Special Topics on Electronic Circuits

Class Meeting Time: Friday 2:10am~5:00pm
Classroom: EE 92383 (Discuss)
Instructor: Chin-Lung Yang (楊慶隆. 電機系所儀器系統與晶片組)
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Handouts: All handouts/lecture notes can be downloaded on Internet or mailed via e-mail.
Office Hours: Tuesday: 2:00-3:30pm / Thursday 8:30-10:00am (or by appointment)

Description: This is a project-oriented course, in which four projects are distributed across the semester and the fifth project utilizes the results of the previous projects to build a demo instrument. Each class member needs to build his/her demo instrument and present it at the end of the semester. The lecture content covers design and analysis of Op Amp circuits that can be utilized for the demo projects.

Textbook:
Design with Operational Amplifiers and Analog Integrated Circuits, 3rd edition, by Sergio Franco

Prerequisite: Fundamentals of electronic circuits, experience with circuit simulation tools (such as SPICE), interest on building a demo instrument. (If you have no experience in designing a device, it is fine to take this course. You will learn how to do it from the demo instrument. Be a fun to be an inventor in the instrumentation field).

Course Syllabus:

Chapter 1: Operational Amplifier Fundamentals
Chapter 2: Circuits with Resistive Feedback

Project #1: Instrumentation Amplifier
+ Brief description of the intended demo instrument

Chapter 11: Voltage References and Regulators

Project #2: Get a DC source from AC

Chapter 3: Active Filters: Part I
Chapter 4: Active Filters: Part II

Project #3: Implement a filter

Chapter 5: Static Op Amp Limitations
Chapter 6: Dynamic Op Amp Limitations

Project #4: Uncompensated Op design

Chapter 12: D/A and A/D Converters
Chapter 7: Noise
Chapter 8: Stability (optional)

Project #5: Demonstration of a small instrument
Examples of the demo system:
光度計、溫度計、濕度計、氣壓計、超音波測距儀、酒精濃度偵測器、恆溫控制器等。

A General Instrumentation Design:

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    Physical Quantity ←           ↓                ↑  
                ↓                ↑  
    Sensor       ↑                ↓  
                ↓                ↑  
  Amplification  Actuator         ↓                ↑  
                ↓                ↑  
  Filtering     Control Unit     ↓                ↑  
                ↓                ↑  
    A/D          Display          ↓  
```

Grading:
Attendance: 15%; Homework: 15%; Midterm Exam: 20%;
Projects: 30%; Final report & Demo: 20%

- One to two persons as a team share the knowledge on how to make an instrument;
  however, everyone must have his or her own designed device and write the report.
- All homework must be handed in paper format and project reports in e-files.
- Course materials are located in my course website
  http://myweb.ncku.edu.tw/~cyang/courses/st_elec1/index.htm
- No delayed homework or project report is allowed. Please check the deadline shown above.
- No cheat and copy work is allowed. You must be failed if you were found cheating.