drawn **NEATLY**.

**Written Research Report:** A 5-10 page written research report is required by each student. Students will perform research on one aspect of digital electronics and how it is used in industry and in the world today. Students are encouraged to perform research online as well as traditional means. Papers should be typed double-spaced and complete with a list of sources.

**Assistance in the Lab:** Students should be prepared to learn to operate most laboratory equipment with little or no help. The TA is available in the lab to help the students master the basic operation of the equipment, to monitor their safety and security, to assist the instructor in ensuring that proper and sufficient equipment/devices/ICs are available to the students to carry out the lab work, to monitor the security of the equipment, and to identify inoperative equipment and take appropriate steps for necessary repairs.

Although the TA and the instructor are available, students must take primary responsibility for the design, construction, trouble-shooting, and operation of their circuits. The TA and/or the instructor are not responsible for debugging the circuits, verifying the designs and checking the circuit wiring.