ECE Senior Design Part A

EE496 A & COMPE496 A

ECE Senior Design

17 January 18

1. Instructor:

John Kennedy
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Office Hours: Friday, 3:00pm – 4:00pm

2. Prerequisites:

EE496-A
EE330L - Engineering Electronics Laboratory
EE420 - Feedback Control Systems (concurrent)
EE430 - Analysis and Design of Electronic Circuits
COMPE375 - Embedded Systems Programming

COMPE496-A
EE330L - Engineering Electronics Laboratory
COMPE375 - Embedded Systems Programming
COMPE361 - Windows Programming
COMPE470 - Digital Circuits (concurrent)

3. Class Time:

Lecture:

Wednesday: 9:30am – 10:20am Rm. LSS-248

Lab:

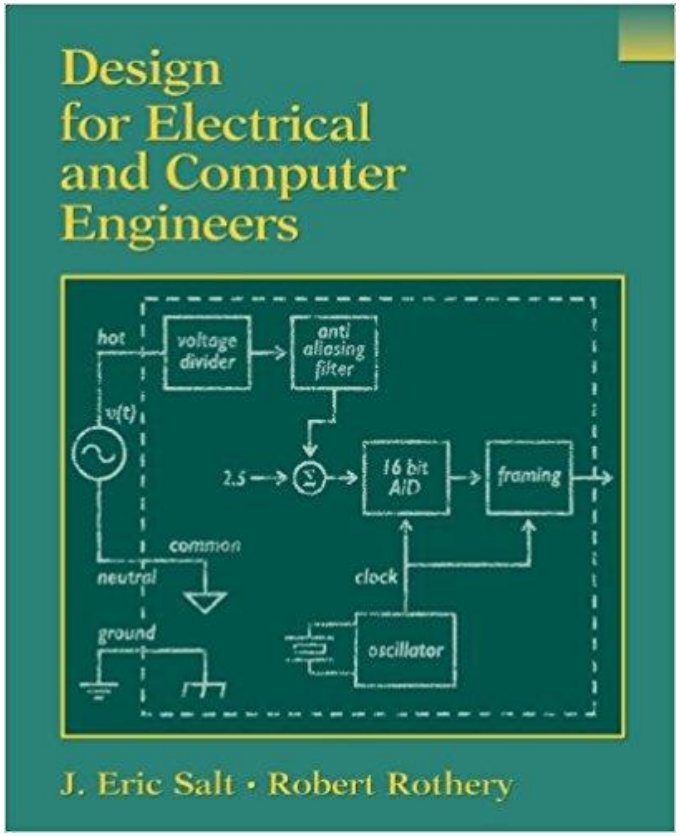
Monday: 9:00am – 11:50am Rm. E207
Wednesday: 12:30pm – 3:20pm Rm. E207
Thursday: 12:30pm – 3:20pm Rm. E207

Current Enrollment:

Monday: 9:00am (COMPE 8 + 3) + (EE 14) = 25
Wednesday: 12:30pm (COMPE 1) + (EE 9) = 10
Thursday: 12:30pm (COMPE 3) + (EE 3) = 6

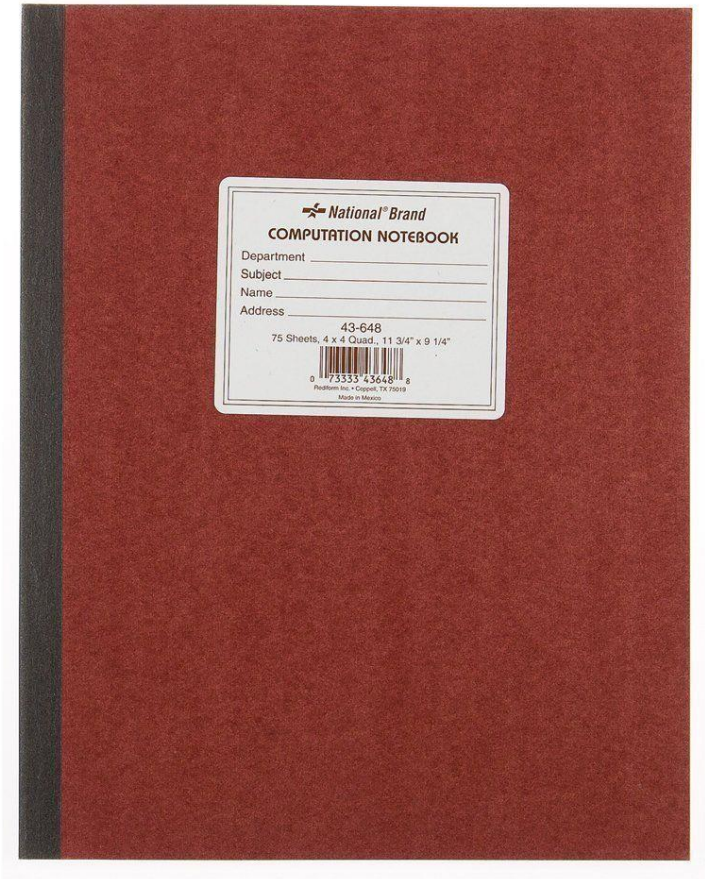
4. Text and Materials:

1. Salt and Rothery: (Recommended – Available at SDSU Library)
Design for Electrical and Computer Engineers,
John Wiley & Sons, 2002 ISBN: 0471391468
(Amazon used around $10)



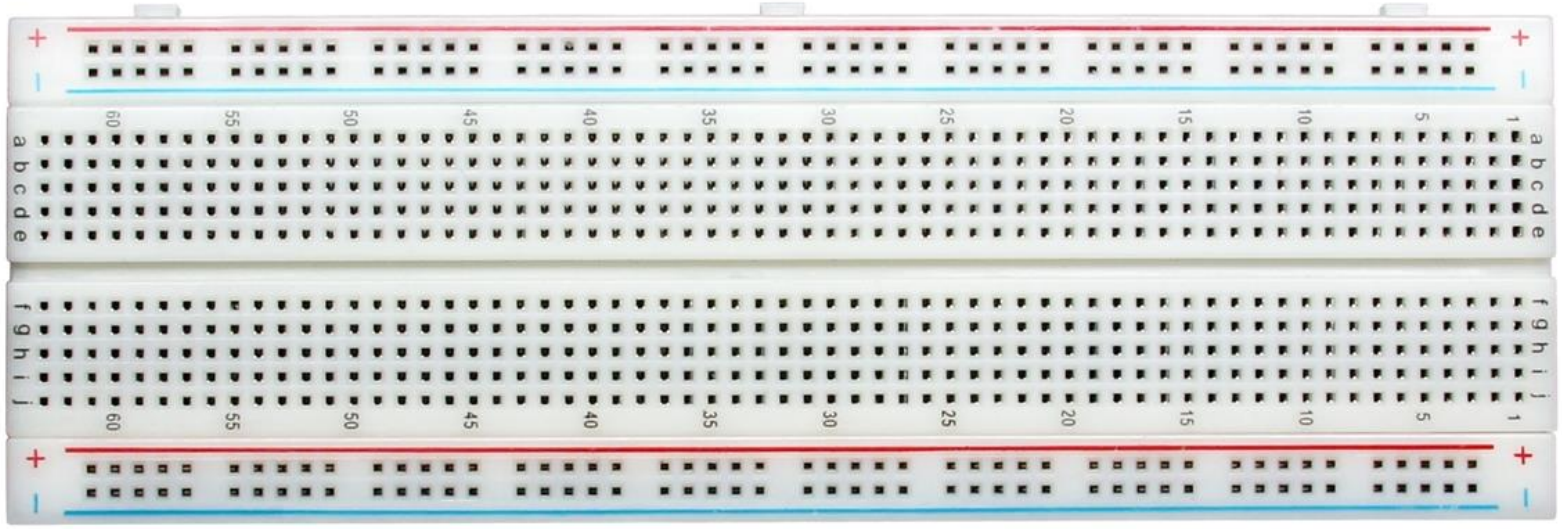
4. Text and Materials:

2. Engineering Notebook: (**Required** for each student)
Suggested Type- 75 Sheets, 4x4 Quad., 11 ¾” x 91/4”
National Brand part # 43-648 (Available in the SDSU Book Store)



4. <u>Text and Materials:</u>

3. Solderless BreadBoard: (**Required** for each student)
Recommend 830 Tie Points, 4 bus or larger (less than $10)



4. Text and Materials:

4. PICkit3 In-Circuit Debugger: (**Required** for each student)
where to get

4. **Text and Materials:**

5. Basic Hand Tools for Electronics: (**Required** for each student

Lead/Wire Cutters – Flush Cutting
(Plato 170 ≈ $6)

Wire Stripper 16 to 26 AWG
(T-Stripper ≈ $12)

Small Needle Nose Plier
(Xcelite L4V ≈ $14)

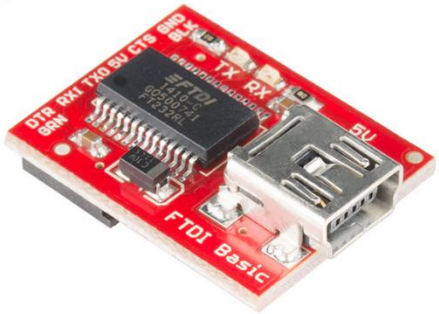
Small Flat Blade Screwdriver
(Wiha 260 ≈ $4)

Tweezers for SMD Assy
(various ≈ $5)

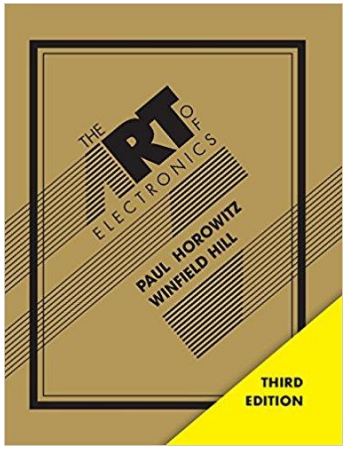
Other Items to Consider

- USB 3.0 Flash Drive
  (16GB ≈ $10)

- FT232R USB to Serial Interface
  (SparkFun ≈ $15)



- The Art of Electronics 3rd Edition
  (ISBN-10: 0521809266 ≈ $62)



5. Purpose of this Course: **Preparation for a Team Based Capstone Design Project**

At the completion of the course, each student will have:

a) a basic competence at reading a datasheet to make component selection decisions based on cost and performance criteria.

b) demonstrated proficiency at using laboratory equipment to test, tune and validate an electronic circuit.

c) the ability to assemble a printed circuit board containing both through hole and surface mount components.

d) demonstrated competence in designing and testing a mixed signal embedded system to meet a set of predefined performance specifications.

e) demonstrated the ability to interconnect electronic devices using synchronous serial communication protocols (SPI & I2C).

f) designed and assembled a printed circuit board (PCB) using professional CAD tools.

g) an understanding of ethical and professional issues faced by engineers.

h) demonstrated the ability to prepare an engineering design proposal with a clear statements of specifications, design criteria and deliverables.

6. Lab Activities:

In order to prepare for the individual design project a number of lab activities and in-lab training sessions will be performed. The lab activities and lecture topics are scheduled so that you will have an overview of the lab topic in the preceding lecture. The labs are structured to test your ability to meet a set of specific design requirements. The method used to meet the design specifications is up to you as there as there are multiple ways to achieve the objectives.

The first 30 minutes of lab will often be used for discussion, demonstration or group exercise. The remainder of the lab time is available for you to work on the lab or demonstrate the previous weeks assignment. Lab results / demos are due by the end of the following weeks lab session. Late lab demo's will be accepted but will be marked down by 10% per week.

7. Individual Design Project:

The Individual Design Project is to design, build, test and document a small electronic system capable of solving a simple task. A typical project will contain a microcontroller, a sensor and some type of actuator or other output device. Each student will design and assemble a custom PCB to implement their design. Once the design is functional the student will evaluate the performance against a set of pre-defined specifications. The project will be documented in a written report and presented to the class in a short oral presentation.

8. Lecture and Lab Topics:

a) Through Hole and Surface Mount Assembly Techniques

b) Selection and Evaluation of Sensors and Transducers

c) Op-Amps and Instrumentation Circuits

d) Microcontroller Interfacing for Mixed Signal Environments

e) Microcontroller Peripherals

f) Embedded Communication Busses I2C & SPI

g) Schematic Capture for PCB Layout

h) Symbol and Cell Management for PCB Design

i) PCB Design using CAD Tools

j) System Design and Block Diagrams

k) Project Management, Planning and Gnatt Charts

l) Engineering Ethics

9. Professional Growth:

Each student is responsible for participating in a minimum of two professional growth seminars throughout the semester. This requirement may be satisfied by attending the SDSU IEEE meetings or any other professional Engineering society meetings. A one paragraph synopsis of the topic covered in the meeting must be submitted to receive credit.

10. <u>Grading:</u>

The approximate grading for the course is as follows:

45% **Individual Design Project, Documentation and Oral Presentation**
Project Proposal 10%
Design Complexity and Execution 15%
Project Report 10%
Oral Presentation 10%

40% **Lab activities**
8 Labs 5% each

15% **Quizzes, Professional Growth and Ethics Assignment**
Quizzes 5%
Professional Growth 5%
Ethics Assignment 5%

11. Tentative schedule of deliverables throughout the semester:

Apr. 4:	Project Proposal Due
Apr. 25:	Engineering Ethics Report due
Apr. 25:	Professional Growth Reports due
Apr. 25-30:	Demonstration of Individual Design Project
Apr. 25-30:	Oral Presentations in Lab Section
May 3:	Last Chance Demo Day (-20%)
May 11:	Final Report Due (Electronic Submission)