

# **Fundamentals of Electric Circuits**

**Feng Xiaoyi**

**School of Electronics and Information in  
NPU**

2022.1



# About me

- Feng Xiaoyi
- Professor
- School of Electronics and Information
- Major: Circuit and System
- Research Interest: Artificial intelligent
- Email: [fengxiao@nwpu.edu.cn](mailto:fengxiao@nwpu.edu.cn)

# Textbook



## Fundamentals of Electric Circuits (Sixth Edition) Charles K. Alexander Matthew N. O. Sadiku



# Recommended Reading

1. Hayt, Kemmerly, & Durbin, *Engineering Circuit Analysis*, McGraw-Hill, 8<sup>th</sup>, Edition
2. Alexander & Sadiku, *Fundamentals of Electric Circuits*, McGraw-Hill, 2007
3. Nilsson & Riedel, *Electric Circuits*, Pearson, 7<sup>th</sup>, 2005
4. Irwin, *Basic Engineering Circuit Analysis*, John Wiley & Sons, 7<sup>th</sup>, 2002
5. G. Polya, *How to Solve It*, Princeton Press, the world-famous best-selling book teaches the reader how to develop winning strategies in the face of seemingly impossible problems.

# Platforms

1. Tencent Meeting + Rain classroom + Wechat

2. Steps:

✓ Before the class:

Enter Tencent Meeting and Rain classroom

(Read the information on wechat ,at least 15 minutes before class)



课堂暗号: 4D5S8

使用雨课堂智能翻页笔 请双击



# Platforms

## 2. Steps:

- ✓ During the class: (teacher-student interaction)
- anonymous feedback: (if you do not understand)

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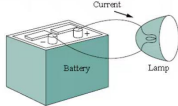
全部 PPT 习题 试卷 +

**chapter 0 Overview of the Course** 第11页

**1. What is a circuit?**

- In electrical engineering, we are often interested in communicating or transferring energy from one point to another. To do this requires an interconnection of electrical devices.
- Such interconnection is referred to as an *electric circuit*, and each component of the circuit is known as an *element*.

An electric circuit is an interconnection of electrical elements.



Function:

- (a) The transfer, distribute and transform of energy;
- (b) The transfer, control and process of signals.

3分钟前

不懂 收藏

# Platforms

## 2. Steps:

✓ During the class: (teacher-student interaction)

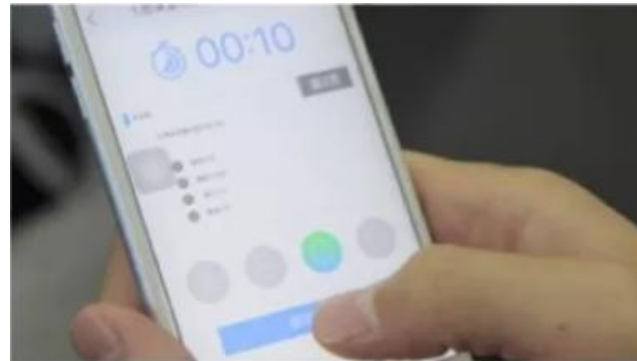
- Limited-time questions:

Single choice questions

Multiple choice questions

Fill-in-the-blank questions

Your behavior will be recorded by the system!



Single choice questions

Our course name is

- ☒ A Fundamentals of Electric Circuits
- ☐ B Linear algebra
- ☐ C Chemistry
- ☐ D Signals and systems

提交



## Multiple choice questions

Requirements of this course include

- ☒ A Attend the classes on Time
- ☒ B Finish Assignment in Time
- ☒ C Submit question in time

提交

Fill-in-the-blank questions

Our course starts at [填空1]

作答

# Platforms

## 2. Steps:

✓ During the class: (teacher-student interaction)

- Real-time comment :



# Some Requirements

- Attend the Classes on Time

Student who miss the class for three times for no reason is not eligible for final exam

- Finish Assignment in Time

Student who does not submit homework three times is not eligible for final exam

# Examination

- Attendance/Assignment 10%
- Quiz and homework 20%
- Final examination 70%

# chapter 0 Overview of the Course

1. What is an electric circuit?
2. What is circuit analysis?
3. What is the task of this course?
4. What are the main contents of this course?

**Fundamentals of Electric Circuits**

# chapter 0 Overview of the Course

## 1. What is an electric circuit?

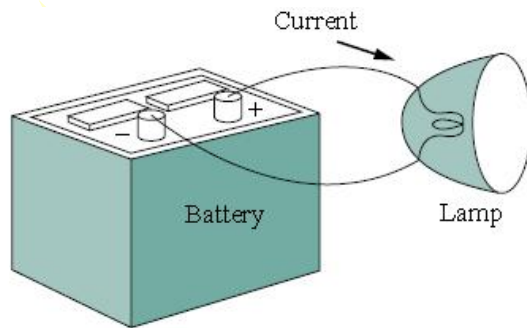


Figure 1.1 A simple electric circuit(flashlight)

It consists of three basic elements: a battery, a lamp, and connecting wires.

Function:

- (a) The transfer, distribute and transform of energy;
- (b) The transfer, control and process of signals.

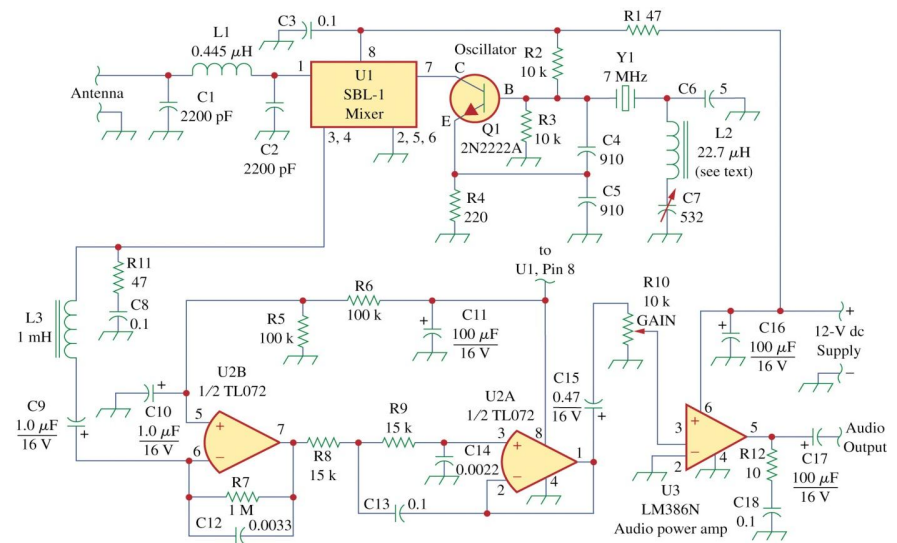


Figure 1.2 A complicated real circuit  
(a radio receiver)

## 2. What is circuit analysis?

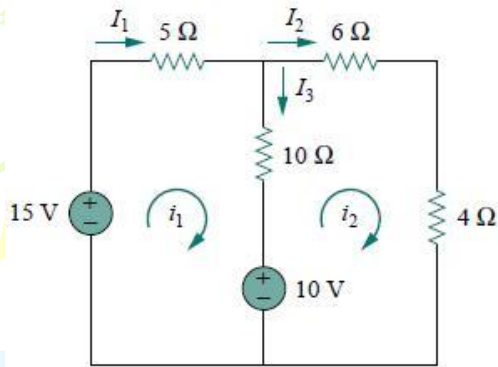


Figure 1.3 A given circuit

6 circuit elements: 2 sources(input), 4 resistors.

For each circuit element: one voltage and one current (output)

**A given circuit** means the Circuit structure and the parameter of each circuit element are known.

**Circuit analysis** is the process of determining the output of a given circuit (or the response to the given input) .

**Circuit analysis** is the process of determining voltages across (or the currents through) the elements of a given circuit.



### 3. What is the task of this course?

Electric circuit theory and electromagnetic theory are the two fundamental theories upon which all branches of electrical engineering are built.

**Tasks of Electric circuit theory:** Enable students to master the basic concepts, basic laws, theorems and basic analysis methods of circuits.

**Circuit analysis can be separated into two broad categories:**

- ✓ Linear circuit analysis

**linear circuit:** the equations(voltage-current relationship) characterized the circuits are linear algebraic or linear differential equations.

- ✓ Nonlinear circuit analysis

**This course deals with linear circuit analysis.**



### 3. What is the task of this course?

–Why study linear analysis?

- ✓ Linear problems are inherently more easily solved than their nonlinear counterparts.
- ✓ A great many systems **behave in a reasonably linear fashion over a limited range**----allowing us to model them as linear systems if we keep the range limitations in mind.

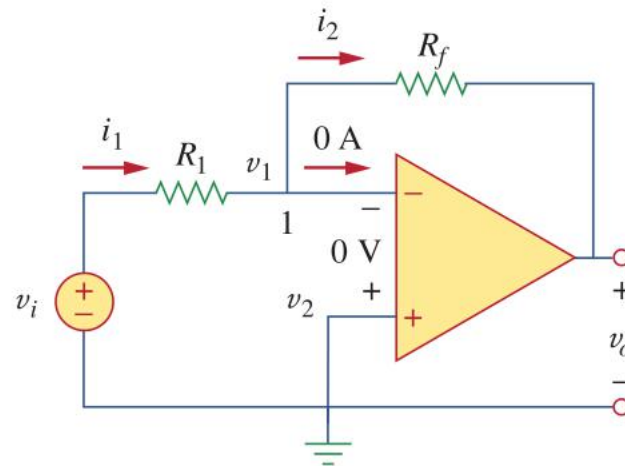
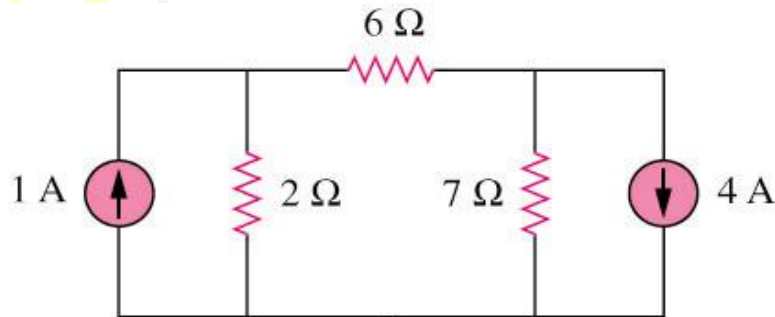
## 4. What are the main contents of this course?

Linear circuit analysis can be separated into four categories.

- DC analysis**: A direct current (dc) is a current that remains constant with time.
- Transient analysis**: Transient analysis examines the transition of a current or voltage in a circuit from one steady state to another after an abrupt change in excitation or circuit structure.
- AC analysis**: An alternating current (ac) is a current that varies sinusoidally with time.
- Frequency response analysis**: the most general of the four categories. The frequency response of a circuit is the variation in its behavior with change in signal frequency.

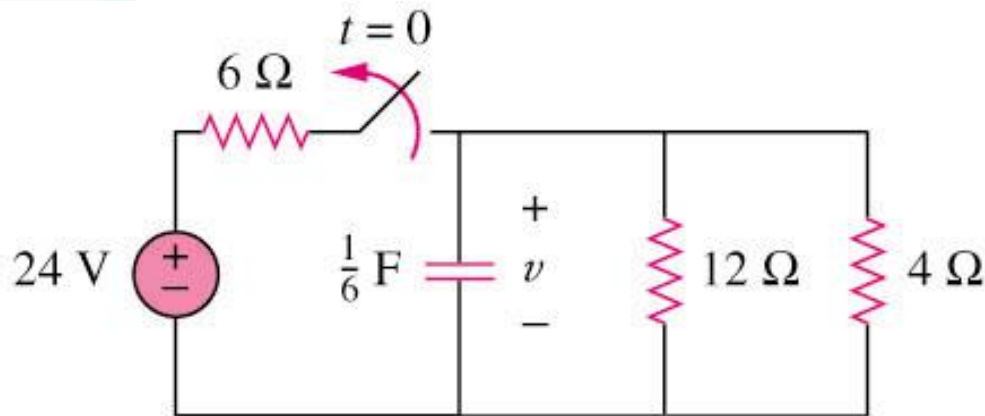
# PART 1 : DC ANALYSIS

- Chapter 1 Basic Concepts
- Chapter 2 Basic Laws
- Chapter 3 Methods of Analysis
- Chapter 4 Circuit Theorems
- Chapter 5 Operational Amplifier



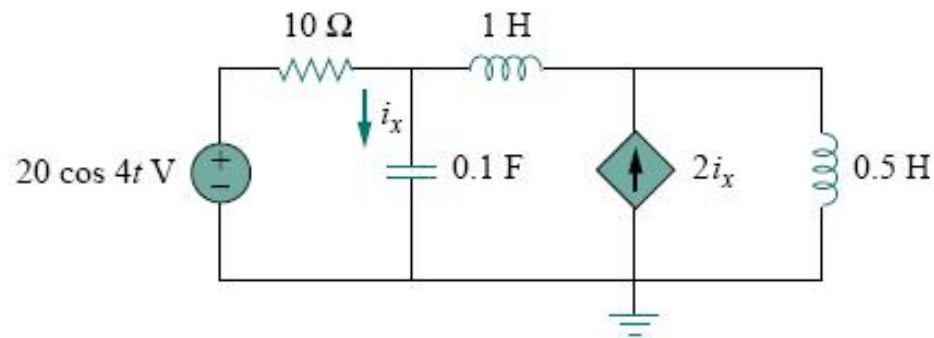
## PART 2 : TRANSIENT ANALYSIS

- Chapter 6 Capacitors and Inductors
- Chapter 7 First-Order Circuits
- Chapter 8 Second-Order Circuits



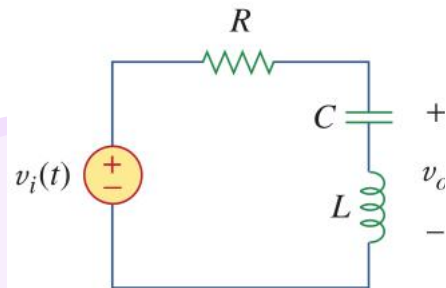
# PART 3 : SINUSOIDAL CIRCUITS

- Chapter 9 Sinusoids and Phasors
- Chapter 10 Sinusoidal Steady-State Analysis
- Chapter 11 AC Power Analysis
- Chapter 12 Three-Phase Circuits
- Chapter 13 Magnetically Coupled Circuits

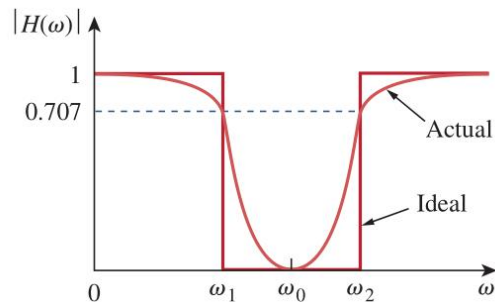


# PART 4: ADVANCED CIRCUIT ANALYSIS

- Chapter 14 Frequency Response
- Chapter 15 Introduction to the Laplace Transform
- Chapter 16 Applications of the Laplace Transform
- Chapter 17 The Fourier Series
- Chapter 18 Fourier Transform
- Chapter 19 Two-Port Networks



Bandstop filter.



Frequency response

