



# Basic Electricity

## 基礎電學

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**Spring 2019**



## Description for Basic Electricity

### 基礎電學 課程概述

This course presents an introductory survey of basic electricity in information engineering. It follows a bottom-up arrangement of subjects that progresses from the basic electric knowledge to circuit analysis and makes all the hardware system applications for information technologies. These covered topics are as follows: electric characteristics and units, introduction to electric components, series and parallel circuits, DC network analysis, DC transient-state circuits, and resonant circuits. 本課程針對資訊工程領域所需之基礎電學知識作概括性的介紹，從電的認識至電路的分析，以作為資工領域在建置硬體系統應用的基本專業養成。這些知識主題包含電的特性與單位、認識電的基本元件(電阻、電容及電感等)、元件的串聯與並聯、分壓與分流定則、直流網路分析(歐姆定理、戴維寧定理及諾頓定理等)、直流暫態電路及諧振電路等。



## Textbook 教科書

# Circuit Analysis: Theory and Practice

電路分析：理論與實務

5th Edition, 2013

By

Allan H. Robbins

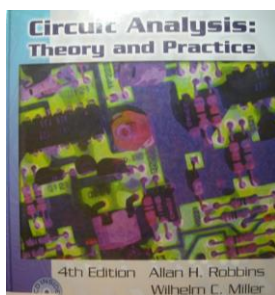
Wilhelm C. Miller

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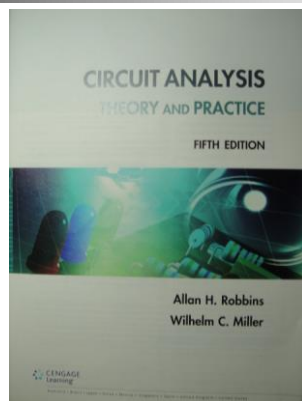


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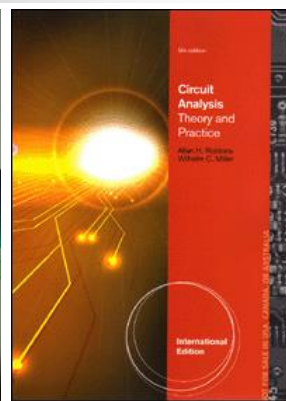
## Textbook Cover 教科書 封面



2008



2013



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學使用，禁止列印、影印、未經授權重製和公開散佈



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## Course Time and Office Hours (課程時間與辦公室時間)

- **Course Time & Place:**
  - **1A: 08:10 ~ 11:00, Monday, C219**
  - **1B: 08:10 ~ 11:00, Tuesday, C219**
- **Office Hours & Place:**
  - **13:10 ~ 16:00, Tuesday, C309**
  - **13:10 ~ 16:00, Thursday, C309**
- **TA Hours & Place:**
  - **CSIE 2B 陳俊宇**
  - **18:00 ~ 20:00, Wednesday, S326**

## Grading (評量)

- **Attendance (出席) : -5 % ~ 5 %**
- **Assignments 指定工作: 35 %**
  1. **Practice & Quiz (實作與小考): 23 %**
  2. **Homework (作業) : 12 %**
- **Midterm Test (期中考): 30 %**
- **Final Test (期末考): 35 %**

## Attendance 出席 -5~5 %

- Roll-call(點名) each class  
-0.5 each since 2nd time **arrival late**
- Signature(簽名) each class  
**-1 for 1st absence,**  
**-2 each since 2nd time absence**

### Exception(例外):

- ◆ **Final test will be rejected if the number of absences is up to six because your learning has not been recognized to complete this course.**

## Assignments 35 %

- Practices 實作 and Quizzes 小考: Grading for sum of righted answers in total problems **23 %**
- Paper-based homework 紙上作業: Grading for sum of righted answers in total problems **12 %**
- **Deliver your paper/assignments on time:**  
準時交實作、小考及作業  
The score will be reduced due to overdue
- **Don't cheat (不欺騙) for your any homeworks**  
**The score would be zero once one is verified 確認抄襲或作弊，該項0分**

**Mid-term Test 30 %**  
**Final Test 35 %**

- **4-page Problems in English/Chinese** 四頁中英文: Closed book and 100 points are maximally graded from 110~125-point problems
- **Don't cheat in any tests** 絕不允許作弊對任何考試  
**The score would be zero once one is verified.**  
**確認抄襲或作弊，該項0分**
- **Open for all the gradings** 公開評量 (You can check your grading anytime)
- **No 58~59.9 points in term score** 期末成績排除 58~59.9分

## Prepare your materials (準備素材)

- **Concentration and Passion** 專心與熱衷
- **Textbook in English or Chinese** 英文或中文教科書
- **Make classnotes by yourself** 自行作筆記
- **Install Multisim** 電路分析專業軟體 **into your PC**
- **Circuit Drawing/Analysis** 電路繪製實作and quiz 小考
- **Propose your questions anytime** 隨時提問
  - TA CSIE 2B 陳俊宇 / Office Hours

# Teaching Web 教學網頁

<http://www.nhu.edu.tw/~chun>

- English-Version
- 首頁(CC Tsai)
- 簡介(Biography)
- 教學課程(Teaching Courses)
- 教學績效(Teaching Awards)
- 輔導績效(Counseling Awards)
- 成績公告(Grade Report)
- 研究(Research)
- 著作(Publication)
- 學術服務(Academic Service)
- 行政服務(Admin. Service)
- 社會服務(Social Service)
- 校務諮詢委員建言(Advisory Service)
- 傑出傑出(Distinguished Sharing)
- 感賞(Impression)
- 獲獎人生(Life Review)
- 全國國小老師訓練營/濟平國小56級六(四)同學會
- HotLinks



關中, Chiayi



Puerto Vallarta, Mexico, Feb 2018



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# Video-based Web: 歷年影片作業

<http://qnew.nhu.edu.tw>



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## Contents 目錄/課程內容 for Circuit Analysis: Theory and Practice

### Part I Foundation DC Concepts 基礎直流觀念

Ch01. Introduction 簡介

Ch02. Voltage and Current 電壓與電流

Ch03. Resistance 電阻

Ch04. Ohm's Law, Power, and Energy  
歐姆定律, 功率 及 能量

### Part II Basic DC Analysis 基本的直流分析

Ch05. Series Circuits 串聯電路

Ch06. Parallel Circuits 並聯電路

Ch07. Series-Parallel Circuits 串並聯電路



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## Contents 目錄/課程內容 (續) for Circuit Analysis: Theory and Practice

### Midterm Test 期中考

Ch08. Methods of Analysis 分析方法

Ch09. Network Theorems 電路網路定理

### Part III Capacitance and Inductance 電容與電感

Ch10. Capacitors and Capacitance  
電容器與電容

Ch11. Capacitor Charging, Discharging, and  
Simple Waveshaping Circuits  
電容器充電, 放電與簡易波形整形電路



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## Contents 目錄/課程內容 (續) for Circuit Analysis: Theory and Practice

**Ch12. Magnetism and Magnetic Circuits**  
磁原理與磁電路

**Ch13. Inductance and Inductors**  
電感與電感器

**Ch14. Inductive Transients \* 電感的暫態**  
**Final Test 期末考**

## Scheduling for CSIE-1A

**2/18(Monday), 2/25, 3/4, 3/11, 3/18**

**3/25(校慶3/23之補假), 4/1, 4/8, 4/15**

**4/17(Wed,6:00PM~ at C322, Midterm-Test)**

**4/22, 4/29, 5/6, 5/13, 5/20, 5/27**

**6/3, 6/10, 6/17**

**6/19(Wed, 6:00PM~ at C322, Final Test)**

# Scheduling for CSIE-1B

2/19(Tuesday), 2/26, 3/5, 3/12, 3/19

3/26, 4/2, 4/9, 4/16

4/17(Wed,6:00PM~ at C322, Midterm-Test)

4/23, 4/30, 5/7, 5/14, 5/21, 5/28

6/4, 6/11, 6/18

6/19(Wed, 6:00PM~ at C322, Final Test)



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## Remind for Answering to Any Tests

提醒：作答時，答案與計算勿混淆

12. Given the internal resistance of a voltage meter,  $R_v = 1M\Omega$ , please show their reading value and loading effect of circuits (a) and (b).

Handwritten calculations for (a):  
 $18 \times \frac{10}{10+100} = 1.8$   
 $18 - 1.8 = 16.2$   
 $16.2 \times \frac{1}{1+16.2} = 1.2$   
 Reading = 12V  
 Loading effect =  $\frac{12}{18} = 66.7\%$

Handwritten calculations for (b):  
 $18 \times \frac{0.5}{0.5+100} = 0.092$   
 $18 - 0.092 = 17.908$   
 $17.908 \times \frac{1}{1+17.908} = 12.092$   
 Reading = 12.092V  
 Loading effect =  $\frac{12.092}{18} = 67.2\%$

17. Given a transmission data as below and the Huffman encoding is used for optimal compression, please calculate the compressed rate.

Character	a	d	f	g	m	u	y
Frequency	90	500	120	110	330	680	70

Handwritten calculations for Huffman tree:  
 90 + 70 = 160  
 160 + 120 = 280  
 280 + 110 = 390  
 390 + 500 = 890  
 890 + 330 = 1220  
 1220 + 680 = 1900

Handwritten calculations for compressed rate:  
 Original data:  $90 \times 8 + 500 \times 8 + 120 \times 8 + 110 \times 8 + 330 \times 8 + 680 \times 8 + 70 \times 8 = 5725$   
 Compressed data:  $90 \times 5 + 500 \times 5 + 120 \times 5 + 110 \times 5 + 330 \times 5 + 680 \times 5 + 70 \times 5 = 4580$   
 Compressed rate =  $\frac{4580}{5725} = 80\%$



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## Hints for Making Your Classnotes

提示：自行作筆記 條列分明

