❖ 2021F-ENGR_0031: Electric Circuits

Instructor : Jeungphill Hanne

<Education>

- **PhD, Physics**, University of California-Los Angeles, USA

→***Majoring in Experimental Biophysics*** *(Dr. Giovanni Zocchi)*

- **PhD Study, Physics**, University of Florida (UF), USA

→ Majoring in Theoretical Elementary Particle physics

- **MS, Physics**, University of California-Riverside, USA
- **BS, Physics**, Inha University, South Korea

<Professional Experiences>

- Jul. 2010~ Aug. 2019: **Postdoctoral Research Associate**,

The Ohio State University Wexner Medical Center, *(Adviser: Dr. Richard Fishel)*

→***Studying DNA Mismatch Repair by Experimental Biophysics***

- Sept. 2006~ Apr. 2010 : **Senior Research Scientist**, LG Display Co, Ltd., South Korea

→Optical Physics

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❖ List

1. SCUPI 2021 Fall Academic Calendar

- Academic Calendar : Midterms & Final etc.
- My Schedule : Office hours etc.

2. Course Introduction

- Course information
  - Subject, Text book, Lecture Hour, Office hour, Course website, etc.
- Course Objective & Scope, Course Learning Key Points
- Course Grading & Tentative Course Schedule

3. Brief Overview

- Brief Overview of the chapters
- Structure of the chapter

1. SCUPI 2021 Fall Academic Calendar

- **Academic Calendar : Midterms & Final etc.**

SCUPI Academic Calendar for 2021-2022 Fall																											
	Aug.	Sep.				Oct.					Nov.				Dec.				Jan.					Feb.			
Monday		30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14
Tuseday		31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15
Wednesday		1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16
Tursday	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17
Friday	27	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18
Saturday	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19
Sunday	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	6	13	
SCU Week	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
SCU Term	Fall Term																					Winter Recess				

Notes:

Registration: Aug.26-27

Make-up exam:Aug.27-29

Classes begin for freshman:Sep.13

Classes begin for other students: Aug.30

Mid-Autumn Festival: Sept.19-21

National Holiday: Oct. 1-7

New Year's Day:Jan.1

1st Midterm

2nd Midterm

Final

This schedule is preliminary!!

1. SCUPI 2021 Fall Academic Calendar

- **My Schedule : Office hours etc.**

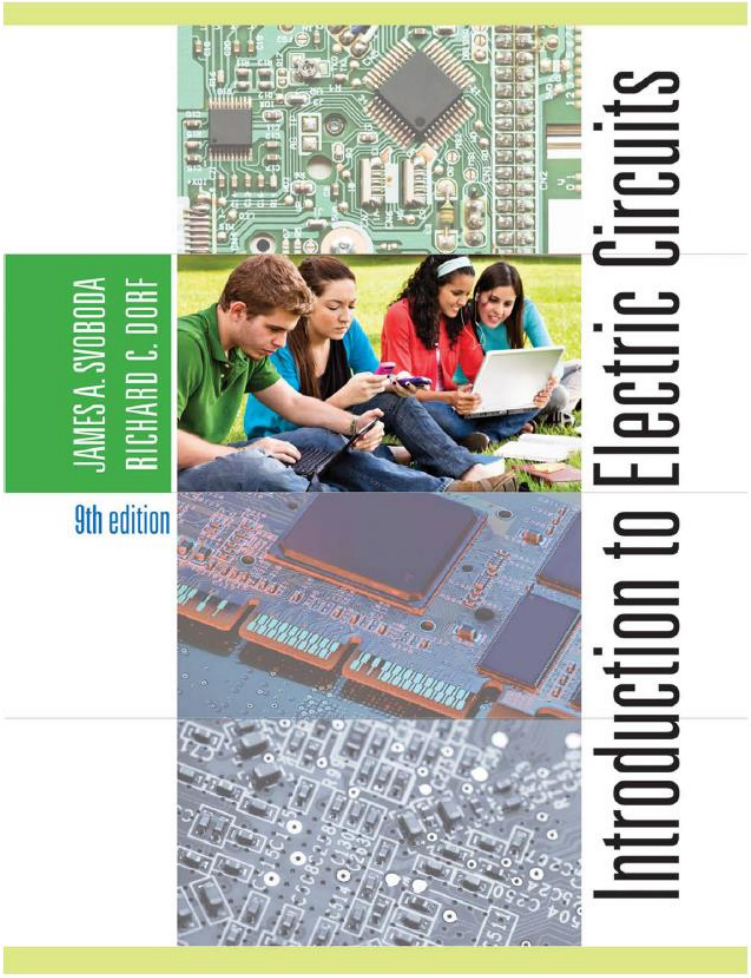
2020-2021 Spring Semester Course Schedule					
Class time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
08:15-09:00				Physics II 02 3-103	
09:10-09:55				Physics II 02 3-103	
10:15-11:00				Office Hour Physics II 02	Physics II 03 3-101
11:10-11:55					Physics II 03 3-101
Lunch Break					
13:50-14:35	Electric Circuit 01 3-106	Electric Circuit 02 3-106			
14:45-15:30	Electric Circuit 01 3-106	Electric Circuit 02 3-106	Office Hour Electric Circuit 02		
15:40-16:25	Electric Circuit 01 3-106	Electric Circuit 02 3-106	Office Hour Physics II 03		
16:45-17:30	Office Hour Electric Circuit 01	Physics II 02 3-103	Physics II 03 3-101		
17:40-18:25		Physics II 02 3-103	Physics II 03 3-101		

*But, you can come to my office anytime when I am in my office ^^*

2. Course Introduction

• Course information

- **Electric Circuits**
  - Learn the basics of Electric Circuit, and the systematic approaches in obtaining and designing the Circuit properties
- **Text Book**
  - Introduction of Electrical Circuits, 9th Ed. Svoboda and Dorf, 2014 (国际学生版)
  - ISBN 978-1-119-54657-3, **WILEY**
- **Lecture**
  - Instructor : Jeungphill Hanne, PhD
    jeungphill.hanne@scupi.cn
  - Time : Mon.(13:50-16:25),or Tue. (13:50-16:25)
  - Office Hour : Mon.(16:45-17:30)/ Wed.(14:45-15:30)
  - Office : 3-321A @ Zone 3
- **TA :** Peter, and Jarvis
  - Office Hrs : To be announced.
- **Course Format**
  - Lecture, and Active Participation (i.e. Quiz, ***Quiz Presentation***, etc.)
- **Course Grading**
  - Two Midterms, Final, Homework, Quiz, and Attitude (ex. Attendance, Focus, Engagement, Punctuality for HW, etc.)



2. Course Introduction

• Course Scope & Objective

- Objective : Understand the basic Electric Circuits, Systematically Solving Electrical properties and eventually obtaining an ability to design a simple Electric Circuit.
- Scope : An advanced Course based on “Electricity & Magneticity” of the Physics 2 course
  → Required : **Basic Concepts (**the Physics 2 course) + **Some mathematical approaches!**
  1. Steady State Circuit : Constant Sources (Voltage, Current), Resistors, Op Amp
     → Chap 1 ~ Chap 6 **: Not much for Math ! (Just simple Matrices)**
  2. Time dependent Circuit : 1+ Variable Sources (Voltage, Current), Capacitors, Inductors
     → Chap 7 ~ Chap 13 : **1st, 2nd Order Differential Eq.. Frequency Domain Analysis (AC)**
  3. A Mathematical tool to tackle **Differential Equation**
     → Chap 14 ~ Chap 16 : **Mathematical Transformation(Laplace, Fourier)**

• Course Learning Key Points

- Systematically and Mathematically Formularize Concepts and Results of Electric Circuit

→ Can Assist to solve to Electrical Properties Easily and Quickly, and to design a New Circuit!

(So, Assume Concepts and Results are already familiarized!!, and Also Some Math!

• Course Grading

- Grading Components : HW(15%), Quiz (5%), Midterm I (25%), Midterm II (25%), Final (25%) and Attitude(5% : Attendance, Focus, Engagement, Punctuality for HW, etc.) + maybe plus alpha

Can be Flexible!

Tests are not accumulative, but might overlap a little bit !

• Tentative Course Schedule

Week	ENGR_0031(Electric Circuits)	Topics	Assignment
Week 1 (8/30-9/05)	Introduction	**Syllabus**	
Week 2 (9/6-9/12)	Chap1 & Chap 2	**Electric Circuit Variables**	HW1
Week 3 (9/13-9/19)	Chap2 & Chap 3	**Circuit Elements**	HW2
Week 4 (9/20-9/26)	Chap 3 & Chap 4	**Resistive Circuits**	HW3
Week 5 (9/27-10/03)	Chap 4	**Analysis of Resistive Circuits**	HW4
Week 6 (10/4-10/10)	Chap 5	**Circuit Theorems**	
Week 7 (10/11-10/17)	Chap 5		HW5
Week 8 (10/18-10/24)	Review & **Mid Term 1**		
Week 9 (10/25-10/31)	Chap 6	**The Operational Amplifier**	HW6
Week 10 (11/1-11/7)	Chap 6	**Energy Storage Elements**	HW7
Week 11 (11/8-11/14)	Chap 7		
Week 12 (11/15-11/21)	Chap 8	**RL and RC Circuits**	
Week 13 (11/22-11/28)	Chap 8		HW8
Week 14 (11/29-12/5)	Review & **Mid Term 2**		
Week 15 (12/6-12/12)	Chap 9	**RLC Circuits**	HW9
Week 16 (12/13-12/19)	Chap 9		
Week 17 (12/20-12/26)	Chap 10	**Sinusoidal Steady-State Analysis**	
Week 18 (12/27-1/2)	Chap 10		HW10
Week 19 (1/3-1/9)	Chap 11 & Review	**AC Steady-State Power**	HW11
Week 20 (1/10-1/16)	**Final**		

3. Brief Overview of the chapters and the structure of the chapter

- Brief Overview of the chapters
- Structure of the chapter

• Brief Overview of the Chapters

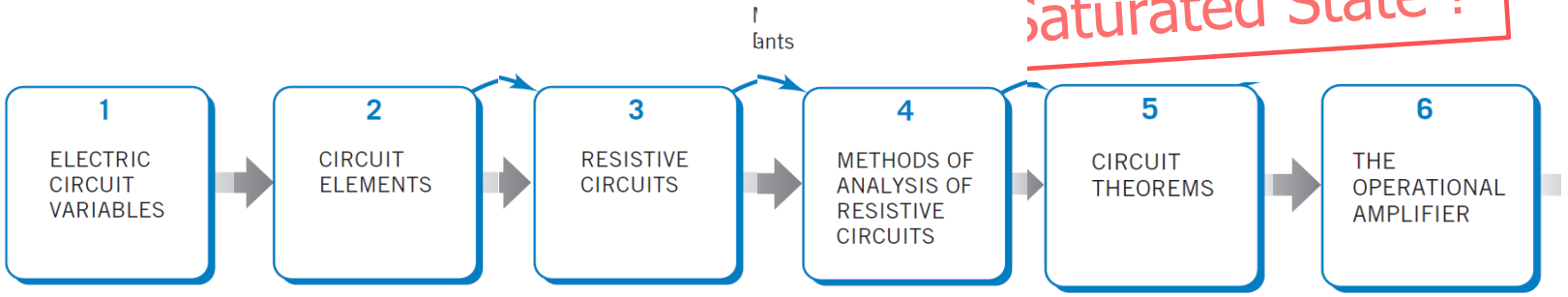
Where KVL & KCL come from ?

✓ All Chapters : Mainly Categorized to Three Parts!

Most Important Part !

1). First Part : Steady State of "Simple" Circuit

Saturated State !



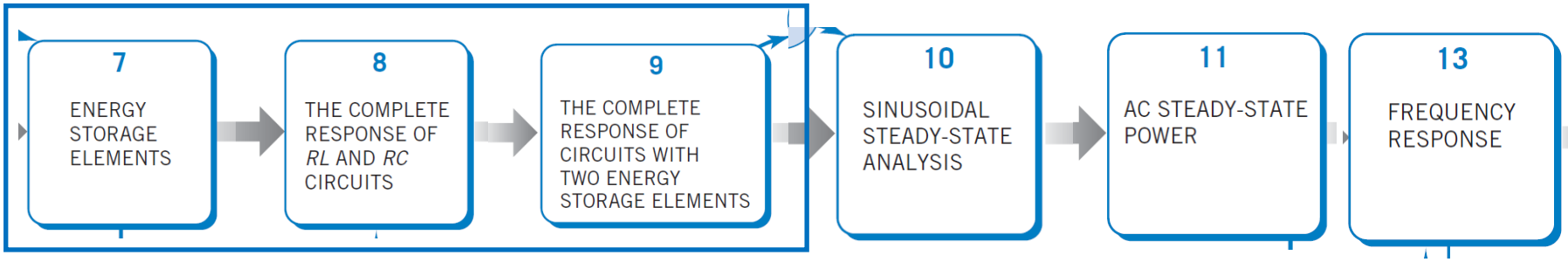
- Circuit Elements : **Resistor Only**, Constant Energy Source (Voltage, Current)
- **Kirchhoff Voltage Law(KVL) & Kirchhoff Current Law(KCL)**
- Theorems from KVL & KCL →Formularize them
- New Electric Component : Op Amp (Operational Amplifier) for Mathematical Calculation

Just KVL & KCL!

→ Not really Mathematically New!!

3. Brief Overview of Chapters and Chapter 1

2). Second Part : Time Varying Circuit



Capacitor +Inductor

1st order Diff. Eq.

2nd order Diff. Eq.

Sinusoidal (AC) input

2nd Most Important Part !

Use Complex variable domain!
→ Useful tool

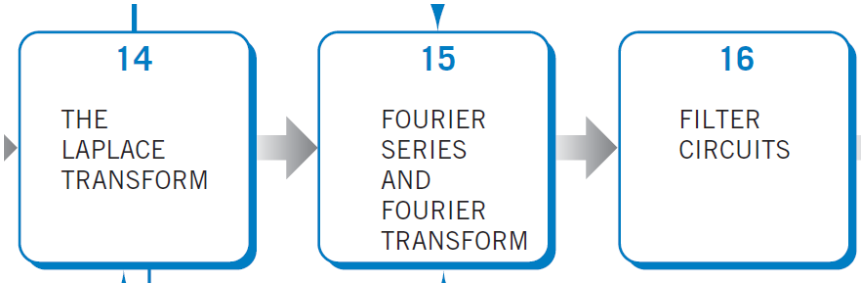
Transient Output + Steady State Output

- Circuit Elements : **Resistor + Capacitor + Inductor Only**, Time Varying Energy Source
  [Specially Alternating → Sinusoidal : AC(Alternating Current)]
- **Kirchhoff Voltage Law(KVL) & Kirchhoff Current Law(KCL)**

→Mathematics : 1st order, 2nd order differential equation, and Frequency Domain Analysis (AC)

3. Brief Overview of Chapters and Chapter 1

3). Third Part : Useful Mathematical Tools for Diff. eq. (Solving, Analysis)



It is good to know !

Transient+ Steady State Output

Frequency Analysis

Revisiting!

- **Course Learning Key Points**

- Systematically and Mathematically Formularize Concepts and Results of Electric Circuit

→ Can Assist to solve to Electrical Properties Easily and Quickly, and to design a New Circuit!

(So, Assume Concepts and Results are already familiarized!!, and Also Some Math!

3. Brief Overview of Chapters

- **Structure of the chapter**

Example

❖ Chapter 4 Methods of Analysis of Resistive Circuits

4.1 Introduction : Node Voltage Analysis & Mesh Current Analysis

4.2 Node Voltage Analysis of Circuits with Current Sources

4.3 Node Voltage Analysis of Circuits with Current and Voltage Sources

4.4 Node Voltage Analysis with Dependent Sources

4.5 Mesh Current Analysis with Independent Voltage Sources

4.6 Mesh Current Analysis with Current and Voltage Sources

4.7 Mesh Current Analysis with Dependent Sources

4.8 The Node Voltage Method and Mesh Current Method Compared

4.9 Analyzing Resistive Circuits Using MATLAB

4.10 Using PSpice to Determine Node Voltages and Mesh Currents

4.11 How Can We Check . . . ?

4.12 Design Example : Potentiometer Angle Display

Skip these parts!