Syllabus & Project Selection

ECE 403 Senior Design II

Week #1

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

Introduction:

Senior Design is a 3-course sequence at NDSU. The overall goal of this sequence is

- To work in a group of 2-4 engineers,
- Demonstrate your ability to apply knowledge related to electrical and computer engineering, and
- Take a project from concept to design, build, test, and demonstration.

Course Information:

Instructors:	Jake Glower, Jeff Erickson
Class Times	Friday 3pm, Offerdahl West (ECE) 125
Office:	ECE 201
Office Hours	Tu/Th 11am - noon
Textbook:	none
	OneNote is required 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 401.

Senior Design Sequence

ECE 401 Senior Design I

- Project Management (how to coordinate a group of engineers)
- Tools you will need in the later courses (CircuitLab, PCB layout, etc).
- PCB Layout with Fusion360

ECE 403 Senior Design II

- Take a larger project and split it in to N parts (one per student)
- Each student designs, builds, and tests a design for their part
- Each student also demonstrates their ability to apply knowledge of ECE

ECE 405: Design II

- Combine separate parts into a single working system
- Design, build, and test a PCB for your overall design

Essentially,

- Take what you did in ECE 401,
- Apply it to a larger, more complex system
- Over the span of two semesters

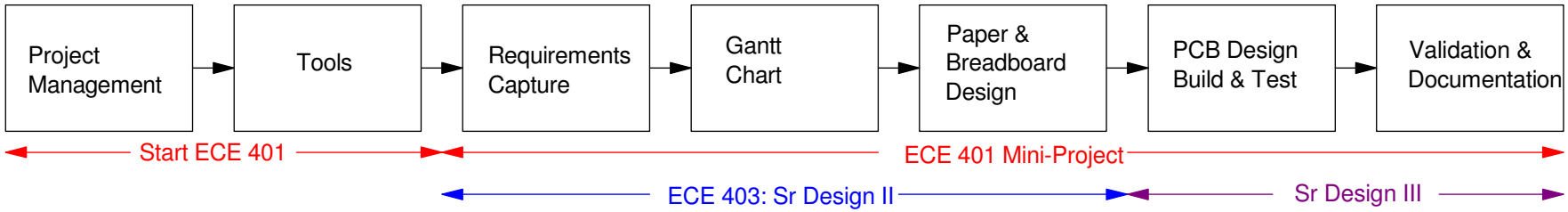
Note:

- ECE 403 has individual grades

  Each student needs to demonstrate his/her ability to apply knowledge of ECE

- ECE 405 has group grades

  The closer you get to a working, packaged, tested design, the higher your grade



Components of Senior Design at NDSU

Lab Notebooks (OneNote)

Similar to ECE 401, MicroSoft OneNote is used in 403 & 405

- Create a new OneNote document for your group
- The same OneNote document will be used throughout Design 2 & 3

OneNote works really well for Senior Design

- Work in these courses is cumulative
- With OneNote, you can easily see what you did previously
- With OneNote, the grader can easily see all of your work
- OneNote avoids having to write a 50 page report at the end

  OneNote is your final report

Syllabus

Senior Design II is really a lab-based class.

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

- 1: Explain projects you can choose from
- 2: Go over project management for Senior Design
- 3: Go over how to demonstrate your ability to apply knowledge of ECE
- 4: Go over ECE tools
- 5: In-Lab Quiz: Using multimeters and oscilloscopes

Week 6 onwards, class no longer meets. However

- Complete the tasks you identified during weeks 1-5
- While doing so, demonstrate your ability to apply knowledge of ECE
- Document your work in your section of OneNote
- Continue meeting with your project sponsor as needed

Grading

- All homework sets are submitted as sections in your group's OneNote document
- Homework sets 1 and 2 are group assignments
- Homework sets 3-10 are individual assignments:

  They should be different for each person in your group (different roles)

  They should be placed under each student's section in OneNote
- Note: You can revise your homework sets to improve your grade

  Final deadline for revisions is Friday of week #16 (dead week)

HW1	Project Selection	5%
HW2	Project Charter & Tasks	10%
HW3	Individual Tasks * Most Important HW Set *	10%
HW4	ECE Concept 1/4	10%
HW5	ECE Concept 2/4	10%
HW6	ECE Concept 3/4	10%

HW7	ECE Concept 4/4	10%
HW8	ECE Tools	10%
HW9	Test Equipment	10%
HW10	Sr Design Expo	5%
	Biweekly Meetings	10%

Overall Grade:

F	D	C	B	A
59% or less	60% - 69%	70% - 79%	80% -89%	90% or more

If you

- Work on your part of your senior design project throughout the semester,
- Are able to demonstrate your ability to apply knowledge of ECE
- Four different ways, and
- Use two ECE tools to test your design

you should be able to get an A in Senior Design II.

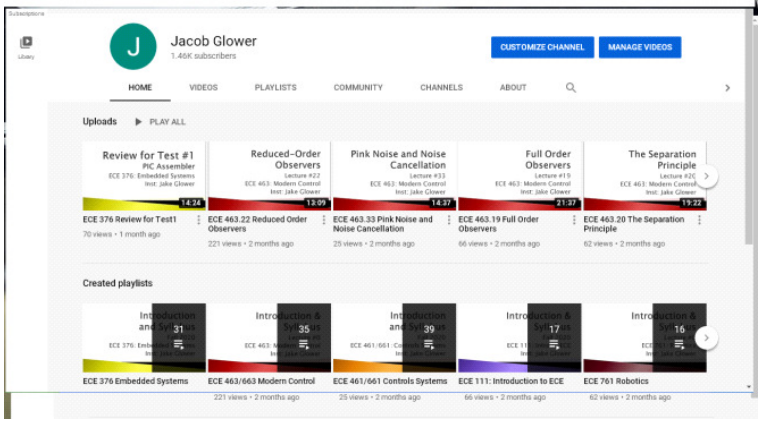
Hy-Flex Model for ECE 403

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



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
Microprocessor (if used)	Raspberry Pi-Pico	any
Programming Language	Python	any

Comments

Homework set #2 and #3 are really important

- They pretty much define what you're going to do for the rest of the semester
- Ask for help if you can't come up with ideas

Have fun in Senior Design II and III

- The whole reason to go into engineering is you want to build stuff
- This is a chance for you to build something you've always wanted, and get college credit for it (!)

It's OK to experiment

- This is a class - if see something neat and want to play with it, please do so.
- Adafruit & SparkFun are good web sites to go to find neat stuff
- Incorporating something off the wall into your design just because you want to learn how to use it is encouraged

But...

- *Do* show you are able to apply knowledge of ECE in your part of your design
- Copying someone else's design and/or code doesn't count

Senior Design Projects

Three types typical

- Industry Sponsored Projects
- Student Suggested Projects
- Faculty Suggested Projects

Projects vary each semester

- Please see Bison Academy for a lit of this semester's projects

Suggested Projects are welcome

- Company projects and/or student projects

There are some constraints

- It has to be something we can build

  No legal issues - we can't build medical devices

- It has to be ECE related

  If you want to pass Design II, you have to show knowledge of ECE

- Students have to be part of a team

  Not necessary that teammates are NDSU students

- It needs something concrete at the end

  So we know if the project was a success or not

- If IP is an issue, we have to use NDSU's IP forms

  Companies can keep the IP rights, but NDSU insists on using our forms

- We would like the project to be presented in the Design Expo

  Good advertising for NDSU, student, company

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.