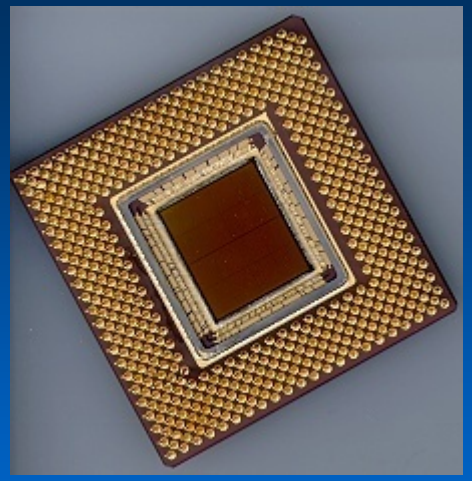


Purdue IM:PACT* Spring 2019 Edition

*Instruction Matters: Purdue Academic Course Transformation

Introduction to Digital System Design

ECE 270 Course Introduction

https://engineering.purdue.edu/ece270

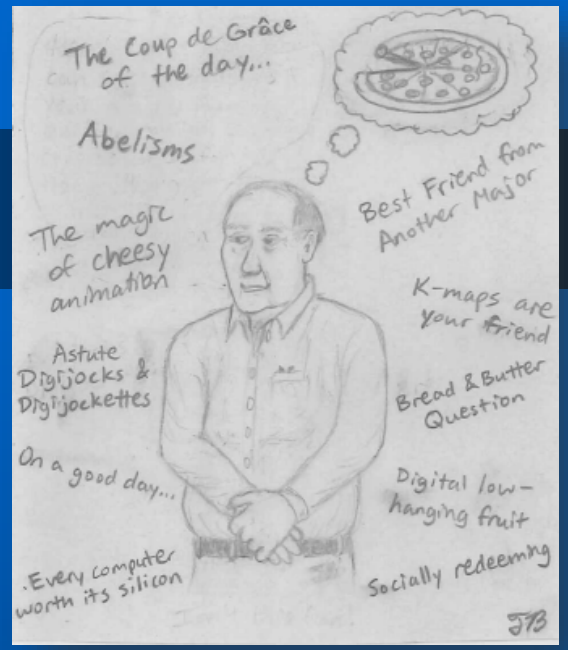
Instructor – 10:30 MWF

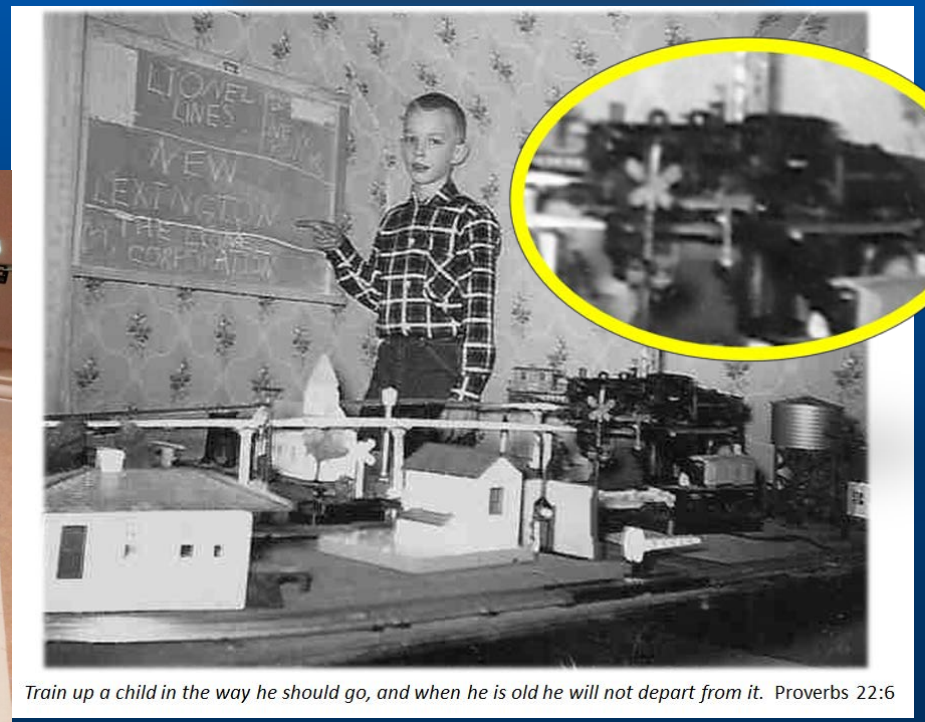
Prof. Dave Meyer

Office: MSEE 238

Hours: T/W/R 3:00-4:00 pm

E-mail: meyer@purdue.edu

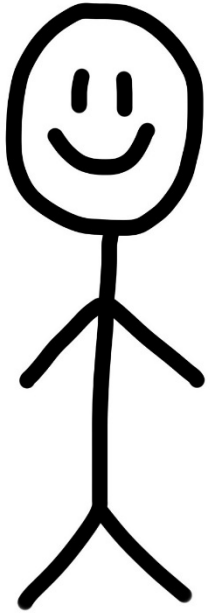




Train up a child in the way he should go, and when he is old he will not depart from it. Proverbs 22:6

Instructor – 4:30 MWF

Dr. Rick Kennell
Office: EE 252
Hours: M/W/F 2:00-3:00 pm
E-mail: rick@purdue.edu



Not an actual picture of Rick

Course Description

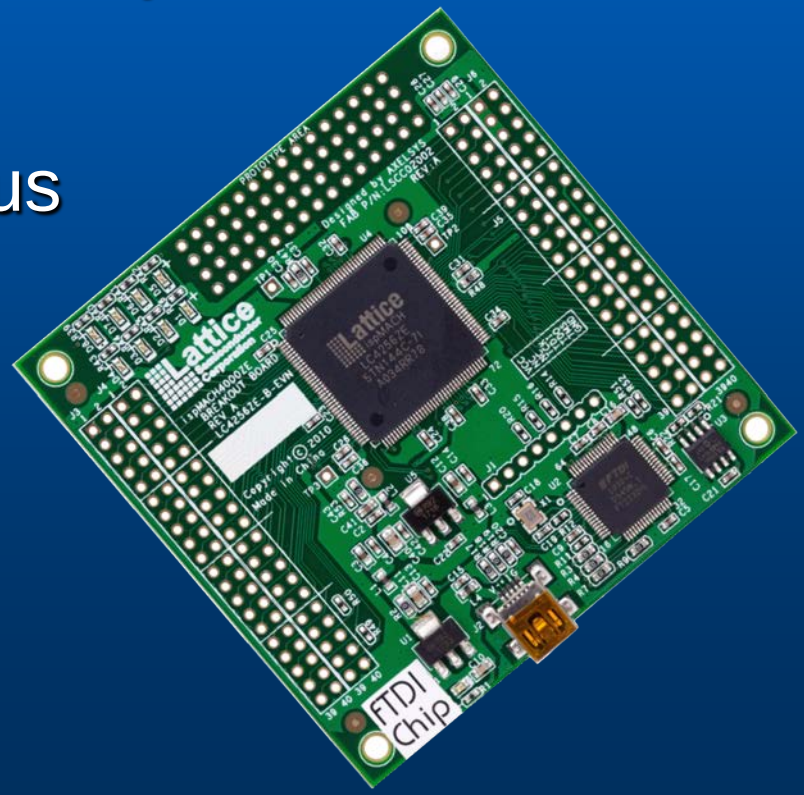
- Introduction to digital system design and hardware engineering
- Emphasis: practical design techniques and circuit implementation
- Lectures, homework, and labs are tightly coupled and highly integrated

Purpose and Prerequisites

- Intended as an ECE “core” course that serves as a *prerequisite* for upper-division Computer Engineering courses, e.g., ECE 337, ECE 362, ECE 437, ECE 477
- *Required background* is a basic understanding of circuits (voltage, current, Ohm’s Law) and electrical components (resistors, capacitors, switches, diodes, MOSFETs)

Why This Course Is Important

- If you go into virtually any form of engineering design, there is a high probability that knowledge of digital systems will be required at some level
- Programmable logic devices (the main focus of this course) represent a *basic building block* of modern digital system design



Course Text, E-mail, and Web Site

- *Digital Design Principles and Practices – 5th Ed.,* John F. Wakerly, Prentice Hall, 2017

NOTE: This text is also used as a reference in ECE 362, ECE 337, and ECE 477

- You will also need to purchase an iClicker student response unit, available at bookstores (register your iClicker on Blackboard)
- Please E-mail all course-related correspondence to ece270@ecn.purdue.edu
- Course web site – "everything you need to succeed in ECE 270 is posted here" – **https://engineering.purdue.edu/ece270**

ECE 27000 – *Introduction to Digital System Design* – Spring 2019

COURSE CALENDAR

Monday	Tuesday	Wednesday	Thursday	Friday
Jan 7 Course Introduction	Jan 8 **LAB INTRO**	Jan 9 Module 1-A **LAB INTRO**	Jan 10 **LAB INTRO**	Jan 11 Module 1-B **LAB INTRO**
Jan 14 Module 1-C	Jan 15 **LAB 1**	Jan 16 Module 1-D **LAB 1**	Jan 17 **LAB 1**	Jan 18 Module 1-E **LAB 1**
Jan 21 **MLK Day**	Jan 22 **LAB 2**	Jan 23 Module 1-F **LAB 2**	Jan 24 **LAB 2**	Jan 25 Module 1-G **LAB 2**
Jan 28 Module 1-H,I	Jan 29 **LAB 3**	Jan 30 Module 1-J **LAB 3**	Jan 31 **LAB 3**	Feb 1 Module 2-A **LAB 3**
Feb 4 Module 2-B	Feb 5 **LAB 4**	Feb 6 Module 2-B,C **LAB 4**	Feb 7 **LAB 4**	Feb 8 ***Day Off for Evening Exam*** **LAB 4**
Feb 11 Module 2-D	Feb 12 **LAB 5**	Feb 13 Module 2-E **LAB 5**	Feb 14 **LAB 5**	Feb 15 Module 2-F **LAB 5**
Feb 18 Module 2-G	Feb 19 **LAB 6**	Feb 20 Module 2-H **LAB 6**	Feb 21 **LAB 6**	Feb 22 Module 2-I,J **LAB 6**
Feb 25 Module 3-A,B	Feb 26 **LAB 7**	Feb 27 Module 3-B **LAB 7**	Feb 28 **LAB 7**	Mar 1 Module 3-C **LAB 7**

Monday	Tuesday	Wednesday	Thursday	Friday
Mar 4 Mod 3-D	Mar 5 **LAB 8**	Mar 6 Module 3-E **LAB 8**	Mar 7 **LAB 8**	Mar 8 ***Day Off for Evening Exam*** **LAB 8**
Mar 11 **Spring Break**	Mar 12 **Spring Break**	Mar 13 **Spring Break**	Mar 14 **Spring Break**	Mar 15 **Spring Break**
Mar 18 Module 3-F	Mar 19 **LAB 9**	Mar 20 Module 3-G **LAB 9**	Mar 21 **LAB 9**	Mar 22 Module 3-H **LAB 9**
Mar 25 Module 4-A,B	Mar 26 **LAB 10**	Mar 27 Module 4-B **LAB 10**	Mar 28 **LAB 10**	Mar 29 Module 4-C **LAB 10**
Apr 1 Module 4-D	Apr 2 **LAB 11**	Apr 3 Module 4-E **LAB 11**	Apr 4 **LAB 11**	Apr 5 Mod 4-F **LAB 11**
Apr 8 Mod 4-G	Apr 9 **LAB 12**	Apr 10 Mod 4-H,I **LAB 12**	Apr 11 **LAB 12**	Apr 12 Mod 4-I **LAB 12**
Apr 15 Mod 4-J	Apr 16 **LAB 13**	Apr 17 Mod 4-J,K **LAB 13**	Apr 18 **LAB 13**	Apr 19 Mod 4-K **LAB 13**
Apr 22 Lab Practical Review	Apr 23 **Lab Practical**	Apr 24 ***Day Off for Evening Exam*** **Lab Practical**	Apr 25 **Lab Practical**	Apr 26 ***Spark Challenge Design Showcase*** **3:00 - 7:00 pm** **Lab Practical**

Lecture Notes

- Two versions are available:
  - Lecture Summary Notes: intended primarily as a "skeleton reference" for following along with the lecture and taking notes during class *(formatted for printing)*
  - Class Presentation Slides: intended primarily for use as an "on screen" reference for annotating a printed copy of the *Lecture Summary* notes *(not formatted for printing)*
- Posted in PDF format on the course web site *(notes and slides will be progressively updated as the semester progresses)*

Lab Kits

- *If you have not done so already* (i.e. for a previous lab course like ECE 207), you will need to order a "Master Kit" that includes the following items:
  - *BB-1 Breadboard Kit*
  - *DK-2 Digital Kit*
  - *TK-1Tool Kit*
  - *Wire Kit*
  - *DC Adapter – 5V Regulated*

Order on-line from Electronix Express the first week of classes to obtain FREE SHIPPING and timely delivery of your kits

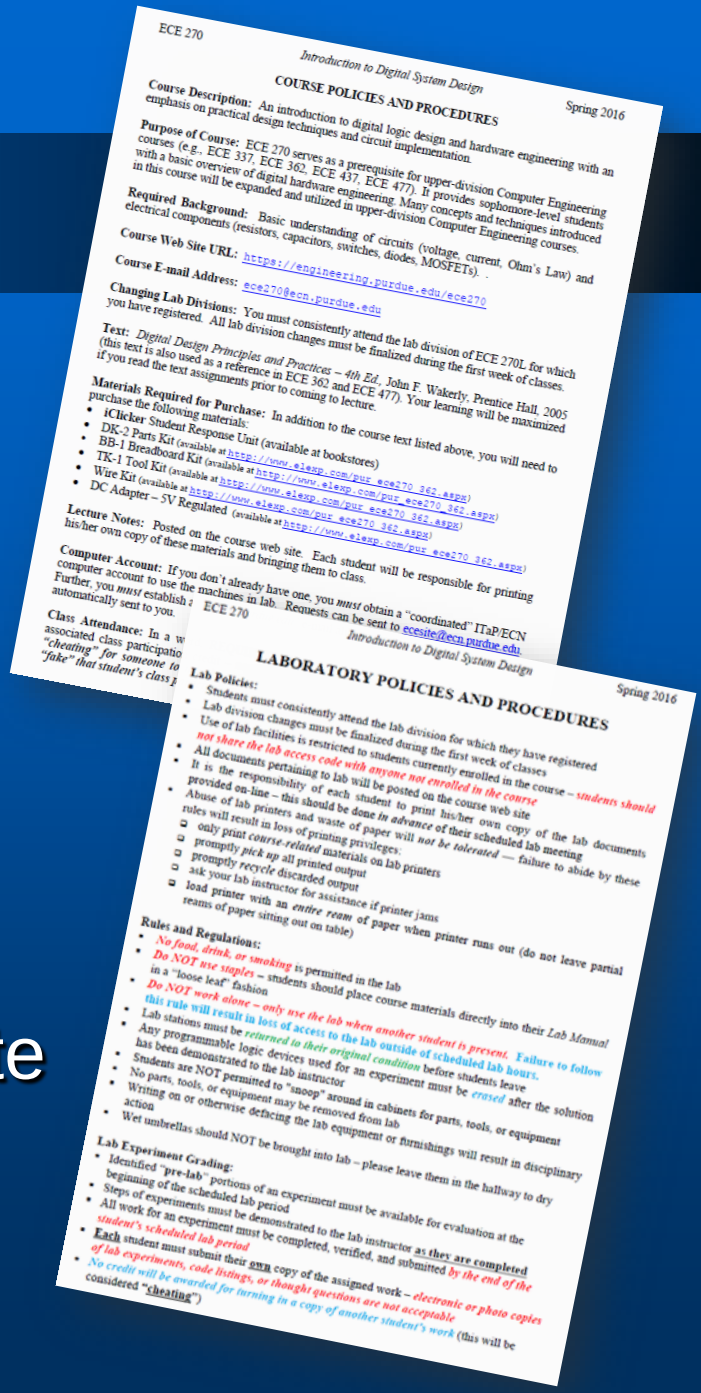
- Link provided on course website Message Board for ordering
- You will also need a 3-ring binder for your *Lab Manual* and *Lecture Summary Notes*

Lab Experiments

- The lab for this course is located in room EE 065
- You must *consistently attend* the lab division for which you have officially registered
- Quizzes will be given at the *beginning* of each lab period (starting with Lab Experiment 1)
- Pre-lab exercises that are assigned must be finished by the *beginning* of your scheduled lab
- Steps of experiments must be demonstrated to your lab instructor *as they are completed*
- All work for a given lab must be completed *by the end of your scheduled lab period* to receive credit
- Make-ups require an *officially excused absence* and *pre-approval* by your Lab Instructor

Homework

- Problem sets will be posted on the web site
- Collected at the beginning of your scheduled lab period and returned the following week
- No credit will be awarded for late homework
- Your first assignment is to read the *Course Policies & Procedures* and *Lab Policies and Procedures* documents posted on the web site



ECE 270 — *Introduction to Digital System Design* — Spring 2016

COURSE POLICIES AND PROCEDURES

Course Description: An introduction to digital logic design and hardware engineering with an emphasis on practical design techniques and circuit implementation.

Purpose of Course: ECE 270 serves as a prerequisite for upper-division Computer Engineering courses (e.g., ECE 337, ECE 362, ECE 437, ECE 477). It provides sophomore-level students with a basic overview of digital hardware engineering. Many concepts and techniques introduced in this course will be expanded and utilized in upper-division Computer Engineering courses.

Required Background: Basic understanding of circuits (voltage, current, Ohm's Law) and electrical components (resistors, capacitors, switches, diodes, MOSFETs).

Course Web Site URL: https://engineering.purdue.edu/ece270

Course E-mail Address: ece270@ecn.purdue.edu

Changing Lab Divisions: You must consistently attend the lab division of ECE 270L for which you have registered. All lab division changes must be finalized during the first week of classes.

Text: *Digital Design Principles and Practices – 4th Ed.*, John F. Wakerly, Prentice Hall, 2005 (this text is also used as a reference in ECE 362 and ECE 477). Your learning will be maximized if you read the text assignments prior to coming to lecture.

Materials Required for Purchase: In addition to the course text listed above, you will need to purchase the following materials:

- **iClicker** Student Response Unit (available at bookstores)
- DK-2 Parts Kit (available at http://www.elexp.com/pur_ece270_362.aspx)
- BB-1 Breadboard Kit (available at http://www.elexp.com/pur_ece270_362.aspx)
- TK-1 Tool Kit (available at http://www.elexp.com/pur_ece270_362.aspx)
- Wire Kit (available at http://www.elexp.com/pur_ece270_362.aspx)
- DC Adapter – 5V Regulated (available at http://www.elexp.com/pur_ece270_362.aspx)

Lecture Notes: Posted on the course web site. Each student will be responsible for printing his/her own copy of these materials and bringing them to class.

Computer Account: If you don't already have one, you *must* obtain a "coordinated" ITaP/ECN computer account to use the machines in lab. Requests can be sent to ecesite@ecn.purdue.edu. Further, you *must* establish a

Class Attendance: In a w
associated class participatio
"cheating" for someone to
"fake" that student's class p

ECE 270 — *Introduction to Digital System Design* — Spring 2016

LABORATORY POLICIES AND PROCEDURES

Lab Policies:

- Students must consistently attend the lab division for which they have registered
- Lab division changes must be finalized during the first week of classes
- Use of lab facilities is restricted to students currently enrolled in the course – *students should not share the lab access code with anyone not enrolled in the course*
- All documents pertaining to lab will be posted on the course web site
- It is the responsibility of each student to print his/her own copy of the lab documents provided on-line – this should be done *in advance* of their scheduled lab meeting
- Abuse of lab printers and waste of paper will *not be tolerated* — failure to abide by these rules will result in loss of printing privileges.
  - only print *course-related* materials on lab printers
  - promptly *pick up* all printed output
  - promptly *recycle* discarded output
  - ask your lab instructor for assistance if printer jams
  - load printer with an *entire ream* of paper when printer runs out (do not leave partial reams of paper sitting out on table)

Rules and Regulations:

- *No food, drink, or smoking* is permitted in the lab
- *Do NOT use staples* – students should place course materials directly into their *Lab Manual* in a "loose leaf" fashion
- *Do NOT work alone – only use the lab when another student is present.* Failure to follow this rule will result in loss of access to the lab outside of scheduled lab hours.
- Lab stations must be *returned to their original condition* before students leave
- Any programmable logic devices used for an experiment must be *erased* after the solution has been demonstrated to the lab instructor
- Students are NOT permitted to "snoop" around in cabinets for parts, tools, or equipment
- No parts, tools, or equipment may be removed from lab
- Writing on or otherwise defacing the lab equipment or furnishings will result in disciplinary action
- Wet umbrellas should NOT be brought into lab – please leave them in the hallway to dry

Lab Experiment Grading:

- Identified "**pre-lab**" portions of an experiment must be available for evaluation at the beginning of the scheduled lab period
- Steps of experiments must be demonstrated to the lab instructor **as they are completed**
- All work for an experiment must be completed, verified, and submitted *by the end of the student's scheduled lab period*
- **Each** student must submit their **own** copy of the assigned work – *electronic or photo copies of lab experiments, code listings, or thought questions are not acceptable*
- *No credit will be awarded for turning in a copy of another student's work* (this will be considered "**cheating**")

Class Participation

- Bring your iClicker to each class meeting – *a properly registered, working iClicker is required to earn class participation credit – no exceptions will be made*
- *Attendance is required to earn class participation credit – no exceptions will be made*
- *Register your iClicker on Blackboard – use will begin on Friday, January 12*
- *Do not "freak out" if you forget your iClicker or it malfunctions – several sessions will be "dropped"*

Office Hours

Scheduled office hours for all course staff members are posted on the course web site

Use of “live” contact hours is encouraged for asking questions about the course material!

Lab Office Hours (Monday-Thursday, 7:00-10:00 PM) will start January 14

Student Info Form

(completed during first lab meeting)

PURDUE UNIVERSITY

Complete the Index of Learning Styles inventory at http://www.engr.ncsu.edu/learningstyles/ilsweb.html and record your learning styles results for each dimension below. Note that students with some combination of REF, VRB, and/or SEQ preferences are typically best suited for the Traditional Lecture division; while students with some combination of ACT, VIS, and/or GLO preferences are likely to benefit from the Directed Problem Solving division. *All students should be able to succeed in either division, however.*

Active/Reflective

ACT 11	ACT 9	ACT 7	ACT 5	ACT 3	ACT 1	REF 1	REF 3	REF 5	REF 7	REF 9	REF 11
○	○	○	○	○	○	○	○	○	○	○	○

Sensing/Intuitive

SEN 11	SEN 9	SEN 7	SEN 5	SEN 3	SEN 1	INT 1	INT 3	INT 5	INT 7	INT 9	INT 11
○	○	○	○	○	○	○	○	○	○	○	○

Visual/Verbal

VIS 11	VIS 9	VIS 7	VIS 5	VIS 3	VIS 1	VRB 1	VRB 3	VRB 5	VRB 7	VRB 9	VRB11
○	○	○	○	○	○	○	○	○	○	○	○

Seuential/Global

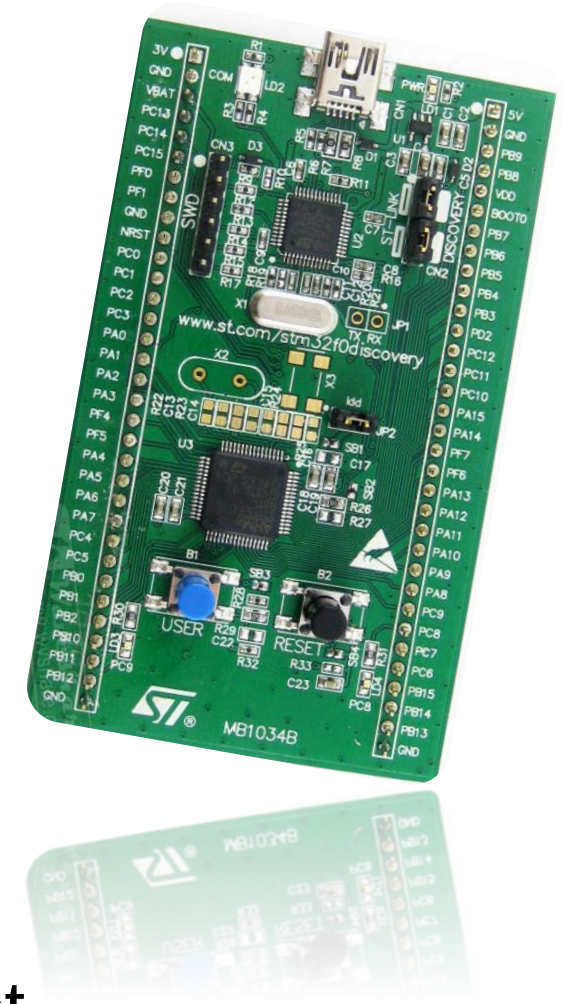
SEQ 11	SEQ 9	SEQ 7	SEQ 5	SEQ 3	SEQ 1	GLO 1	GLO 3	GLO 5	GLO 7	GLO 9	GLO 11
○	○	○	○	○	○	○	○	○	○	○	○

Write a paragraph describing something you consider important about yourself (e.g., a special talent, hobby, particular career interest, issue that is important to you, etc.):

Write a paragraph describing how you best learn (e.g., by listening to a lecture, by watching someone work examples, by reading a textbook, by working problems yourself or with a "study buddy", etc.)"

Sample ECE 362 Mini-Projects and ECE 477 Senior Design Projects

ECE 362 Mini-Project



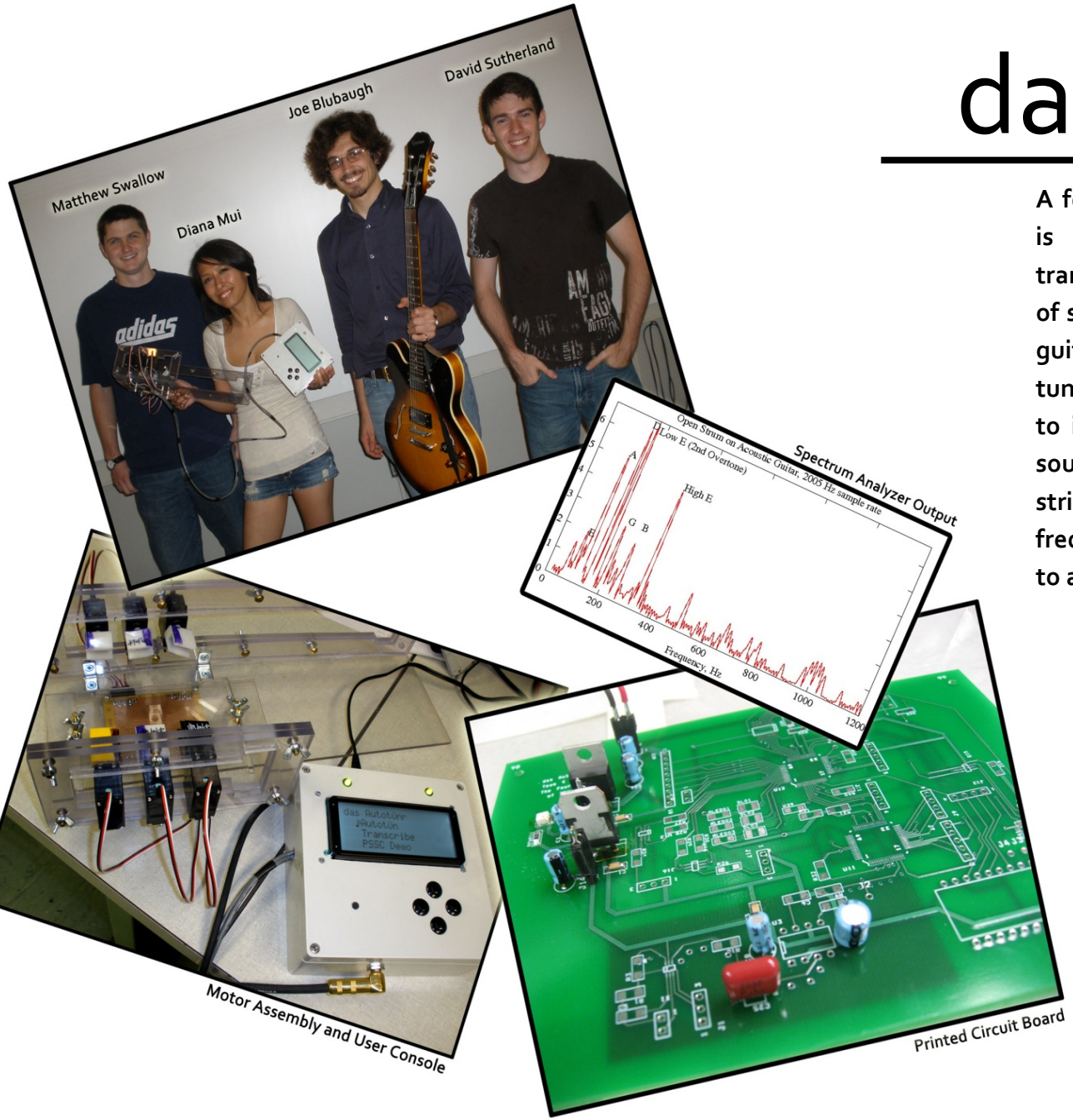
- Embedded system design based on microcontroller kit
- Basic requirement is to design a product that makes good use of the microcontroller's computational and interfacing resources
- Done in teams of 2-4 students (self-selected)
- Projects showcased at Spark Challenge (held on last day of classes)


ECE 362 Mini-Project
Design Showcase

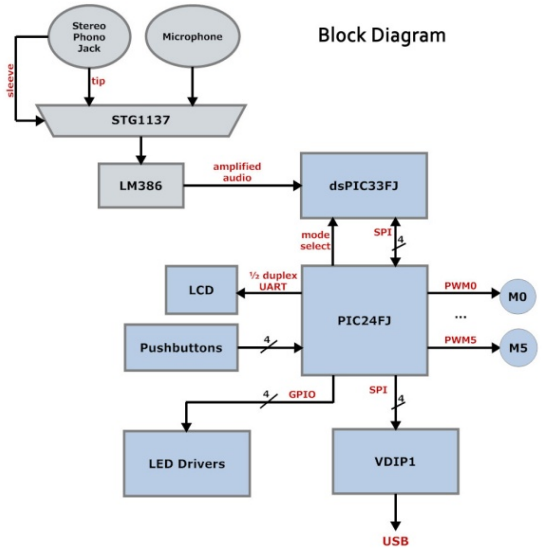
ECE 477 Senior Design Project

- Open-ended, team-specified embedded microcontroller-based device of *personal interest* to (most) team members
- Done in teams of 4 students (self-selected)
- Tractable, yet “difficult enough”
- Must utilize a microcontroller and may also utilize a CPLD or FPGA
- May also utilize a “motherboard” (e.g. R-pi)
- Must interface to something: sensor, keypad, LCD, etc. using USB, Ethernet, Firewire, IR, RF, etc.
- Requires the design of a two-layer custom printed circuit board (PCB)
- Must satisfy five general and five project-specific success criteria
- Opportunity to develop communication and teamwork skills that will be needed in industry

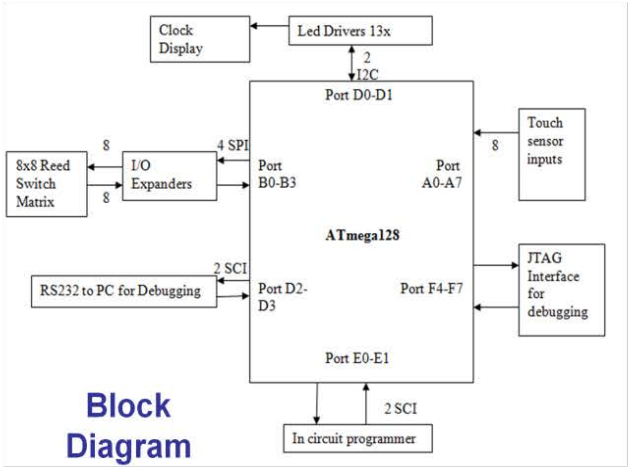
das Autotünr



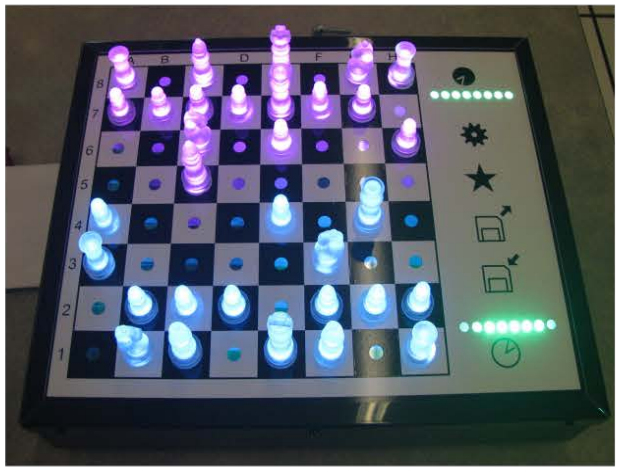
A feat of Purdue engineering, das Autotünr is an automatic guitar tuner and MIDI transcription device. It has a motor assembly of six servo motors which turn the pegs of a guitar based to a default or user-defined tuning. A discrete Fourier transform is used to identify the fundamental frequency of a sound signal. The motors will adjust the strings to match the correct frequency. The frequencies can also be stored as a MIDI file to a USB mass storage device.



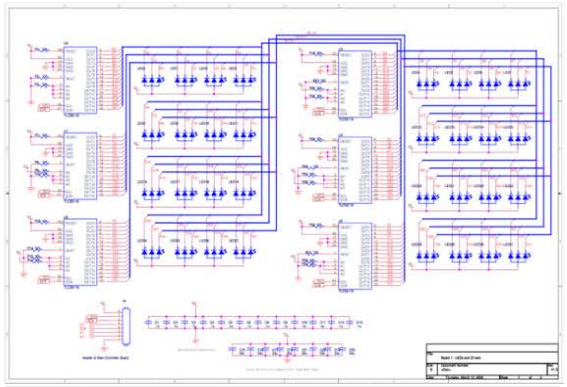
Not So Deep Blue



Block Diagram



Product

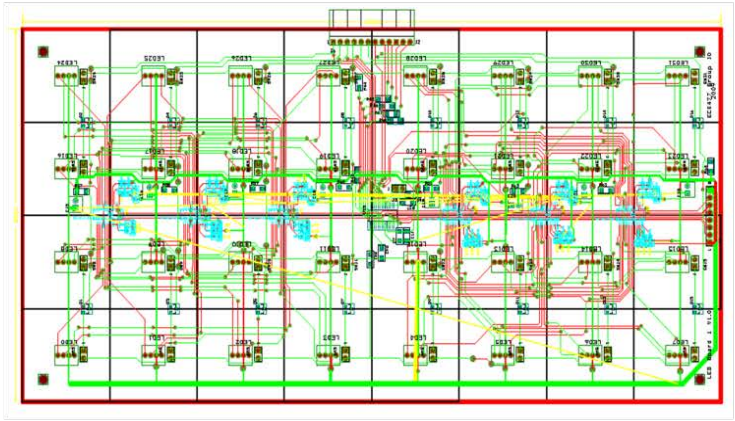


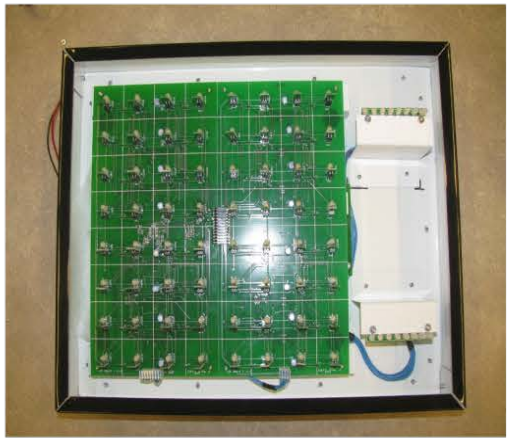
Schematic

Not So Deep Blue **is an electronic chess board.**

The product enhances game experience by displaying possible moves when a piece is picked up. Piece detection is achieved using reed switches under each square on the board and magnets on each piece. Game information is displayed using RGB LEDs. This includes game time, player turn, piece location and possible moves.

LED/reed switch PCB

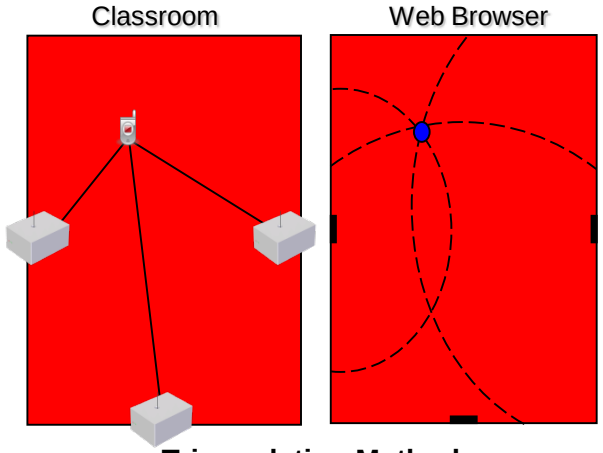




Package

We Will Find You

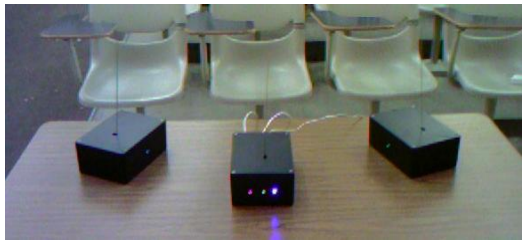
"We Will Find You" **is a group of three distributed modules that detect and determine the location of a cell phone in a defined area.**



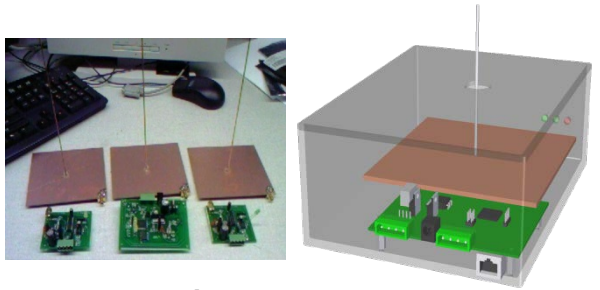
Triangulation Method

- **The main module and a pair of satellite modules are placed to the corners of an isosceles triangular area.**
- **The power levels received by the antennas are transmitted to the main module.**
- **The location of the cellular phone is calculated by the main microcontroller using triangulation method.**
- **It is displayed on a web browser through Ethernet connection.**

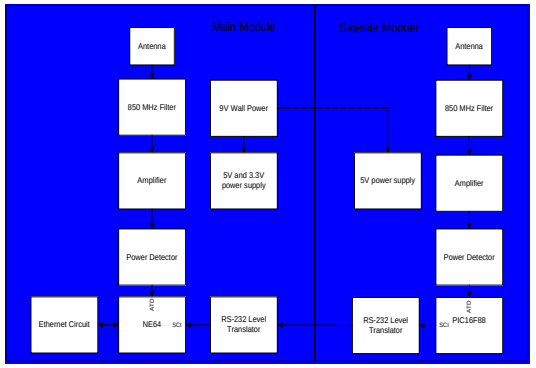
Mehmet Gunal, EE **Brian Hemmersmeier, CompE** **Ali Mihankhah, CompE** **Eric Naglich, EE**



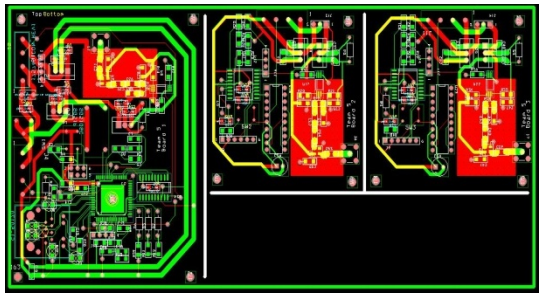
Main and Satellite Modules



PCB and Antenna Components



Block Diagram



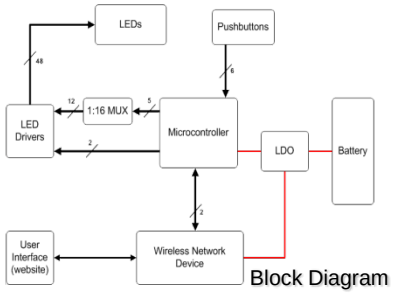
PCB Layout

Project Specific Success Criteria

- **An ability to send data from two satellite antenna modules to the main microcontroller.**
- **An ability to measure band-specific RF energy generated by cell phones through designed antennas and receivers.**
- **An ability to determine the position of a cell phone relative to the antenna modules' positions.**
- **An ability to render a graphical display of the position of the detected cell phone.**
- **An ability to calibrate the device for different sized detection areas based on triangular antenna arrangement.**

RoboRubik

Design



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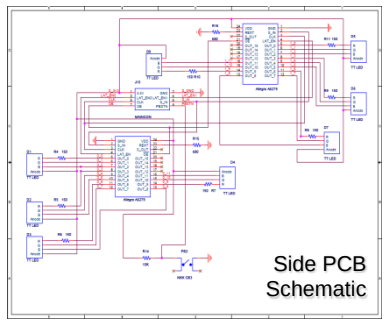
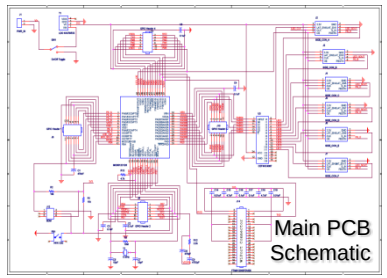
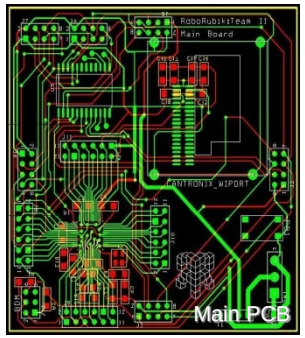
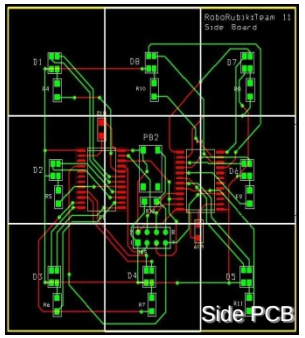

Side PCB Schematic


Main PCB Schematic

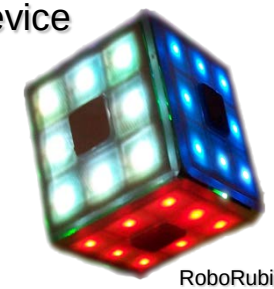
RoboRubik is a self-contained automated Rubik's Cube solver. You can scramble and solve it just like a normal Rubik's Cube. If you get stuck, you can get hints as to what your next move should be. RoboRubik comes with an embedded user interface accessed through any device with wireless networking ability. It's a fun and simple way to learn about and play with one of the most beloved puzzles in the world.

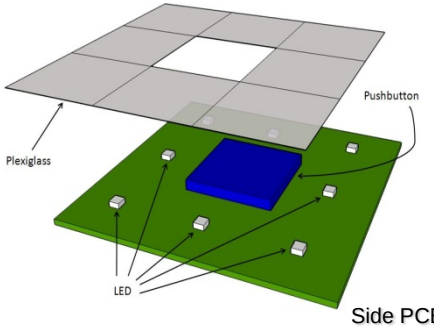
Development


Main PCB

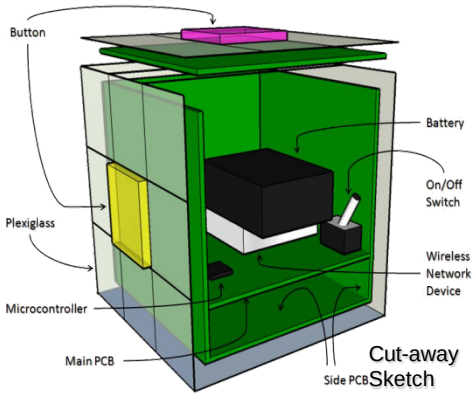

Side PCB

Device


RoboRubik



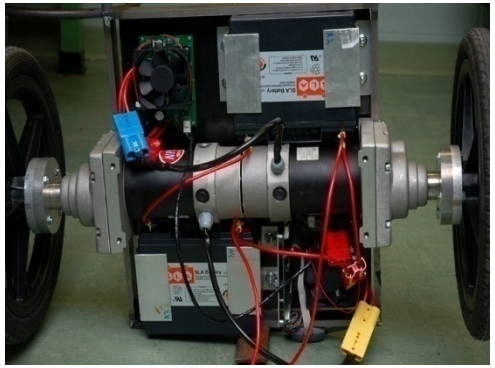
Side PCB Sketch



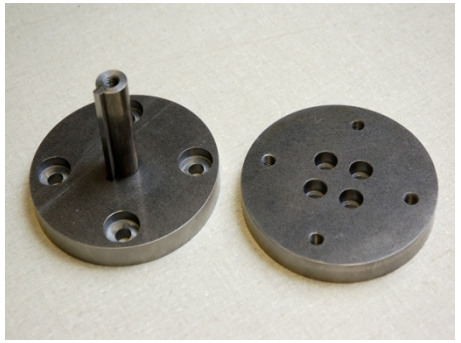
Cut-away Sketch

The Two Wheel Deal

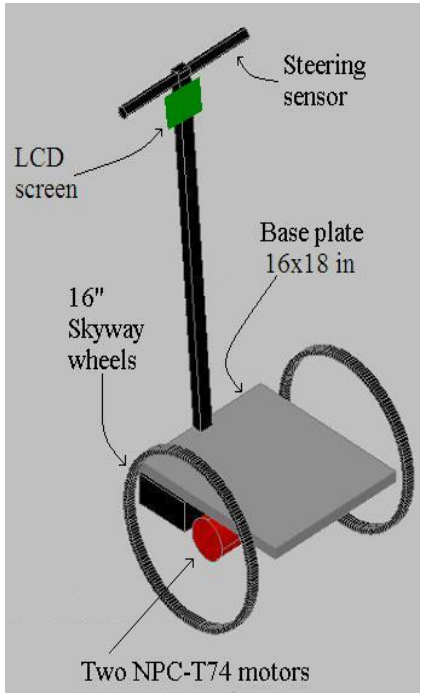
Packaging Layout



Wheel Hubs

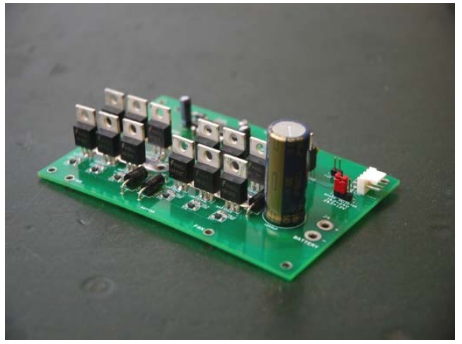


Preliminary Chassis Design



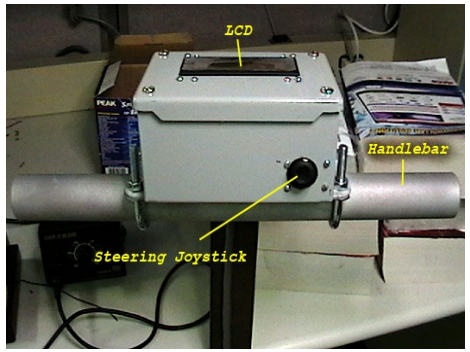
The Two Wheel Deal is a vehicle used for transporting a single rider on two wheels. The design uses an accelerometer and gyroscope to sense when the center of gravity is not directly over the axis of the wheels. It then drives the wheels in order to keep the vehicle balanced. The LCD screen displays battery life, speed, and tilt angle.

Motor Controller PCB

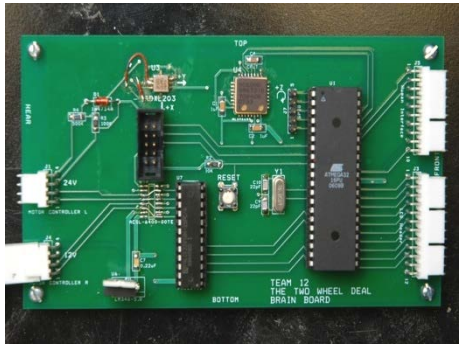


LCD Display

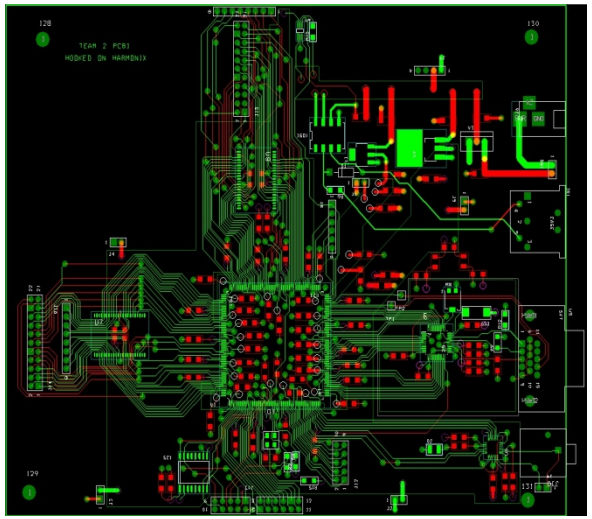
User Interface



Microcontroller PCB



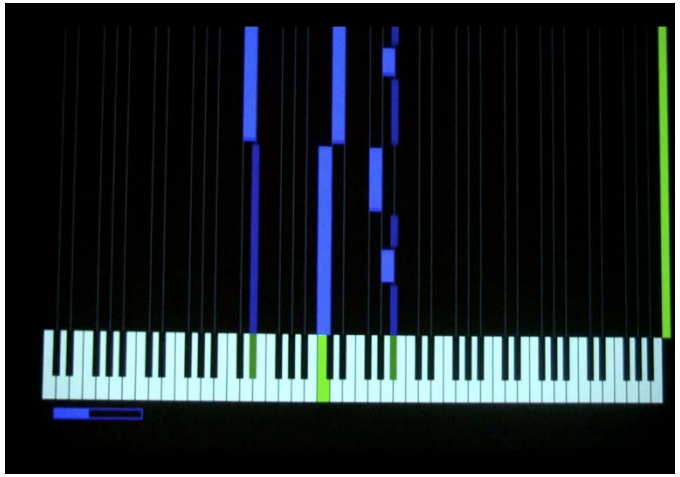
Hooked on Harmonix



4-layer Printed Circuit Board (PCB)

Synopsis: The user selects one of several MIDI tracks stored in Flash memory, and the corresponding file is parsed outputting bars of appropriate length to a standard computer monitor. Performance from a standard MIDI keyboard is judged and graded when the song is finished.

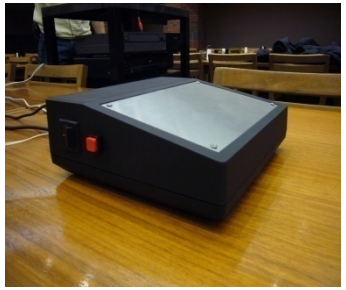
Hooked on Harmonix is a learning tool that teaches the user valuable piano skills while providing an entertaining experience at the same time.



User input from standard MIDI keyboard is compared to stored MIDI song file

Final Printed Circuit Board (PCB)

I/O Ports (from left): Audio Output, VGA output, MIDI input, power input



SOUNDS GOOD / *DS³ Digital Steerable Sound System*

Joe Land, Ben Fogle, James O'Carroll, Elizabeth Strehlow

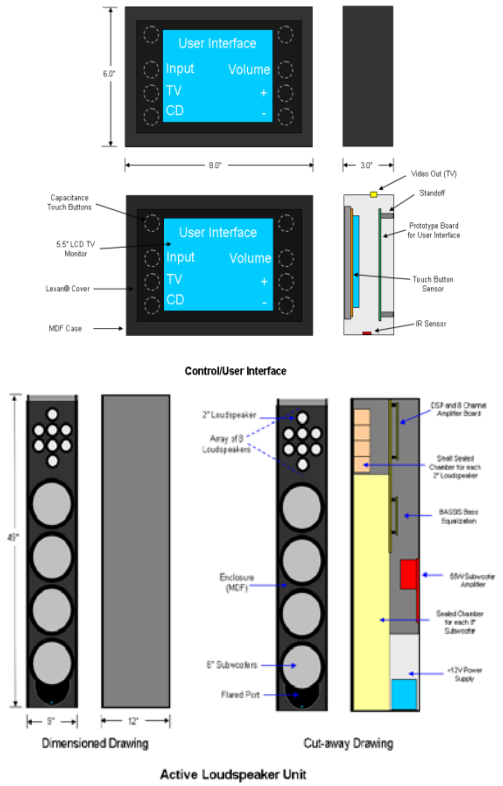
PROJECT DESCRIPTION:

-**Digitally Steerable Sound System, allows for non-ideal placement of speakers**

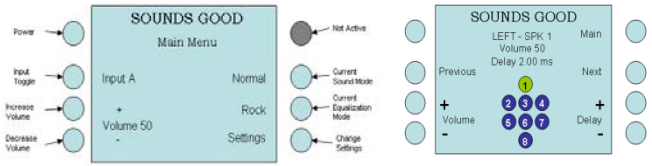
-**Six Preset Equalization Modes**

-**Wireless Control Interface**

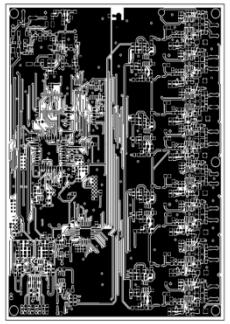
ILLUSTRATION OF CONCEPT:



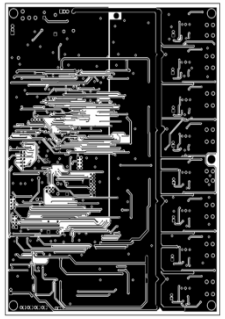
USER MENUS CONCEPT:



PCB LAYOUT:

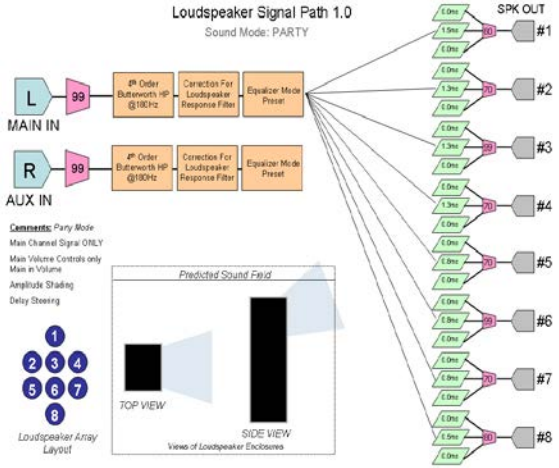


Top Copper



Bottom Copper

SIGNAL PATH:



USER INTERFACE UNIT:

LOUDSPEAKER UNIT:

FRONT

BACK

Facts About Learning Design

- FACT: Very little learning occurs as a result of just listening about how to solve design problems

Facts About Learning Design

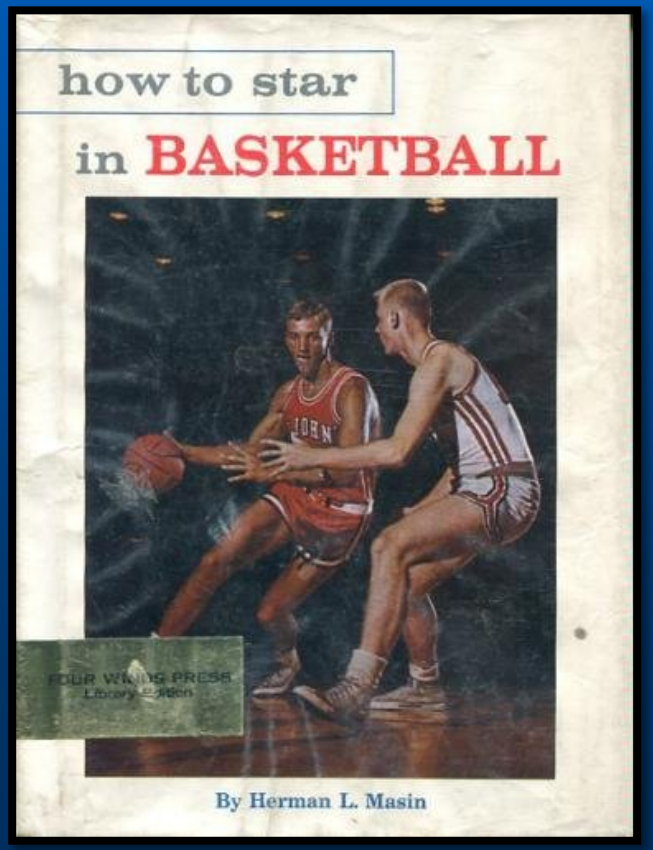
- FACT: Very little learning occurs as a result of just reading about how to solve design problems

Facts About Learning Design

- FACT: Very little learning occurs as a result of just watching someone else solve design problems

Facts About Learning Design

- The best way to learn design-oriented material is to put it into practice!
- The best way to study for this course is to practice, *practice*, practice!
- There are no shortcuts!



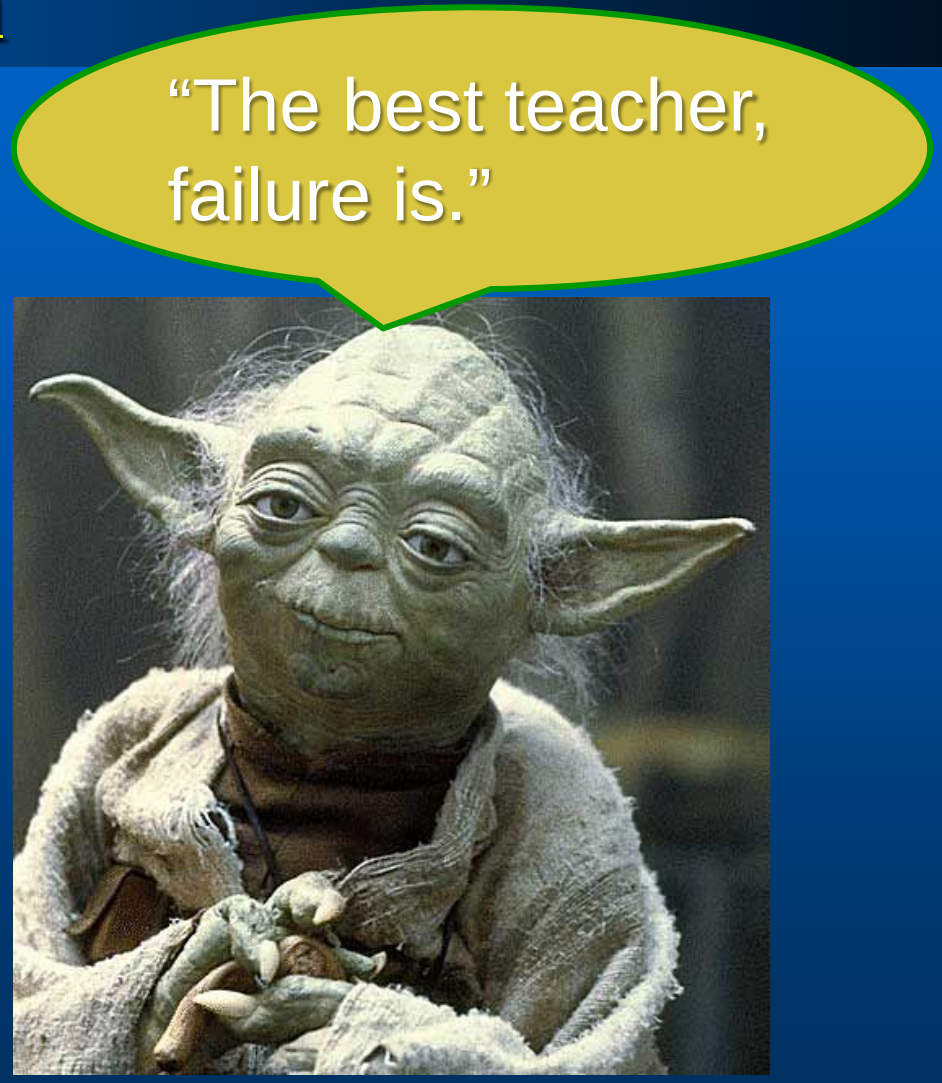
Suggestion: Read assigned text material *before lecture,* and work homework problems and review for quizzes *as soon after lecture as possible.*

Key to success: *Keep current!*

Facts About Learning Design

- *Don't "freak out" if your lab experiment doesn't work the first time!*
- *Failure can be your friend – 90% of learning occurs as a result of the "debugging" process!*

"…we know that suffering produces perseverance; perseverance, character; and character, hope."



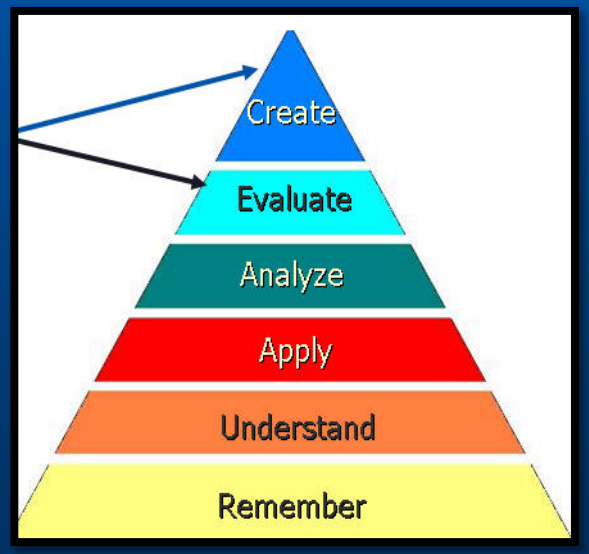
Learning Outcomes

A student who successfully fulfills the course requirements will have demonstrated:

1. an ability to analyze and design CMOS logic gates
2. an ability to analyze and design combinational logic circuits
3. an ability to analyze and design sequential logic circuits
4. an ability to analyze and design computer logic circuits
5. an ability to realize, test, and debug practical digital circuits

Learning Objectives

As part of faculty participation in the Purdue IM:PACT initiative, a detailed set of learning objectives have been developed based on Bloom's taxonomy



The goal is to *teach intentionally* and *test intentionally* based on the stated outcomes and objectives

A list of learning objectives is included in the Lecture Summary Notes for each outcome as well as the Class Presentation Slides

Learning Outcome Assessment

- ***You will earn 1% bonus credit for each course outcome you successfully demonstrate***
  - For Outcomes 1-4, basic competency will be assessed based on hourly exam questions, for which a minimum score of 60% will be required
  - For Outcome 5, a score of 60% on each lab experiment *or* a score of 60% on the Lab Practical Exam will be required for successful demonstration

Grade Determination

90% to 100%	A- / A / A+
80% to 90%	B- / B / B+
70% to 80%	C- / C / C+
60% to 70%	D- / D / D+
< 60%	F

Bonus Opportunities and Exercises	Δ_1%
Class Participation (iClickers)	4.0%
Homework Assignments (13 @ 0.77%)	10.0%
Lab Experiments (13 @ 1.5%)	19.5%
Lab Quizzes (13 @ 0.5%)	6.5%
Lab Practical Exam	10.0%
Outcome Assessment Exams (4 @ 12.5%)	50.0%
Outcome Demonstration Bonus (5 @ 1%)	Δ_2%
	100+Δ%

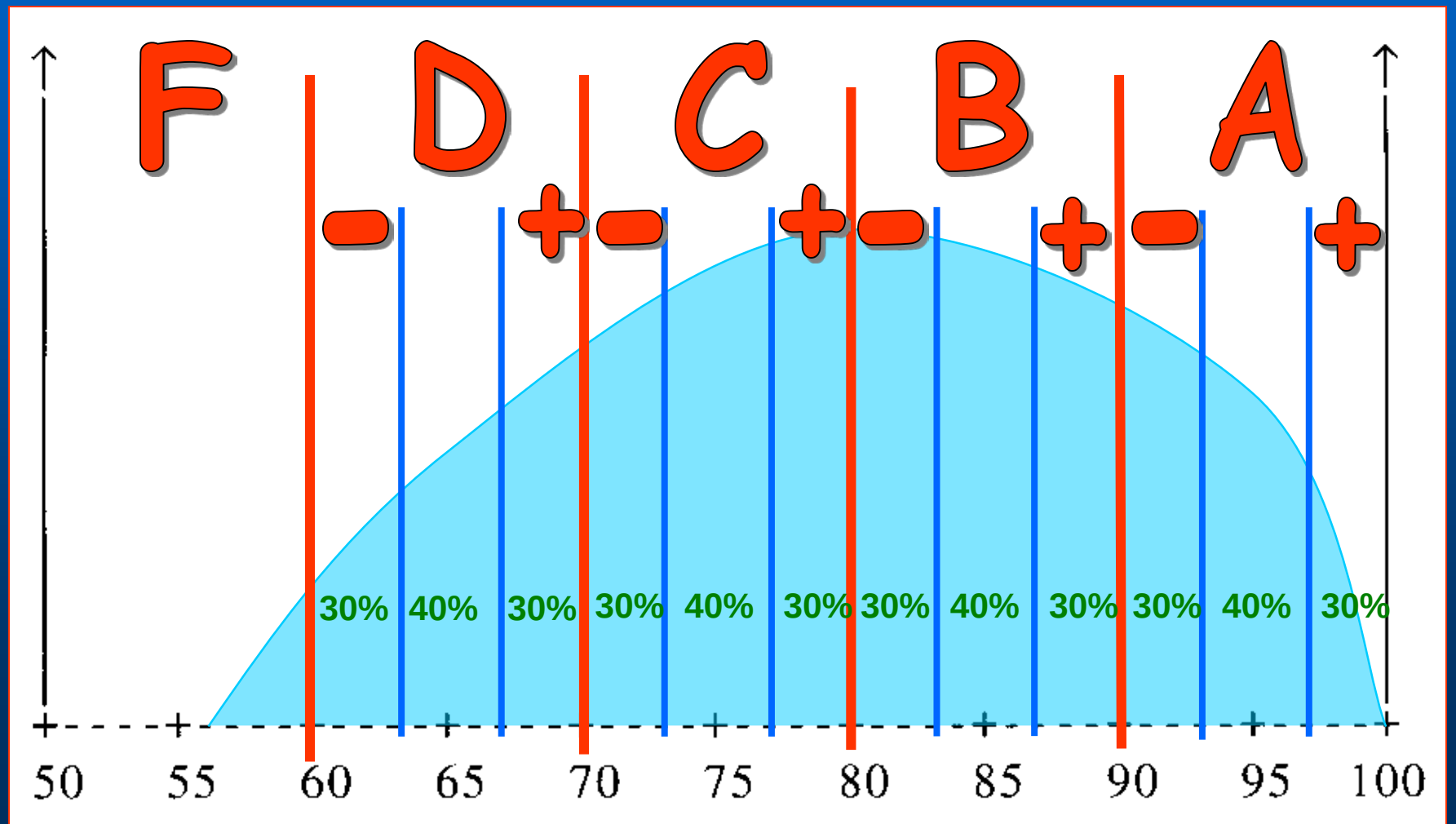
Grade Determination

- Calculation of Raw Weighted Percentage:

$$RWP = \frac{\sum_i WGT_i \times SCORE_i}{\sum_i WGT_i} \times 100$$

- RWP then “curved” (mean-shifted) with respect to upper percentile of class, yielding the Normalized Weighted Percentage (NWP)
- Windowed Standard Deviation (WSD) for class is calculated based on statistics of “middle” 90% of class
- Cutoff Width Factor (CWF) is then *max*(WSD,10), i.e., the *nominal cutoffs* are 90-80-70-60 for A-B-C-D, respectively

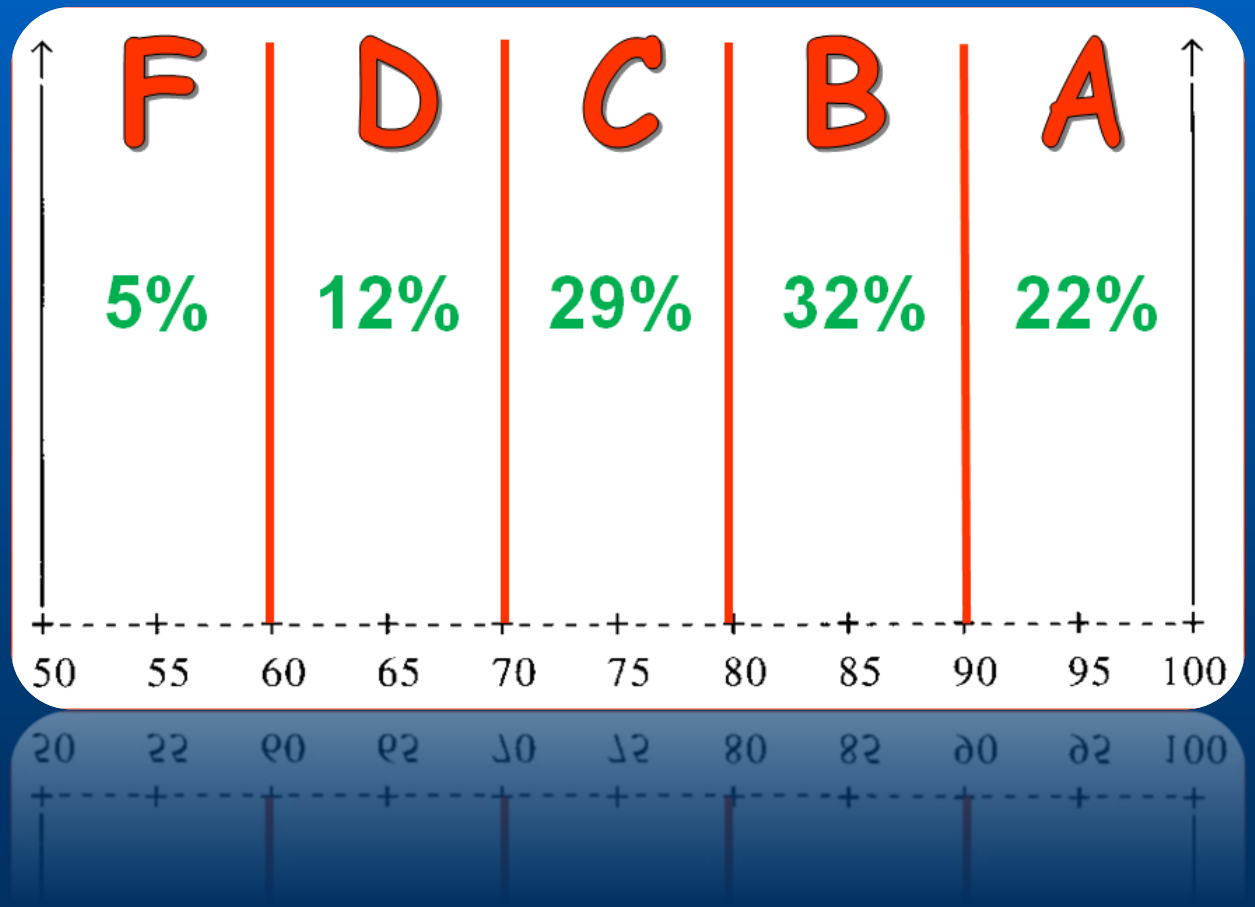
± Grading Visualization (CWF=10)



Grade Determination

- Note: There are no A / B / C / D / F "quotas"!
- Goal: Minimize number of D / W / F grades!!

Typical grade distribution and course GPA: 2.54



Borderline Cases and Incompletes

- A “borderline” is officially defined as an NWP *within* 0.5% of a cutoff
- Before course grades are assigned, the instructor will carefully examine all such cases to determine if the next higher grade is warranted
- IMPORTANT NOTE: The “next higher grade” is NOT AUTOMATICALLY GUARANTEED!!
- A grade of I or E will be given only for cases in which there are *documented* medical or family emergencies that prevent a student from completing required course work by the end of the semester
- University Regulations stipulate that a student must be PASSING in order to *qualify* for a grade of I or E

Academic Honesty

- The following will result in a FAILING GRADE:
  - using an “electronic copy” of another student’s lab solution file
  - attempting to use a “surrogate” test taker
  - altering solutions submitted for re-grade
  - misrepresenting another student’s work as your own (i.e., copying a homework solution)
  - using a “clicker” registered to another student

Academic Honesty

- All cases of “cheating” will be reported to the Dean of Students Office and to the ECE Associate Head
- *Resist the temptation* to take short-cuts in schoolwork – they inevitably lead to shortcuts in careers!!
- *A professional person does not take credit for the work of someone else!*

Emergency Preparedness

- To report an emergency, call 911
- To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, or view current status at www.purdue.edu/ea
- There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD – if you feel threatened or need help, push the button and you will be connected immediately
- If a fire alarm sounds during class we will immediately suspend class, evacuate the building, and proceed outdoors – do not use the elevator
- If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter as directed
- If we are notified during class of a Shelter in Place requirement for a hazardous materials release or a civil disturbance (including a shooting or other use of weapons), we will suspend class and shelter in the classroom, shutting/securing the door and turning off the lights
- See the Emergency Preparedness website for additional information http://www.purdue.edu/ehps/emergency_preparedness/index.html

Important Deadlines/Restrictions

- All lecture and lab division changes must be completed during the first week of classes
- You must attend the lab division for which you have officially registered
- No late pre-labs or homework assignments will be accepted
- Requests for make-up labs must be approved by your Lab Instructor in advance of the evening office hour session you plan to complete the makeup
- Quizzes will be given at the beginning of your scheduled lab period – there will be no make-ups (quizzes missed due to officially approved absences will be pro-rated – maximum number of quizzes that can be pro-rated is 2)
- Exams missed due to planned absences on scheduled evening or final exam dates must be made up in advance
- No makeup exams will be given after the scheduled exam period unless your absence has been officially excused by the Dean of Students

Words to the Wise

- Everyone currently enrolled has the ***potential*** to do well in this course
- You will ***not*** do well, however, if you:
  - fail to attend class (and miss working the homework problems)
  - don't read the assignments before class
  - attempt to "cram before exams"
  - merely "look at" the practice exams
  - expect to "learn by osmosis"
  - attempt to "cheat" in any way

Let's Get Started!

- The first part of this course will cover some basic topics that will be used throughout the digital systems curriculum, starting with *basic electronic components* and ending with *combinational logic circuit design*
- The second part of this course will cover more advanced introductory topics, starting with *sequential logic circuits* and ending with the *design of a simple computer*
- *All* of the topics covered in this course have been *carefully chosen*, based on how the material will be used in later courses

What is a Computer Engineer?

A *computer engineer* has knowledge of both the *theoretical* and *practical* aspects of how to analyze, design, *and* implement *computer* hardware *and* software…

What is a Computer Engineer?

...which leads to a *basic intuition* of how computer hardware and software *work*, the *synergy* between them, and what *solution(s)* are "*most practical*" or "*best*" given a set of *design constraints*.

What is a Computer Engineer?

He/she is therefore able to *design systems* based on the *analysis of tradeoffs* among a *variety of different implementation strategies* afforded by *current technology*.