

2021 spring 物理實驗技術

後續課程公告與資料將在 <https://elearn.nthu.edu.tw/>

教材：講義、及補充電子檔教材

作業、實驗課報告等 60%，實驗專題成果含內容、口頭報告、總結寫作 20%，上課情形、實驗記錄簿完整 20%

週次	講解課(first 1 hr)	實驗、實作內容 (next 3 hours)
1	課程說明、講解 實驗儀控軟體 I: Labview Foundations	實驗分組
2 3/1(一) 和平紀念日補假 3/5(五) 梅竹賽		
3	實驗儀控軟體 II: V structures, Arrays, clusters, File I/O	Labview exercise session I
4	實驗儀控軟體 III, Graph Chart / DC circuits/ diodes	Labview exercise session II
5	Circuit concepts and applications	Circuit Lab. 1 Diode characteristics
6 4/2(五) 掃墓節補假	數據擷取 Data Acquisition I	Circuit Lab. 2 Applications of Nonlinear Circuit Elements
7 4/5(一) 掃墓節補假		
8	數據擷取 Data Acquisition II	數據擷取實習 I: 自製數位電溫度計
9 4/3(一) 兒童節補假 提前於 4/1(六)	數位電路與 Arduino 應用	實驗控制與數據擷取實習 II
10	運算放大器特性與應用 I	微控制器 Arduino 應用
11	運算放大器特性與應用 II	Circuit Lab. 3 Op characteristics I
12	運算放大器特性與應用 III	Circuit Lab. 4 Op-Amp circuits II
13-16 4週		綜合小專題: 實驗控制軟硬體設計實作
17 6/14(一)端午節	小專題成果發表	Final Report /Presentation on projects

注意事項

1. 每次上課請確實簽到及簽退。
2. 實驗室內不可攜帶食物、飲料，並禁止飲食。

3. 每組請自行攜帶一臺筆記型電腦，以便實驗上使用。
4. 上課期間禁止觀看與課程無關的網頁以及玩遊戲，違反者以扣分處分，屢勸不聽者該次實驗成績零分。
5. 每人請準備一本實驗紀錄本，實驗時紀錄本次的實驗過程及結果。
6. 有事不能出席實驗課者，請事先請假。
7. 請假者請在一個月內補做完實驗，否則該次實驗 0 分。
8. 無故曠課者，每次扣總成績 20 分。
9. 請準時出席實驗課，打鐘後 5 分鐘出席者扣總成績 2 分。
10. 非正當理由請假補做實驗者，該次成績以 80% 計算。(生病者需當天藥單證明)

Lab Report Format and Style

Lab reports are to be prepared on A4 paper stapled together, including the raw data (or a copy). It is not necessary to use a bound notebook to record your lab data or write your lab report. For each laboratory exercise, one lab partner will prepare the first half (Sec. I, II) of the written lab report and the other lab partner will prepare for the second half (Sec. III, and IV). This pattern will alternate for each laboratory exercise so that each student will prepare five full written lab reports their lab partner will prepare five different full lab reports. On the final project, each student should write their own full report.

Throughout your professional career you will be required to write internal reports, papers for research journals, proposals, grant applications, etc. To prepare you for these tasks, one of the purposes of this course to improve your skills in the area of written technical communication.

On the first page of your report, write (1) your name (identified as the author), (2) lab section day and time, (3) lab station number, (4) the name of your lab partner, and (5) a table with entries for set-up, data and program, analysis, discussion, questions, clarity, and total grade.

Each full laboratory report will be graded on the basis of 100 points.

Lateness: Three points deducted for each school day late. Saturdays, Sundays, and holidays do not count.

Following are the major lab report sections (100 points total):

- I. **Set-up:** A simple block diagram of the experimental setup you used with all essential equipment labeled. A photocopy of the appropriate diagrams from the course book could be included, with any modifications that you made to do the lab exercise.
- II. **Procedure and Data Summary:** A clear presentation of your data and how you took it for each procedure section, with uncertainties, as you would find in a published technical journal article. (The "Raw Data" section below would be complete, but need not be as clear or as organized.) Any special or unusual experimental circumstances should be mentioned. This section should contain all the information specified in the textbook and required for the Analysis section without requiring reference to the "Raw Data" section.
- III. **Analysis:** A clear description of how you analyzed the data and the results of your analysis. Include typical error propagation from raw measurements to analyzed quantities. In almost all cases the description will refer to tables and graphs. Remember to label the axes of all graphs with numbers and units, and provide a short title for each graph. Whenever possible, compare the analyzed results with numerical expectations. Reference background material, (e.g. equations from the textbook or numbers from manufacturers data sheets) as appropriate.

IV. **Discussion, questions, and Conclusions:** Draw conclusions from your observations, data, and analysis. This section should total at least 500 words (1 page single space typed, 2 pages handwritten) and address the following points:

- 1) The principles demonstrated in each procedure section. Often this only requires stating what is obvious to you, but not necessarily obvious to a colleague reading your report who has not done the laboratory exercise.

- 2) Compare the results of different procedure sections (whenever appropriate) For example, in Laboratory Exercise 4 compare the bandwidth of the gain = 100 amplifiers with the unity gain buffer amplifier.

- 3) Compare your observations to what you would expect. (Why did you observe what you did?) If a mathematical model is used to describe the behavior of the system, describe how well it agreed with your measurements and give possible reasons for any disagreement.

- 4) Discuss general situations where the principles and techniques demonstrated in the laboratory exercise could be used.

- 5) Discuss the major components used in the laboratory exercise and the role each played.

- 6) Discuss limitations of the laboratory exercise and how they can be reduced by changing the method or the equipment.