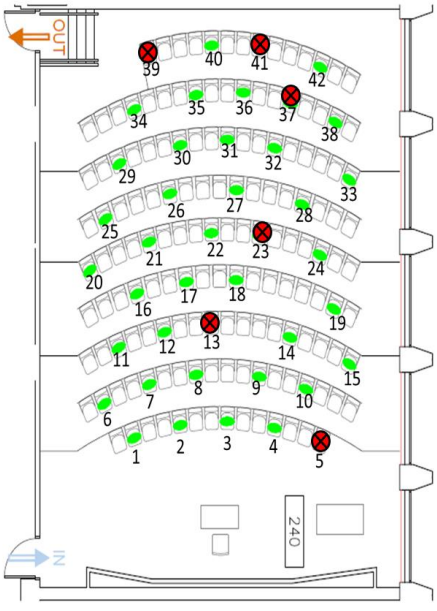
Release Nov 2002

ECE401

Perspectives In Electrical and Computer Engineering

Lecture 3

1



Last Name	First Name	Lecture Seat	ROW
Hamilton	Matthew T.	1	ROW 1
Divadic	Adnan	2	ROW 1
Araujo	Samuel	3	ROW 1
Pontbriand	Joel A.	4	ROW 1
Balsamo	Elijah J.	6	ROW 2
Candra	Zhafirah V.	7	ROW 2
Malo	Savannah M.	8	ROW 2
McKendall	Philip R.	9	ROW 2
Prendergast	Amy	10	ROW 2
Snyder	Nicholas (Nick) R.	11	ROW 3
Audette	Jeremiah J.	12	ROW 3
Reis	Justin S.	14	ROW 3
Bormley	Owen M.	15	ROW 3
Orlowski	Peter P.	16	ROW 4
Brown	Nathaniel H.	17	ROW 4
Staples	Kaia J.	18	ROW 4
Power	Michaela R.	19	ROW 4
Cannistraro	Sean P.	20	ROW 5
Shea	Samuel M.	21	ROW 5
Eaton	Devin T.	22	ROW 5
Bateman	Aaron M.	24	ROW 5
Bove	Noah C.	25	ROW 6
Cacasse	Jalen R.	26	ROW 6
Crawley	Michael A.	27	ROW 6
Mueller	Brooke A.	28	ROW 6
Corbett	Liam J.	29	ROW 7
Sanborn	Jared C.	30	ROW 7
Senter	Luke P.	31	ROW 7
Thomsen	Wyatt (Wyatt) J.	32	ROW 7
Nevins	Michael E.	33	ROW 7
Wageling	Hunter T.	34	ROW 8
Roland	Sebastian T.	35	ROW 8
Belanger	Alex E.	36	ROW 8
Savoie	Dale M.	38	ROW 8
Boette	Jacob W.	40	ROW 9
Nikijuluw	Timothy A.	42	ROW 9

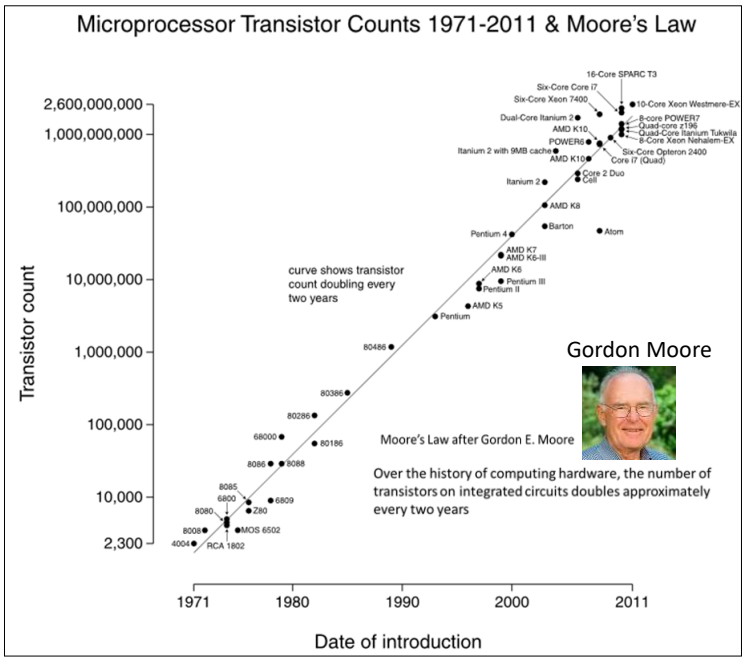
2

Last Time

- Prince Spaghetti Day Explained
- Seating for Lecture
- Engineering Programs
- Discussion Forum
  - Virtual Introductions
  - What will computers look like in the year 2060?
- A bit on Computer Evolution

Today

- Finish up Challenge from Last Class
- What the Hell is it Friday
- Prelab for Laboratory 1
- Suggested Study Tips
- Thinking of Learning Styles
  - What is my learning Style?
    - How do I understand how I learn?



5

Major Driving Force of Computers is Technology

- Moore's Law
  - Technology for Switching
    - Mechanical Relay ~ 0.01 seconds or 10^{-2}
    - Vacuum Tube ~ 0.00001 seconds or 10^{-5}
    - Transistor ~ 0.000001 seconds or 10^{-6}
    - Integrated Circuit ~ 0.00000001 seconds or 10^{-8}
    - Ultra Large-Scale IC ~ 0.000000001 seconds or 10^{-9}

Future: 3D Integrated Circuits
Molecular Computing
Quantum Computing

6

Moore's Law
- Technology for Switching
  - Mechanical Relay ~ 0.01 seconds or 10^{-2}
  - Vacuum Tube ~ 0.00001 seconds or 10^{-5}
  - Transistor ~ 0.000001 seconds or 10^{-6}
  - Integrated Circuit ~ 0.00000001 seconds or 10^{-8}
  - Ultra Large-Scale IC ~ 0.000000001 seconds or 10^{-9}

- IBM 1401
  - 1960 computer based on the transistor
  - Cost $150,000 dollars
  - Had 4 KiloBytes of Memory (4,000 Bytes)
  - Performance: 100 microseconds per operation
- A Typical PC (37 years later)
  - 1997 computer based on an intel CPU
  - Cost $1,500 dollars
  - Had 400 MegaBytes of Memory (400,000,000 Bytes)
  - Performance: 0.01 microseconds per operation

7

	1960	1997	Ratio	
Cost	$150,000.00	$1,500.00	0.01	Cost

Price reduction by 100

8

	1960	1997	Ratio	
Cost	$150,000.00	$1,500.00	0.01	Cost
Memory	4000	400000000	100000	Performance

Storage Increase by 100,000

9

	1960	1997	Ratio	
Cost	$150,000.00	$1,500.00	0.01	Cost
Memory	4000	400000000	100000	Performance
Speed	0.0001	0.00000001	10000	

Increase in Speed by 10,000

10

	1960	1997	Ratio	
Cost	$150,000.00	$1,500.00	0.01	Cost
Memory	4000	400000000	100000	Performance
Speed	0.0001	0.00000001	10000	

Between 1960 and 1997 Performance/Cost Increase can be calculated as a factor of:

$$\frac{(100,000 \times 10,000)}{0.01} = 10^{11}$$

This does not even consider that we have a huge decrease in system power!

11

Performance/Cost Increase

Food for Thought!

- Think of what would happen if this had happened to the automobile industry?

	1960	1997	Ratio	
Cost	$3,000.00		0.01	Cost
Capacity	4		100000	Performance
Speed	60		0.0001	

12

Performance/Cost Increase

Food for Thought!

- Think of what would happen if this had happened to the automobile industry?

	1960	1997	Ratio	
Cost	$3,000.00	$30.00	0.01	Cost
Capacity	4		100000	Performance
Speed	60		0.0001	

  - Cars would cost 30 dollars (based on a $3,000 dollar care in 1960)

13

Performance/Cost Increase

Food for Thought!

- Think of what would happen if this had happened to the automobile industry?

	1960	1997	Ratio	
Cost	$3,000.00	$30.00	0.01	Cost
Capacity	4	400000	100000	Performance
Speed	60		0.0001	

  - Cars would cost 30 dollars (based on a $3,000 dollar care in 1960)
  - Would carry 400,000 passengers (based on 4 people per car capacity in 1960)

14

Performance/Cost Increase

Food for Thought!

- Think of what would happen if this had happened to the automobile industry?

	1960	1997	Ratio	
Cost	$3,000.00	$30.00	0.01	Cost
Capacity	4	400000	100000	Performance
Speed	60	600000	0.0001	

  - Cars would cost 30 dollars (based on a $3,000 dollar care in 1960)
  - Would carry 400,000 passengers (based on 4 people per car capacity in 1960)
  - Would have a speed of 600,000 miles per hour (based on a speed of 60mph in 1960)

15

How long would it take to get from Boston to LA if we were to travel it at 600,000 mph?

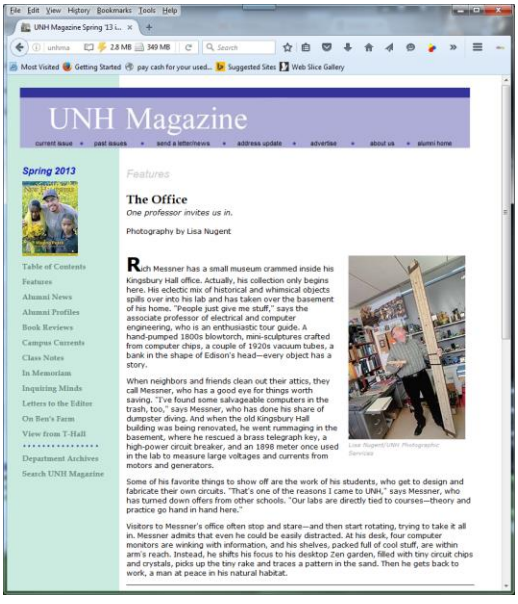
$$3000\ miles \times \frac{1}{600000\ miles/hour} = 0.005 \text{ hours}$$

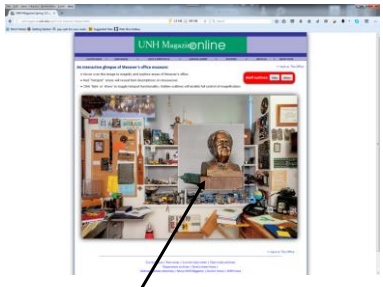
$$0.005\ hours \times 60\frac{min}{hour} \times 60\frac{sec}{hour} = 18\ seconds$$

16

17

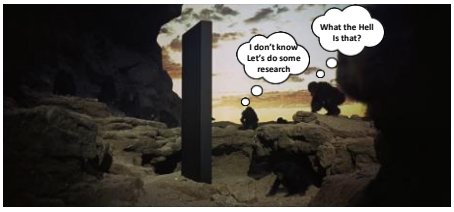
http://unhmagazine.unh.edu/sp13/rich-messner.html





Thomas Alva Edison

18

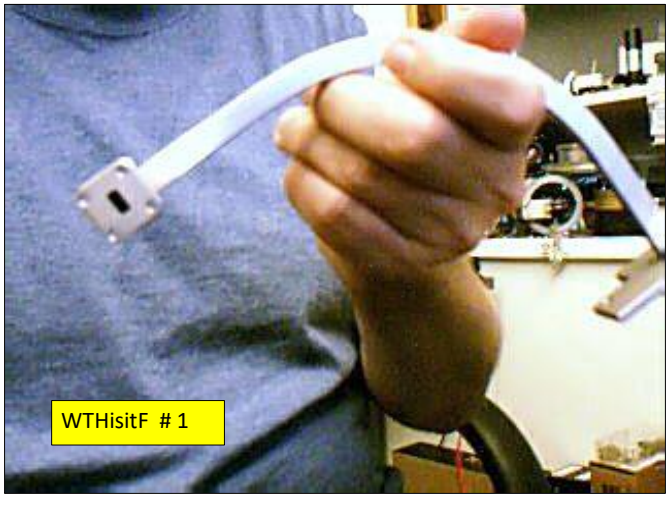


What the Hell is it Friday?

Every Friday a new object will be chosen for you to research and you will be given the opportunity to tell me exactly what it is

19

What the Hell is it Friday



20

What the Hell is it Friday

- You may use your camera to take a picture of the item
  - This allows you to refer later to it later in order to help you in your research
- Email me your "educated guesses"
  - DO NOT EMAIL ME UNTIL THE CLASS IS OVER!!!!
- First one to get it totally correct will get a prize
- Time stamp on the email will determine who was first

21

ECE401 Laboratory

22

Laboratory Structure

- Location:
  - Kingsbury Hall Room S216
- Lab Times:
  - MWF 3:10PM-5:00PM
  - Tu Thr 3:40PM-5:30PM
    - Make sure you are listed and attend the lab section you are registered for
    - Always come prepared for Laboratory
    - Computers or other internet access devices **ARE** allowed in lab **FOR LABORAOTORY PURPOSES ONLY**

Prelab 1

- Lab 1
  - Two Weeks Long
  - Prelab (one week)
    - The anatomy of a personal computer:
      - Research Phase
- Students in Monday Section
  - TAs gave additional information this past Monday so you should have enough information to compete the Prelab
  - Coordinate with TAs on your Prelab if you require help

Laboratory Notebooks?

- Why a laboratory notebook?
  - Documentation of work performed
  - Why do we want to have this????
    - Others can recreate your efforts and validate it
    - Useful in Intellectual Property Litigation
    - Helps you as an engineer remember things you did and the order you did it!
    - Required by many companies for the purposes of documentation and potential litigation

25

Laboratory Notebook

- Our Notebook:
  - National Brand COMP BOOK
  - 10 x 7 7/8 inch 5 x 5 Quad ruled (5 blocks to 1")
  - 80 pages typical

OR

26

Notebook practices

- Never tear out pages from the notebook **WHY?**
  - Removes permanently the record of what was done
    - Exception: Carbon copied notebooks
- Always use an ink pen when making entries **WHY?**
  - Makes the documentation permanent and unalterable
- Never scratch out or mask out fully any mistakes you might make **WHY??????**
  - Makes it impossible to see what was done and thus the chronology of the work cannot be fully determined
  - If a mistake is made just put one line through the mistake

Labs are Separated into two parts

- **PRELAB**

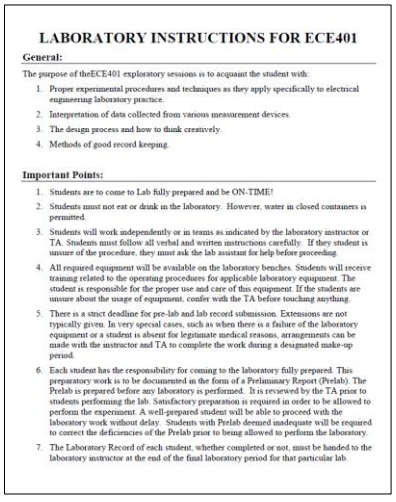
  Preliminary work necessary for you to proceed to lab and effectively and efficiently perform the work to be done in laboratory

- **LAB**

  Documentation of what transpired in lab using your PRELAB as the guide to perform the LAB work

Review Laboratory Documentation Instructions and Lab 1

- Located under the Files on Canvas



LABORATORY INSTRUCTIONS FOR ECE401

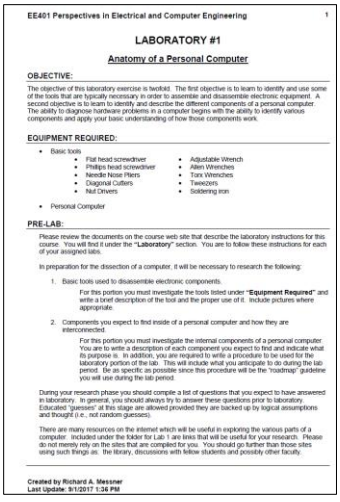
General:

The purpose of theECE401 exploratory sessions is to acquaint the student with:

1. Proper experimental procedures and techniques as they apply specifically to electrical engineering laboratory practice.
2. Interpretation of data collected from various measurement devices.
3. The design process and how to think creatively.
4. Methods of good record keeping.

Important Points:

1. Students are to come to Lab fully prepared and be ON-TIME!
2. Students must not eat or drink in the laboratory. However, water in closed containers is permitted.
3. Students will work independently or in teams as indicated by the laboratory instructor or TA. Students must follow all verbal and written instructions carefully. If they student is unsure of the procedure, they must ask the lab assistant for help before proceeding.
4. All required equipment will be available on the laboratory benches. Students will receive training related to the operating procedures for applicable laboratory equipment. The student is responsible for the proper use and care of this equipment. If the students are unsure about the usage of equipment, confer with the TA before touching anything.
5. There is a strict deadline for pre-lab and lab record submission. Extensions are not typically given. In very special cases, such as when there is a failure of the laboratory equipment or a student is absent for legitimate medical reasons, arrangements can be made with the instructor and TA to complete the work during a designated make-up period.
6. Each student has the responsibility for coming to the laboratory fully prepared. This preparatory work is to be documented in the form of a Preliminary Report (Prelab). The Prelab is prepared before any laboratory is performed. It is reviewed by the TA prior to students performing the lab. Satisfactory preparation is required in order to be allowed to perform the experiment. A well-prepared student will be able to proceed with the laboratory work without delay. Students with Prelab deemed inadequate will be required to correct the deficiencies of the Prelab prior to being allowed to perform the laboratory.
7. The Laboratory Record of each student, whether completed or not, must be handed to the laboratory instructor at the end of the final laboratory period for that particular lab.



EE401 Perspectives in Electrical and Computer Engineering

LABORATORY #1

Anatomy of a Personal Computer

OBJECTIVE:

The objective of this laboratory exercise is twofold. The first objective is to learn to identify and use some of the tools that are typically necessary in order to assemble and disassemble electronic equipment. A second objective is to learn to identify and describe the different components of a personal computer. The ability to diagnose hardware problems in a computer begins with the ability to identify various components and apply your basic understanding of how those components work.

EQUIPMENT REQUIRED:

- Basic tools
  - Flat head screwdriver
  - Phillips head screwdriver
  - Needle Nose Pliers
  - Diagonal Cutters
  - Nut Drivers
  - Adjustable Wrench
  - Allen Wrenches
  - Torx Wrenches
  - Tweezers
  - Soldering iron
- Personal Computer

PRE-LAB:

Please review the documents on the course web site that describe the laboratory instructions for this course. You will find it under the "**Laboratory**" section. You are to follow these instructions for each of your assigned labs.

In preparation for the dissection of a computer, it will be necessary to research the following:

1. Basic tools used to disassemble electronic components.
   For this portion you must investigate the tools listed under "**Equipment Required**" and write a brief description of the tool and the proper use of it. Include pictures where appropriate.
2. Components you expect to find inside of a personal computer and how they are interconnected.
   For this portion you must investigate the internal components of a personal computer. You are to write a description of each component you expect to find and indicate what its purpose is. In addition, you are required to write a procedure to be used for the laboratory portion of the lab. This will include what you anticipate to do during the lab period. Be as specific as possible since this procedure will be the "roadmap" guideline you will use during the lab period.

During your research phase you should compile a list of questions that you expect to have answered in laboratory. In general, you should always try to answer these questions prior to laboratory. Educated "guesses" at this stage are allowed provided they are backed up by logical assumptions and thought (i.e., not random guesses).

There are many resources on the internet which will be useful in exploring the various parts of a computer. Included under the folder for Lab 1 are links that will be useful for your research. Please do not merely rely on the sites that are compiled for you. You should go further than those sites using such things as: the library, discussions with fellow students and possibly other faculty.

Created by Richard A. Messner
Last Update: 9/1/2017 1:36 PM

First Laboratory

- Computer Anatomy 101
- What is the first lab about?
  - Getting comfortable with handling electronic parts and common tools
  - Taking apart a "old" desktop computer and identifying computer subsystems and structure
  - Documenting what you are **GOING** to do in lab (Prelab Document)
  - Documenting what you have **DONE** in the lab (Lab Document)

LABORATORY #1

Anatomy of a Personal Computer

OBJECTIVE:

The objective of this laboratory exercise is twofold. The first objective is to learn to identify and use some of the tools that are typically necessary in order to assemble and disassemble electronic equipment. A second objective is to learn to identify and describe the different components of a personal computer. The ability to diagnose hardware problems in a computer begins with the ability to identify various components and apply your basic understanding of how those components work.

31

Prelab for Laboratory 1

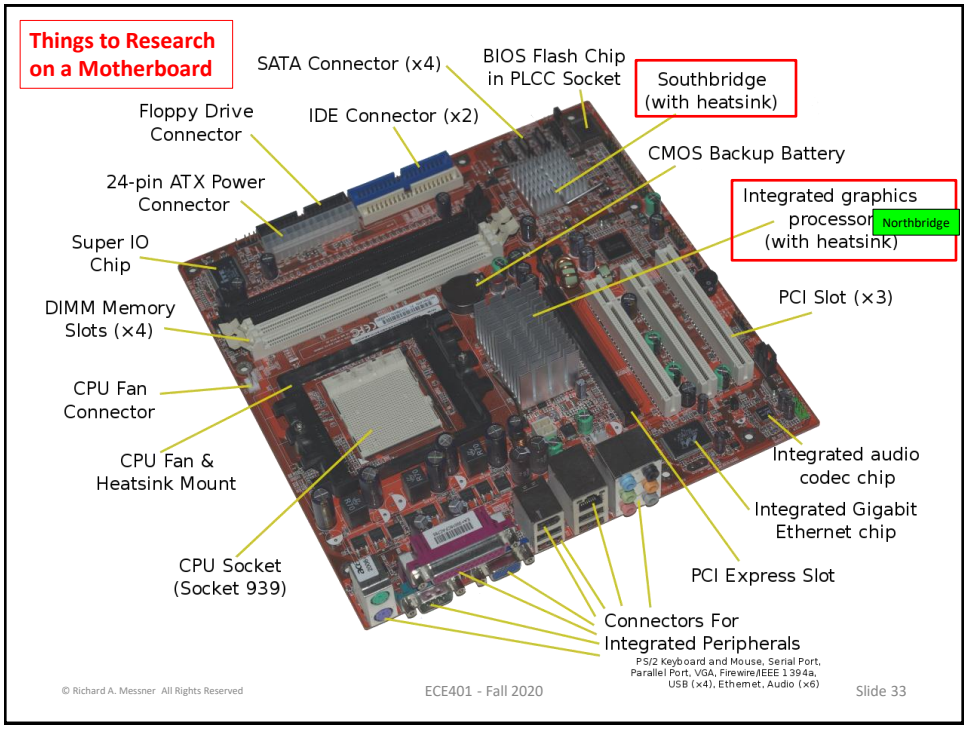
- Week 1: Anatomy of a PC
  - Research phase

Monday	Tuesday	Wednesday	Thursday	Friday
7 Labor Da	8	9	10	11

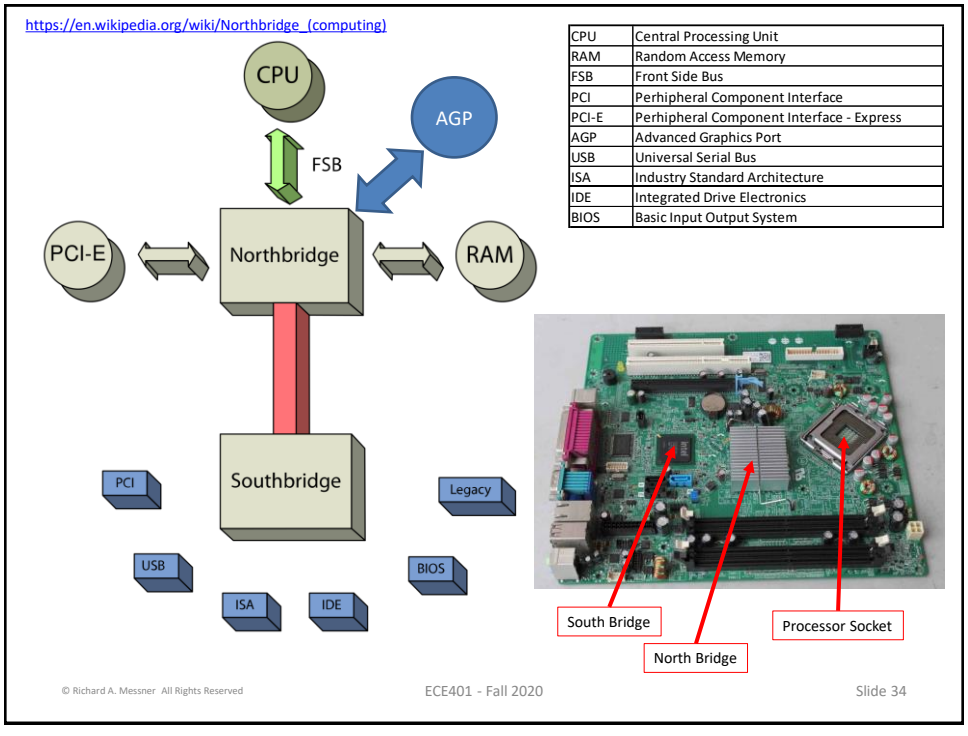
RESEARCH and PRELAB

  - Research and Investigate
    - Basic computer anatomy
      - Use the Library
      - Use the web
      - Share knowledge with other classmates
      - Talk with other professors
    - Individually create the Prelab that will describe what you will do in Lab and how you will do it
      - Prelab is NOT in your lab notebook (upload pdf document via Canvas)
        - » Prelab is a separate word-processed document (use the ECE Cluster)
        - » You can insert it into your lab notebook for your hardcopy record or merge your pdf prelab with your pdf lab once completed
      - This is a **DYNAMIC** document!

32



33



CPU	Central Processing Unit
RAM	Random Access Memory
FSB	Front Side Bus
PCI	Perhipheral Component Interface
PCI-E	Perhipheral Component Interface - Express
AGP	Advanced Graphics Port
USB	Universal Serial Bus
ISA	Industry Standard Architecture
IDE	Integrated Drive Electronics
BIOS	Basic Input Output System

34

LAB for Laboratory 1

Monday	Tuesday	Wednesday	Thursday	Friday
14	15	16	17	18
Performing and Documenting the Lab				

- Week 2: Anatomy of PC
  - **Lab Phase**
  - **Use the Prelab as a guide to perform the Lab**
  - **Document what you** did in Laboratory in your lab notebook
    - Some Suggestions
      - Form a well structured document
        - » The mark of a good lab write-up is that someone else in the class should be able just to pick up your lab, read and understand it, and recreate what you did in lab.
      - Take notes on what you actually did in Lab. (sometimes it might be different from what you anticipated in the prelab)
      - Make comments on what you learned
      - Make comments on what you want to (or need to) investigate further
      - Make sure you follow the TAs instructions on what is required for your electronic submission of your lab record to CANVAS

Remember

- You will get the most out of any course **ONLY IF** you put in serious effort to learn and understand the material
- This requires:
  1. Spending the appropriate amount of time on the course material
  2. Asking questions when necessary
  3. **NOT** waiting until the last minute to do the work!!!!!

Time on your hands

- At the present time (no pun) you do not have the technology to alter or increase the time that you have available to you (at least not yet!)

All it will take is one Brilliant Idea!

37

Time on your hands

	Days per week	Hours per day	Hours per week	Weeks per semester	Hours per semester
Available	7	24	168	14	2352

38

Time on your hands

	Days per week	Hours per day	Hours per week	Weeks per semester	Hours per semester
Available	7	24	168	14	2352

Fixed Time Required for Classes for a typical first semester Electrical and Computer Engineering student

Classes					
Math425			5		70
ECE401			5		70
Econ			3		42
CS410			3.5		49
			16.5		**231**

39

Time on your hands

	Days per week	Hours per day	Hours per week	Weeks per semester	Hours per semester
Available	7	24	168	14	2352

Classes					
Math425			5		70
ECE401			5		70
Econ			3		42
CS410			3.5		49
			16.5		**231**

Left over time for all other “things”

Left Over			151.5		2121

40

Time on your hands

	Days per week	Hours per day	Hours per week	Weeks per semester	Hours per semester
Available	7	24	168	14	2352
Personal Need					
			0		0
			0		0
			0		0
			0		0
			0		**0**
Classes					
Math425			5		70
ECE401			5		70
Econ			3		42
CS410			3.5		49
			16.5		**231**
Left Over			151.5		2121

41

Time on your hands

	Days per week	Hours per day	Hours per week	Weeks per semester	Hours per semester
Available	7	24	168	14	2352
Personal Need					
Sleeping			0		0
Eating			0		0
Personal Hygiene			0		0
Travel			0		0
			0		**0**
Classes					
Math425			5		70
ECE401			5		70
Econ			3		42
CS410			3.5		49
			16.5		**231**
Left Over			151.5		2121

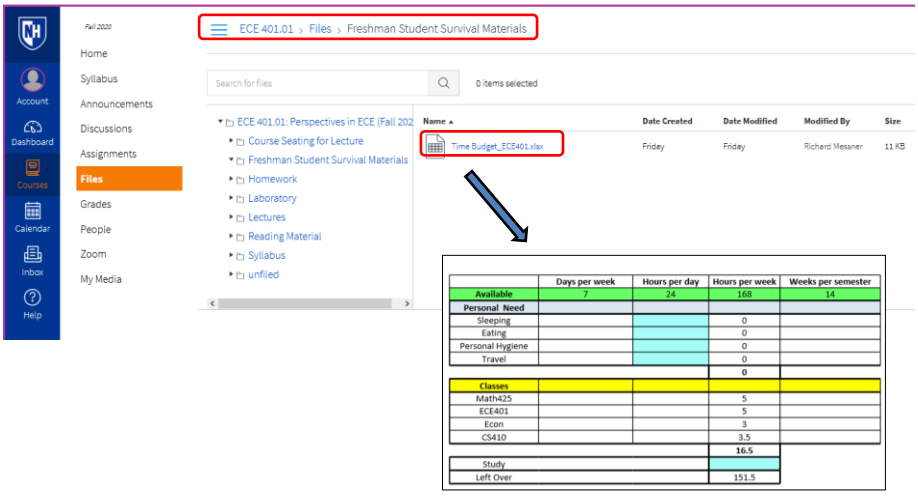
42

Time on your hands

	Days per week	Hours per day	Hours per week	Weeks per semester	Hours per semester
Available	7	24	168	14	2352
Personal Need					
Sleeping			0		0
Eating			0		0
Personal Hygiene			0		0
Travel			0		0
			0		**0**
Classes					
Math425			5		70
ECE401			5		70
Econ			3		42
CS410			3.5		49
			16.5		**231**
Study					0
Left Over			151.5		2121

43

Excel File



	Days per week	Hours per day	Hours per week	Weeks per semester
Available	7	24	168	14
Personal Need				
Sleeping			0	
Eating			0	
Personal Hygiene			0	
Travel			0	
			0	
Classes				
Math425			5	
ECE401			5	
Econ			3	
CS410			3.5	
			16.5	
Study				
Left Over			151.5	

44

Study, Note-Taking, Homework, and Exam Tips

45

Study Tips

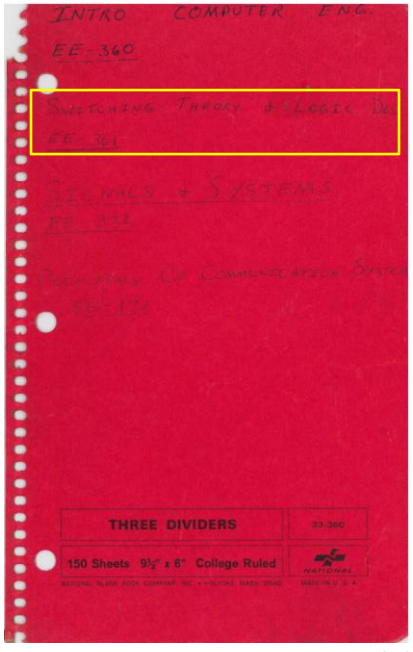
- Develop a good work ethic
  - Do things above and beyond the course
  - What you put into something is what you will get out of the effort
    - **Nothing IN** => **Nothing OUT** in terms of your learning
- Manage your time appropriately
  - Schedule of **Focus Time** is a **MUST**
    - Quite place: Library is a good place
    - No distractions: turn off all electronics and **FOCUS**
  - Ensure that you schedule time to get help on course material that is not clear to you

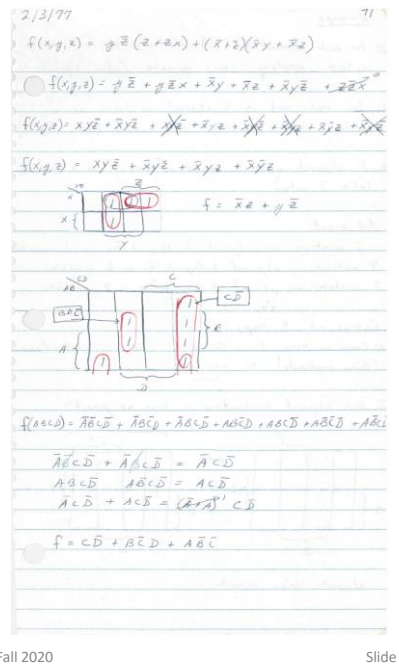
46

Study Tips

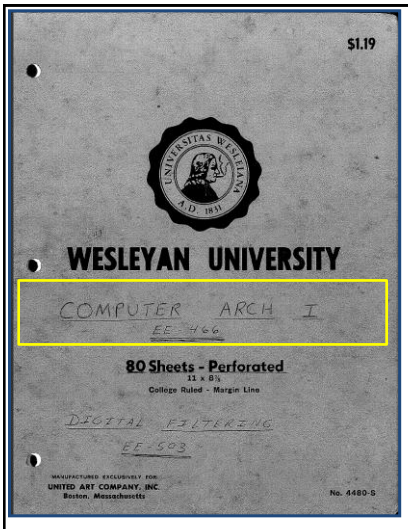
- Take notes in lectures
  - Even if there are slides you can still take notes
    - Sometimes professors will make slides available before lecture
      - Not usually the case and not the case for my classes
      - If slides are available, print them out and take them to class. Then take notes on them as the professor lectures
    - Most professors do not have all slides available before class
      - Ask the professor to number their slides
      - In your notebook you can then reference the slide so that when you are away from the classroom you can correlate the lecture notes with the appropriate slides
        - » **DO NOT THINK YOU CAN RECALL THINGS WITHOUT NOTES! THIS IS A GRAVE ERROR**
      - Download the slides from CANVAS as soon as you can and place in you ECE401 file on your computer (or keep hardcopy as well!)

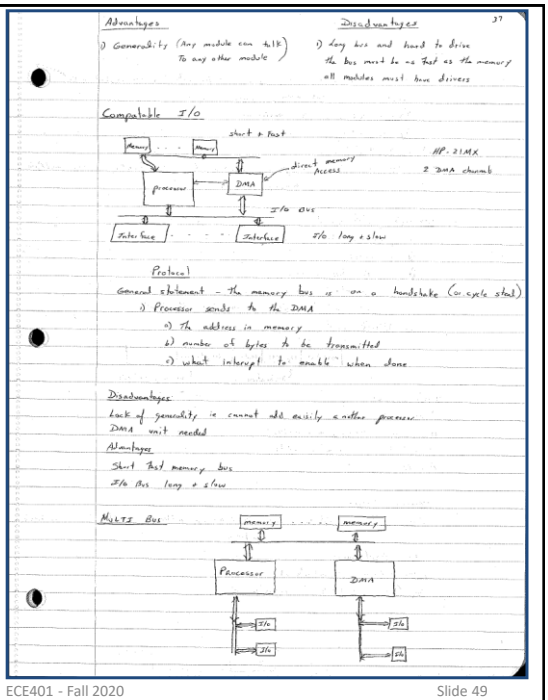
47





48





49

End

50