
Syllabus

ECE 320 Electronics I

Lecture #0

Please visit [Bison Academy](#) for corresponding
lecture notes, homework sets, and solutions

What are Electronics?

Devices made out of semiconductors

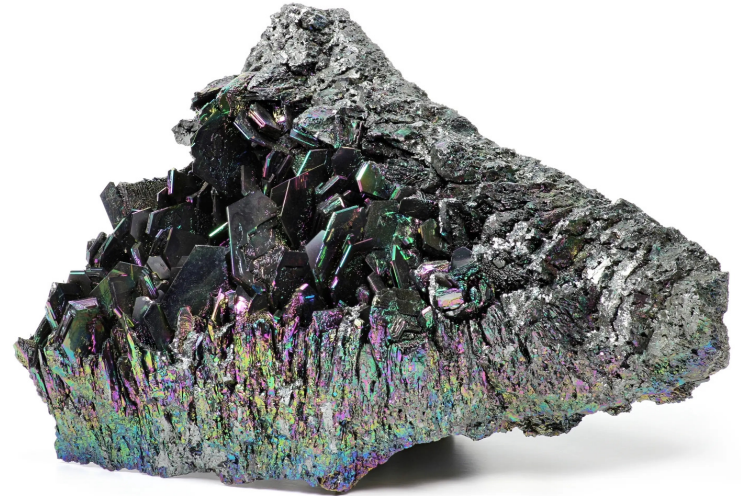
- Silicon, Germanium

Nonlinear devices in general

- Makes circuit analysis hard

Note: This is a junior-level course

- Students don't know what they don't know
- 35 lectures = 35 different things you can do with electronics



Course Content: Week 1-4

Circuits-I Review

- Voltage nodes, current loops, Thevenin
- 555 Timers

Semiconductors

- Thermistors & Photo-Resistors

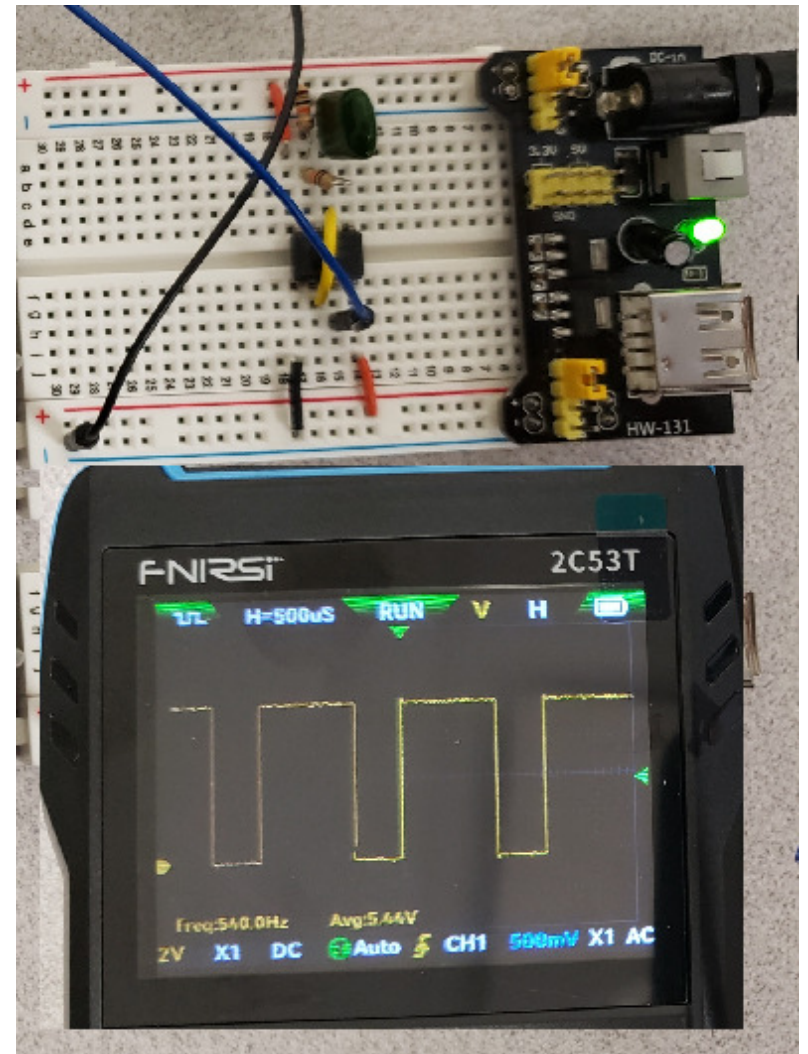
pn-junction

- diodes

Diode Circuits

- LEDs
- AC to DC converters
- Max/Min
- Clippers

Review & Test #1



Course Content: Week 5-8

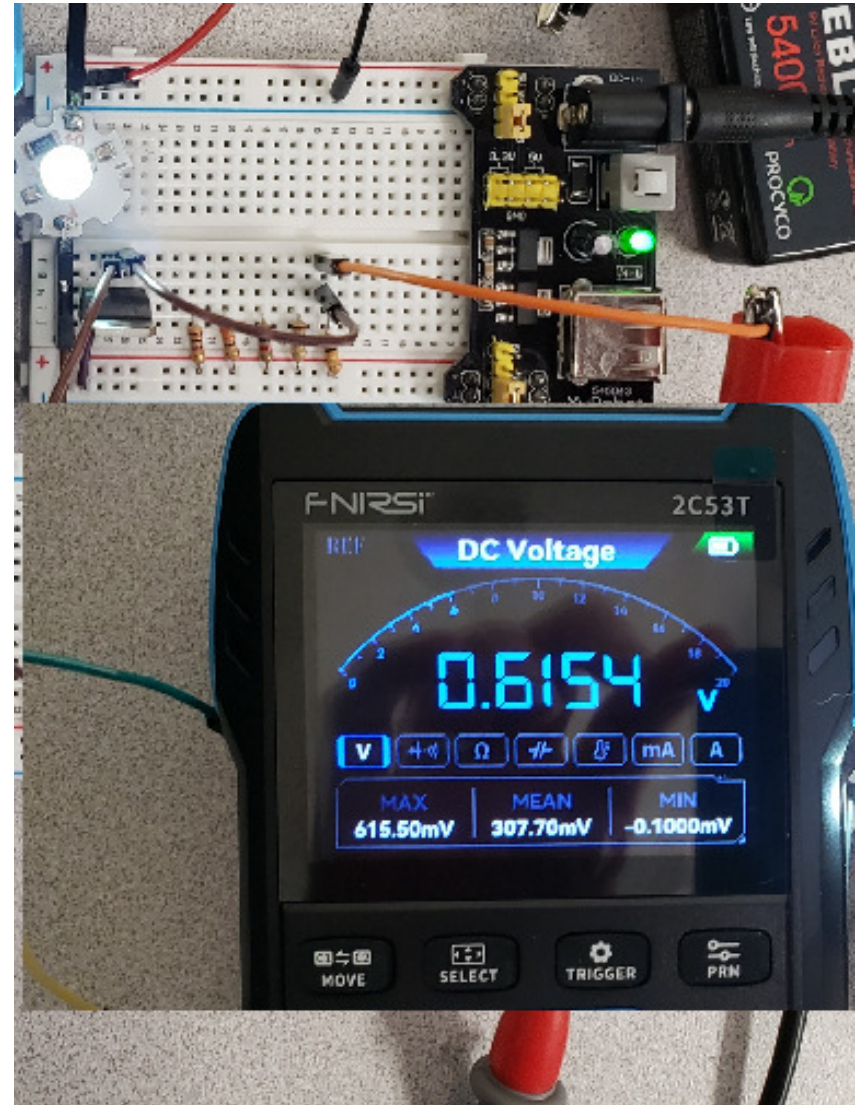
Transistor Circuits

- Transistor Theory
- Transistor Switch
- H-Bridge
- DC to DC Converter
- DC to AC Converter

Digital Electronics

- DTL Logic
- TTL Logic
- CMOS logic

Review & Test #2



Course Content: Week 9-12

Analog Electronics

- Amplifiers
- Mixers
- Push-Pull Amplifiers

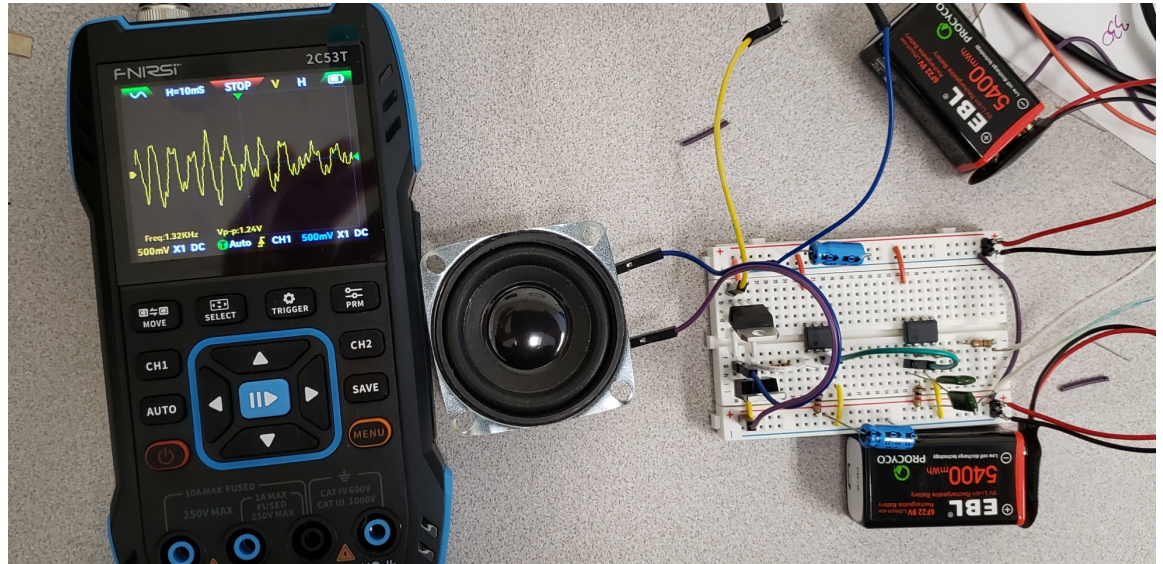
Filters

- Active Filters
- Butterworth Filters

Transistor Amplifiers

- Common-Emitter
- Common-Base
- Common-Collector

Review & Test #3



Course Information:

Instructor:

- Jake Glower

Class Times

- Online

Labs:

- Part of homework sets
- Lab kit has components you'll need

Office Hours:

- Monday 8am - Noon
 - On Zoom
- Available throughout the summer
 - I check my email regularly

ECE 320: Electronics I

Digital & Analog Electronics : Summer 2026

Updated 04/08/2026

[Syllabus](#) - [HW & Solutions](#) - [Best of 320](#) - [Resources](#) - [Comments](#)

Date	Lecture	Videos YouTube Playlist	Handouts	Homework Labs part of HW
Week #1 May 18 - 22	Intro to ECE 320 Slides #0	0 Syllabus FNRSI Multimeter	Install Matlab	HW #1
	Circuits I Review Slides #1	1 Circuits I Review	1 KCL KVN	
	Complex Numbers and Phasors Slides #2	2. Complex Numbers AC vs. DC (EB)	2 Phasors	
	555 Timers Slides #25	25 555 Timers		
Week #2 May 25 - 29	Matlab & CircuitLab Slides #3	3 Matlab & CircuitLab		HW #2
	Semiconductors Slides #4	4 Semiconductors	4 Thermistor	
	The pn Junction Slides #5	5 The pn Junction Diodes (EB)	5 Diode Ckt.	
	Ideal Diodes Slides #6	6 Ideal Diodes	6 Diode Ckt.	
Week #3 June 1-5	Light Emitting Diodes (LEDs) Slides #7	7 LEDs Color Wheel 1000W LED	7 LEDs	HW #3
	AC to DC Converters Slides #8	8 AC to DC Full Bridge Rectifier (EB)	8 AC to DC	
	Min, Max Circuits Slides #9	9 Max Min	9 Max/Min	
	Clipper Circuits Slides #10	10 Clipper	10 Clipper	
Week #4 June 8-12	Review Homework sets 4-6			Test #1 Friday, June 12 th 6am - midnight
	Test #1 Homework #1-3			

Bulletin Description:

ECE 320: Characterization, modeling, and analysis of digital circuits using diodes, BJTs, FETs, and Op Amps. Prereq: ECE 211. F, S

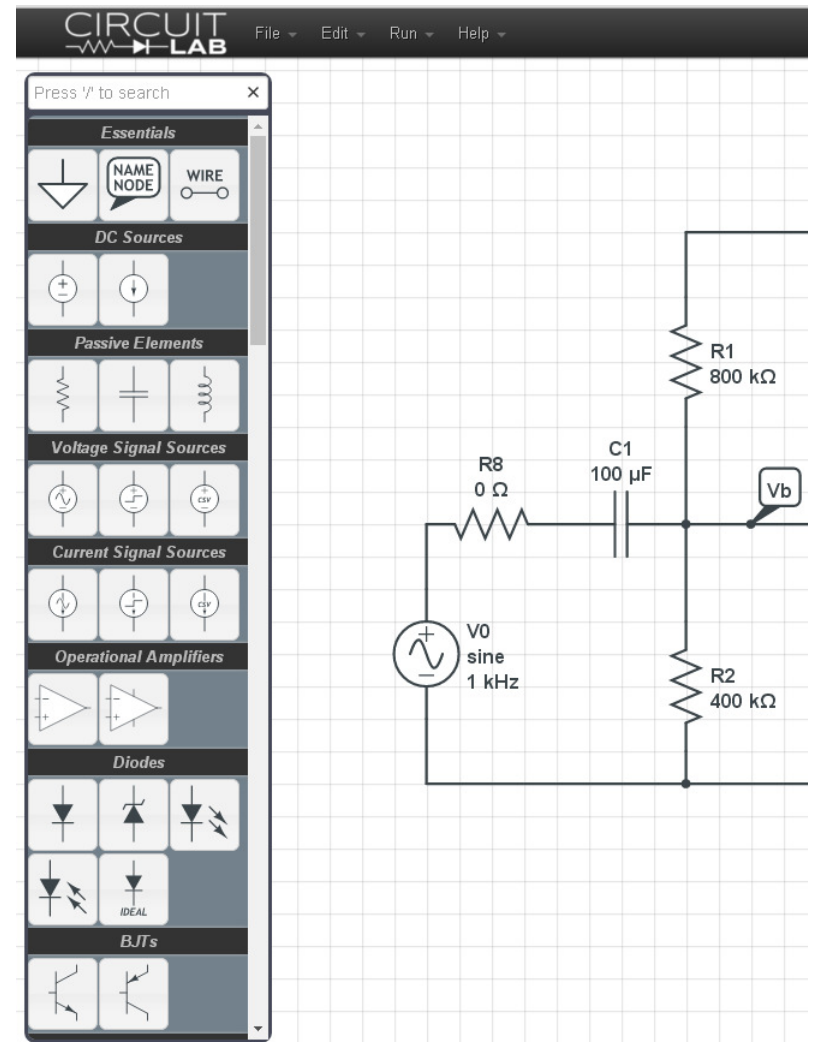
ECE 320 Course Objectives:

By the end of the semester, students should be able to:

- Explain how current flows in a semiconductor via holes and electrons
 - Explain how diodes and transistors operate
 - Design and analyze diode circuits using nonlinear and ideal-diode models
 - Design and analyze transistor circuits with binary outputs, and
 - Design and analyze op-amp circuits with binary outputs
 - Design and analyze op-amp circuits with analog inputs and outputs
 - Design and analyze filters including RC, Butterworth, and Chebychev, and
 - Design and analyze transistor amplifiers using 2-port models
-

Required Student Resources:

- Calculator capable of complex numbers
 - HP35S recommended
 - Most ECE students use TI84 Plus
- Ability to make videos
- Matlab
 - Free for NDSU students
 - Register using your NDSU email account
 - @ndsu.edu (works)
 - @ndus.edu (does not work)
- CircuitLab account
 - Free for NDSU students
 - Register using your NDSU email account
- ECE 320 Lab Kit
 - One per student
 - Mailed out early May



Evaluation Procedures and Grading Criteria

Grades will be the average of the following:

Homework & Labs	Exams	Final Exam
25%	25% each	none

Grades are rounded to the nearest 1%, with your final grade being

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

Text Book

www.BisonAcademy.com

- Free
- What most students use

www.electronics-tutorials.ws

- Good web site with lots of ECE material

Microelectronic Circuit Design

- Richard C. Jaeger
 - Any edition works
 - \$9.49 used
 - optional if you want a hardcopy



BISON ACADEMY

[Advising Info](#)

[ECE Lab Supplies](#)

[ECE 111: Intro to ECE](#)

[ECE 211: Circuits I](#)

[ECE 311: Circuits II](#)

[ECE 320: Electronics I](#)

[ECE 331: Energy Conversion](#)

[ECE 341: Random Processes](#)

[ECE 343: Signals and Systems](#)

[ECE 376: Embedded Systems](#)

[ECE 401: Senior Design I](#)

[ECE 403: Senior Design II](#)

[ECE 405: Senior Design III](#)

[ECE 461: Controls Systems](#)

[ECE 463: Modern Control](#)

[ECE 476: Advanced Embedded](#)

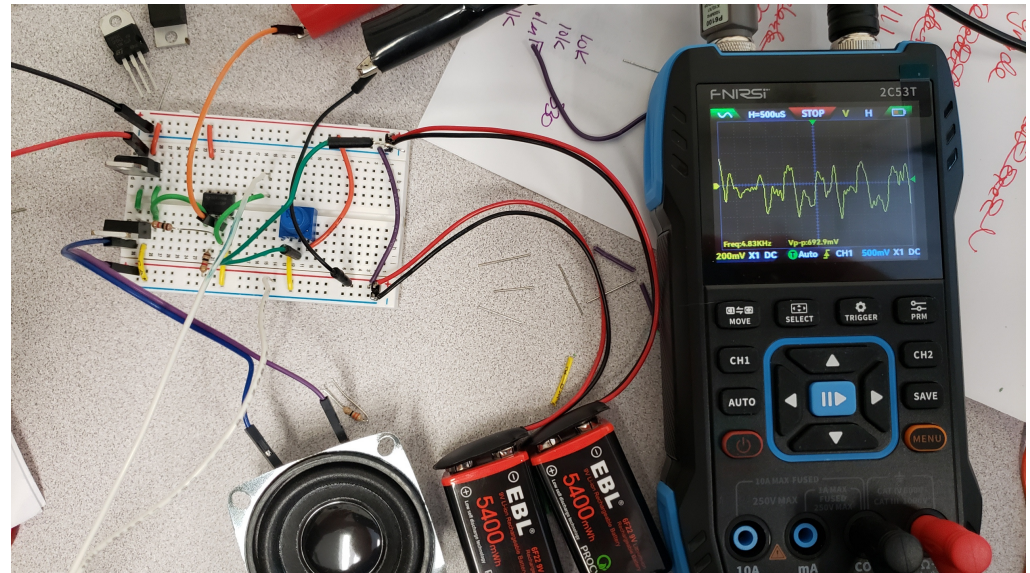
[ECE 761: Robotics](#)



Lab Kits

Lab kits include pretty much everything you'll need for your homework sets

- One lab kit per student
- Mailed out early May
- Multimeter - Oscilloscope - Signal Generator
 - FNRSI 2C53T
- Breadboards
- Power Supplies
 - 5V
 - +/- 9V
- Components
 - Resistors
 - Capacitors
 - Transistors
 - 555 Timers
 - Op-Amps (digital & analog)



Bison Academy - Syllabus

- Topics covered each day
- Lecture notes in portrait and landscape format (pdf)
- Recorded lectures for online students (or anyone) - YouTube link
- Handouts and solutions that we go over in class
- Weekly homework and solutions to the homework (pdf)

	Date	Lecture	ECE 320 Videos YouTube PlayList	Handouts	Homework On-Line: Email solutions to Jacob_glowen@yahoo.com Subject: ECE320 HWx
M	Jan 10	Holiday	0 Syllabus	Install Matlab	HW #1
W	Jan 12	Intro to ECE 320 Circuits I Review Slides #1	1 Circuits I Review	1 KCL KVN	
Th	Jan 13	Complex Numbers and Phasors Slides #2	2. Complex Numbers AC vs. DC (EB)	2 Phasors	
F	Jan 14	Matlab & CircuitLab Slides #3	3 Matlab & CircuitLab		
M	Jan 17	Holiday			HW #2
W	Jan 19	Semiconductors Slides #4	4 Semiconductors	4 Thermistor	
Th	Jan 20	The pn Junction Slides #5	5 The pn Junction	5 Diode Ckt	
F	Jan 21	Quiz #1 (EE 206 Review)			

Bison Academy - Homework Sets & Solutions

Homework sets and solutions from previous semesters

- Makes good sample problems to work on
- Solutions to these homework sets let you check your answers
- Solutions also useful if you get stuck on a homework problem

Quizzes and solutions fom previous semesters

Fall 2021	Spring 2021	Fall 2020	Spring 2020	Fall 2020
1: Circuits Review Solution #1 (pdf) Solution #1 (YouTube) Quiz #1 Quiz #1 Solution (pdf) Quiz #1 Solution (YouTube)	1: Circuits Review Solution #1 Quiz #1 Quiz #1 Solution	1: Circuits Review Solution #1 (pdf) Solution #1 (YouTube) Quiz #1 Quiz #1 Solution	1: Circuits Review Solution #1 Quiz #1 Quiz #1 Solution	1: Circuits Review Solution #1 (pdf) Solution #1 (YouTube) Quiz #1 Quiz #1 Solution
2: pn Junction Solution #2 (pdf) Solution #2 (YouTube) Quiz #2 Quiz #2 Solution (pdf) Quiz #2 Solution (YouTube)	2: pn junction Solution #2 Quiz 2 Quiz 2 Solution	2: pn Junction Solution #2 (pdf) Solution #2 (YouTube) Quiz #2 Quiz #2 Solution Quiz #2 (YouTube)	2: pn Junction Solution #2 Quiz #2 Quiz #2 Solution	2: pn Junction Solution #2 (pdf) Solution #2 (YouTube) Quiz #2 Quiz #2 Solution Quiz #2 (YouTube)
3: LED, AC-DC Solution #3 (pdf) Quiz #3 Quiz #3 Solution (pdf) Quiz #3 (YouTube)	3: LEDs Solution #3 Quiz 3 Quiz 3 Solution	3: AC to DC, LEDs Solution #3 (pdf) Quiz #3 Quiz #3 Solution	3: AC to DC & LEDs Solution #3 Quiz #3 Quiz #3 Solution	3: AC to DC, LEDs Solution #3 (pdf) Quiz #3 Quiz #3 Solution

Bison Academy - Best of ECE 320

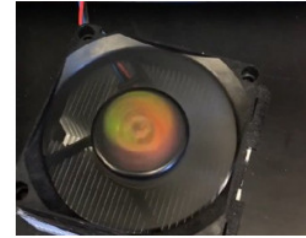
Homework sets usually contain three parts

- Design on paper
- Simulate in CircuitLab
- Build and demonstrate in hardware

Making a YouTube video works pretty well for demonstrating your hardware

- YouTube videos also work well for demonstrating your skills to employers
- Place YouTube link on your resume.

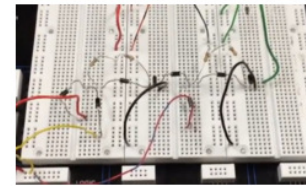
Better YouTube videos linked on Bison Academy (with student's permission)



Electronically Turning On and Off a Fan

Spring 2018

A Schmitt Trigger along with a transistor switch replace the resistor with a light sensor or temperature sensor to turn a fan on based upon light level or temperature.

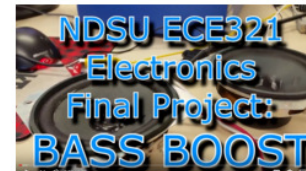


DTL NAND Gate

Fall 2014

A DTL logic gate is built using transistors and

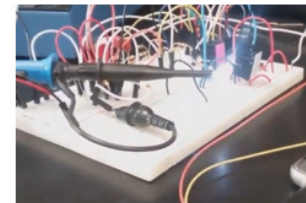
ECE 321: Analog Electronics



Bass Boost

Spring 2015

The audio signal from a computer (or cell phone) subwoofer. A 3rd-order Butterworth filter is used. An amplifier boosts the voltages. A push-pull arrangement



Electronic Candle

Fall 2018

An electronic circuit is built to simulate a flicker generator (from a cell phone app) is mixed with a push-pull amplifier with a current

Legal Stuff:

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).

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.

Attendance: According to NDSU Policy 333 (www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. Students are responsible for the material covered in class and in assignments regardless of their attendance.
