

工程量測與虛擬儀表設計

課程目的：

以實作過程，提供學生應用理論及量測技術整合訓練，並建立機電整合基本能力

參考書：

1. 課程講義
2. Richard Figliola and Donald Beasley: Theory and design for mechanical measurement, Wiley, 1995.
3. 趙中興編譯：感測器，全華圖書，2006。
4. 楊善國：感測與量度工程，全華圖書，2005。

教師：趙儒民 603 室： 電話:2757575-63532

上課時間： 星期三 第五、六、七節

Office Hours: 星期三 10:00~12:00 and by appointment

成績：	課堂實作成績	20%
	期中實作報告	20%
	專題提案、定期技術報告	20%
	期末專題展示	30%
	期末書面報告	10%

課程大綱：

1. 感測器介紹
2. 應變規
3. 熱電偶
4. 加速規
5. 振動量測分析
6. PWM 伺服機
7. 馬達控制
8. SPI 介面應用
9. 閉迴路控制 (LabVIEW)
10. 工程實案討論

■ 期中專題：

1. 依課程進度,整合應變規、溫度、電子電路量測電路板，並完成測試。
2. 報告內容應包含理論基礎與應用目的、硬軟體說明與實現方式。

■ 期末專題：

1. 構思期末專題及擬定軟、硬體使用規劃；
2. 設計一個含有 Input/Output 應用元件的測試平台，感測器等電子元件可在 Digkey or Mouser 網路平台尋找。專題內容含電路設計與製作（含電路板製作）及測試規劃。
3. 每週進度報告與查核；期末成果展示。
4. 繳交：期末專題書面報告、口頭報告投影片、兩頁精簡說明投影片。

◇ 因應疫情關係實作課程可能會分兩個時段分組或個別進行

Engineering Measurement and Virtual Instrumentation

Objectives:

This course teaches students to use fundamental theory and to design a hand-on experiment to verify it. At the end, it provides an opportunity for students to design and experience a mechatronic system

Text and references:

1. Instrumentation for Engineering Measurements, 2nd edition by James Dally, William Riley, and Kenneth McConnell, Wiley, 1993.
2. Richard Figliola and Donald Beasley: Theory and design for mechanical measurement, Wiley, 1995.
3. John Essick: Advanced LabVIEW Labs, Prentice Hall, 1999.

Grading :	Midterm report	20%
	In class hands-on assignment	20%
	Final Project proposal and weekly report	20%
	Final project presentation/report	30%
	Documentation	

Course outline :

1. Introduction to sensors
2. Strain Gage
3. Thermocouple
4. Accelerometer
5. Vibration measurement and analysis
6. Motor application including PWM servo and stepper motors
7. Closed loop control using LabVIEW
8. Engineering case study

Midterm report

Design and fabricate a circuit board for strain, temperature electronic measurement and complete its performance test.

A brief report is required for its fundamental theory and application.

Midterm test, and in class hands-on assignment:

LabVIEW Programming test

In class hands-on assignment and LabVIEW HW

Final Project Requirement:

1. To design and demonstrate a mechatronics system with Input sensing and Output control units.
2. Weekly meeting and progress report are mandatory
3. Hand in: Final project report with presentation slides and two pages concise PPT file

Course schedule arrangement

110 學年上(2021.9~2022.1)

■ 期中專題：

1. 依課程進度,整合應變規、溫度、電子電路量測電路板,並完成測試。
2. 報告內容應包含理論基礎與應用目的、硬軟體說明與實現方式。

■ 期末專題：

1. 構思期末專題及擬定軟、硬體使用規劃；也可以使用其他軟硬體設備,但須說明原創性與專題努力成果。
2. 設計一個含有 Input/Output 應用元件的測試平台,感測器等電子元件可在 Digikey or Mouser 網路平台尋找。專題內容含電路設計與製作(含電路板製作)及測試規劃。
3. 每週進度報告與查核;期末成果展示。
4. 繳交：期末專題書面報告、口頭報告投影片、兩頁精簡說明投影片。

Week	Contents	Remarks
0		
1	課程簡介 Instrumentation and Engineering Measurement(1) 機電專題成果介紹與討論	9/15 線上課程
2	Instrumentation and Engineering (2)、DEMO	9/22 LabVIEW Learning
3	Case Study - AD/DA; AI/AO; DI/DO	9/29 LabVIEW Learning
4	Case Study - Strain gage (Stress analysis)	10/06 LabVIEW Learning, sub vi
5	Case Study - Thermocouple (Temp sensor)	10/13 國慶日
6	Case Study - Accelerometer, Vibration Shaker(B1F)	10/20 LabVIEW Learning, Loop
7	期中專題製作	10/27 LabVIEW Learning, Array Strain Gage project
8	期中專題製作	11/3 電路設計與製作
9	Case Study - Timer-Counter-PWM signal for servo motor, Basics of mechatronics	11/10 電路測試與報告
10		11/17 LabVIEW Learning Case and sequence

工程量測與虛擬儀表設計

8/5/2018

Week	Contents	Remarks
11	Case Study - SPI interface and GPIB communication	11/24 Cluster Digital communication
12	Case Study - Close Loop Control H bridge and Fuzzy or PID motor control	Final project proposal submission 12/1 Lab work, 5F
13 (12/8)	Final Project preparation	Project discussion (1)*
, 14 (12/15)	Final Project preparation	String and file I/O Project discussion (2)*
15 (12/22)	Final Project preparation	Lab work, 5 th fl Project discussion (3)*
16 (12/29)	Final Project preparation	Lab work, 5 th fl Project discussion (4)*
17 (1/5)	Final Project preparation	Lab work, 5 th fl Project discussion (5)*
18 (1/12)	Final presentation	End of class

* Project discussion takes place at Room 603, on the 6th floor