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

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.

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).

Class Meeting Time: Monday 2:10 am~5:00 pm
Instructor: Chin-Lung Yang (楊慶隆．電機系所儀器系統與晶片組)
Office Phone: 06-2757575 ext. 62422
Office Hours: Monday 9:00-10:30am / Wednesday 8:30-10:00pm (or by appointment)

Course Syllabus:

Chapter 1: Operational Amplifier Fundamentals+ IA Preview
Chapter 2: Circuits with Resistive Feedback

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Project #1: Instrumentation Amplifier
+ Brief Description of the Intended Demo Instrument

Chapter 11: Voltage References and Regulators

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Project #2: Get a DC Source from AC

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

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Project #3: Implement a Filter

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

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Project #4: Uncompensated Op design + Alleviation

Supplements: Sensors

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

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Project #5: Demonstration of a small instrument
Projects:
   Two major projects: (sub-blocks: Project #1 ~ Project #4) + demo instrument systems

Examples of the demo systems:
   光度計、溫度計、濕度計、超音波測距儀、酒精濃度偵測器、恆溫控制器、
   體重計、心電圖、Power Factor Meter、壓力(脈診)、觸控面板、一氧化碳偵測器等。

A General Instrumentation Design:

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Physical Quantity ← ─ ─ ─ ─ │
↑         Sensor         ↑
↑         Amplification  ↑
↑         Filtering      ↑
↑         A/D            ↑
↓         Display
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**Grading:**

Attendance: **20%**; Homework: **10%**; Midterm Exam (Take Home): **15%**;

**Bonus: each project’s top one**

**Notices:**

- Hand-writing sheets/notebooks are suggested.
- Don’t be afraid of dealing bread board (or implementation) other than analysis or simulation.
- One to three 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 project reports must be handed in e-file format. And reports are **highly** related to the
  project scores.
- Course materials are located in my course website
- 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.
The relationship between Other Courses in
Instrument, System and Chip Group

1. 生醫系統IC及微機電設計與儀器及檢測系統
2. 生物資訊、臨床與人體保健

電子電路
系統設計
非破壞性
檢測
生醫積體
電路設計
CMOS/MEMS
微系統晶片設計
電子電路IC
設計
1. 生醫系統IC及微機電設計與儀器及檢測系統
2. 生物資訊、臨床與人體保健

數位影像
處理
生物資訊
程式設計
微波理論
與生醫系統整合
微波工程
及其生醫應用
數位影像
處理
平面顯示器技術及電路設計
平面顯示器之色彩影像處理系統設計
生物資訊
程式設計
機器學習
與生物訊息學
分子生物演算法
臨床生醫
儀器訊號
導論
人體潛能 工程
保健科技
t特論
2. 生物資訊、臨床與人體保健