Syllabus & Project Selection

ECE 405 Senior Design III

Week #1

Please visit Bison Academy for corresponding lecture notes,
homework sets, and videos
www.BisonAcademy.com

Course Information:

Instructors:	Jake Glower, Jeff Erickson
Class Times	Fr 3pm, Offerdahl West (ECE) 125
Office:	ECE 201
Office Hours	Tu/Th 11am - noon
Textbook:	none
	OneNote is requred as your lab notebook.
On-Line:	www.BisonAcademy.com

Bulletin Description:

Capstone experience in formulation and design of a system or device. 1 Lecture. Prereq: ECE 403.

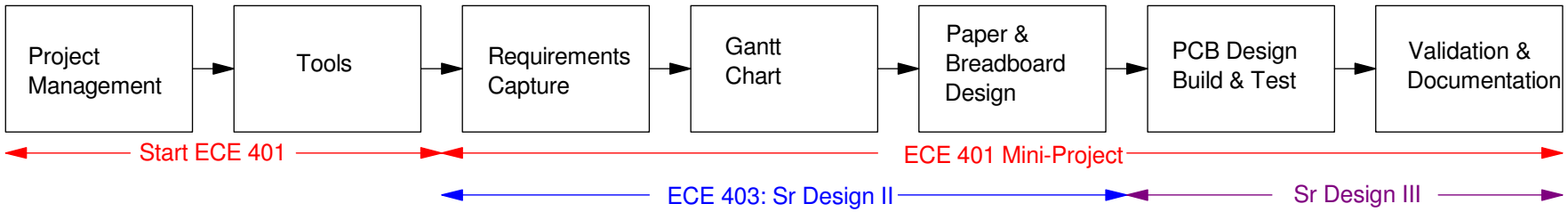
Introduction:

In Senior Design 2, you

- Picked a project for your group,
- Split your design into sections for each student, and
- Each student designed a circuit and/or program for their portion of the project

The goal of Senior Design 3 is to

- Take the parts of your design from ECE 403,
- Put them together into a single working device,
- Create and test a PCB so that your design is semi-permanent,
- Package and deliver your final design to your customer



Notes:

ECE 403 was pretty much individual grades

- Your project was split into N sections, one per student
- Each student design a system for their part of the design
- While demonstrating an ability to apply knowledge of ECE

ECE 405 is pretty much a group grade

- Now take those parts and put them together
- Create a packaged working device that meets your overall requirements

The further along you get in this process, the higher your grade

Lab Notebooks (OneNote)

Keep using your OneNote document for ECE 405

Add your work to what's already there

Note:

- ECE 405 is mostly a group activity

  Get your overall project to work
- Sections in OneNote will now be group activities
- Your OneNote document *is* your final report

OneNote		
Sections	**Pages**	**Content**
Project Selection	-	ECE 403 Material (individual)
Work Breakdown	-	
Student A	-	
Student B	-	
Student C	-	
HW1	Gantt Chart	ECE 405 Material (group)
	Meeting Schedule	
Breadboard	Schematic	
	Build	
	Test	
PCB	Layout	
	Build	
	Test	
Final Packaging	Package	
	Overall Test	
	Poster	
	2-Minute Video	

Syllabus

Senior Design III is really a lab-based class.

Weeks 1-5, class meets at its scheduled time and place

- 1: Organize your group for ECE 405
- 2: Go over Fusion 360 for schematics capture
- 3: Go over Fusion 360 for PCB layout
- 4: Go over soldering surface mount parts
- 5: Use of oscilloscopes and multimeters (meet at your lab station)

Week 6 onwards, class no longer meets. However

- Keep meeting with your sponsor every other week
- Keep working on your project
- PCB's *need* to be ordered by week #12 at the *latest*
- The end of the semester comes faster than you expect

Syllabus

HW	Target Due Date to get an A...	Homework Set & Task	%
1	Week 2	Gantt Chart	10%
2	Week 5	System Breadboard	10%
3	Week 7	Breadboard Test	10%
4	Week 10	PCB Layout	10%
5		Test Equipment	10%
6	Week 13	PCB Build & Test	10%
7	Week 15	Packaging	10%
8	throughout the semester	Attend Biweekly Meetings	10%
9	Week 15	2-Minute Video	10%
10	Week 16	Present at Sr Design Expo	10%

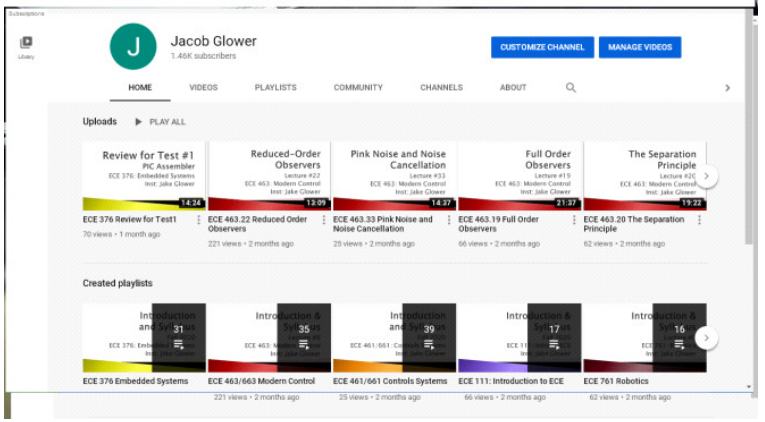
Hy-Flex Model for ECE 405

Students are welcome to take this course however they like:

- In-Person: Students are welcome to addend class at the designated class time and location.
- Live-Stream: Students are also welcome to live-steam the class. A link with how to connect will be sent out at the start of the semester on BlackBoard
- On-Line: Students are also welcome to take the class on-line by watching YouTube videos

It doesn't matter which section you signed up for

- You can attend however you like
- There's plenty of room



Grading

Senior Design III is pretty much a group grade based upon how far you get on your project.

Grade	Rubric
A 93% - 100%	Working PCB, meets all requirements. Packaged and ready to deliver to customer. Demonstrated at Senior Design Expo.
B 83% - 92%	Breadboard works, PCB works. Some requirements not met or not packaged and ready to deliver to customer.
C 73% - 82%	Project built, tested, and working on breadboad level. PCB ordered and soldered but only partially working.
D 63% - 72%	Project built and partially working at the breadboard level. Unable to test at the PCB level
F < 63%	Unable to demonstrate a working device at the breadboard level. Unable to demonstrate a working device at the PCB level.

Grading (cont'd)

Grades can be adjusted for individuals in the group based upon observations from the instructors and project sponsor:

Grade	Rubric
+1 letter grade	Student was largely responsible for getting the project to work. Made contributons well beyond the rest of the group.
-1 letter grade	Student put in minimal effort in ECE 405 and let the group carry him/her
F	Student did not show up meetings and made no apparent contribution to the 405 project

401 vs. 403/405

Limitations in ECE 401 are lifted in ECE 403/405

	ECE 401	ECE 403/405
PCB Size	2" x 2"	up to 60 square inches
Mounting Holes	200 mils	200 - 250 mils
Ground Plane	yes	yes
Power Plane	yes	Depends upon design
Trace Width: Power	40 mils	8 mils to 600 mils
Other Traces	20 mils	8 mils to 600 mils
Test Points	6+ Through Hole	6+ Surface Mount or Through Hole
Components	Through Hole	any (0805, TSOP, DIP, etc.)

	ECE 401	ECE 403/405
Silk Screen (top)	yes include date & group number	yes include date & group number
Silk Screen (bottom)	no	yes if components placed on both sides of board
Font Size	50 mil or larger height/10 for thickness	50 mil or larger height/10 for thickness
Digikey Trace Width Calculator	optional	Longest trace with highest current
LEDs	5mm Through Hole Design for 100mA Build for 20mA	Any size, any number 0805 recommended Place on power, ground, other signals
Power	9V battery 7805 to step down to 5VDC	any
Fuse	1 Ohm resistor Add reverse polarity protection	optional

Final Comments

Some things take time

- You need a working breadboard
- To get the correct schematics
- To design out your PCB
- Which you need before you can solder your PCB
- Which you need before you can test your overall design

It takes 10 days to order your PCB once it's been designed

- Plus another 10 days if you need a 2nd iteration

The end of the semester comes sooner than you think

- *Do* start working on your 405 project right away

Legal Stuff:

Attendance: According to NDSU Policy 333, attendance in classes is expected. How you attend is up to you (in-person, live-stream, online). Students are responsible for the material covered in class and in assignments regardless of their attendance. Note that all lecture notes, homework sets, and solutions are available on-line at www.BisonAcademy.com

Students with Special Needs: Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office (www.ndsu.edu/disabilityservices) as soon as possible.

Academic Honesty: The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

Academic Honesty Defined: All written and oral presentations must “respect the intellectual rights of others. Statements lifted verbatim from publications must be cited as quotations. Ideas, summaries or paraphrased material, and other information taken from the literature must be properly referenced” (Guidelines for the Presentation of Disquisitions, NDSU Graduate School).

Legal Stuff (cont'd)

ECE Honor Code: On my honor I will not give nor receive unauthorized assistance in completing assignments and work submitted for review or assessment. Furthermore, I understand the requirements in the College of Engineering Honor System and accept the responsibility I have to complete all my work with complete integrity.

Veterans and Student Soldiers: Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance.