❖ 2022F-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, Optical/Electrical Engineering

<Research Background & Direction>

- Biophysics, Biomedical Science, Bio/Biomedical Engineering, Optical/Electrical Engineering

→ *So, you can come to me anytime, and can ask any advice, or question for the future Career, and so on…., Very happy to share my experience, but the choice is yours !!*

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❖ Agenda for today

1. SCUPI 2022 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. Call class rolls

4. Brief Overview of Chapters

1. SCUPI 2022 Fall Academic Calendar

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

SCUPI Academic Calendar for 2022-2023 Fall

	Aug.	Sep.				Oct.				Nov.					Dec.				Jan.					Feb.		
Monday	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	20
Tuesday	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	11	18
Wednesday	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	12	19
Thursday	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	13	20
Friday	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	14	21
Saturday	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	15	22
Sunday	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	16	23
SCU Week	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	26
SCU Term	2022 Fall Teaching Weeks																		Final Weeks		Winter Recess					

Midterm

Final

This schedule is preliminary!!

1. SCUPI 2022 Fall Academic Calendar

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

2022-2023 Fall Semester Course Schedule					
Class time	Monday	Tuesday	Wednesday	Thursday	Friday
08:15-09:00					
09:10-09:55					
10:15-11:00				Physics 2 03 3-101	
11:10-11:55				Physics 2 03 3-101	
Lunch Break					
13:50-14:35	Electric Circuit 01 3-106	Electric Circuit 01 3-106	Office Hour Physics 2 02	Office Hour Physics 2 03	
14:45-15:30	Electric Circuit 01 3-106	Electric Circuit 01 3-106	Office Hour Electric Circuit 01		
15:40-16:25	Electric Circuit 01 3-106	Electric Circuit 01 3-106	Office Hour Electric Circuit 02		
16:45-17:30	Physics 2 02 3-101	Physics 2 03 3-101	Physics 2 02 3-101		
17:40-18:25	Physics 2 02 3-101	Physics 2 03 3-101	Physics 2 02 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 : Refer to my schedule
  - Office Hour : Wed.(13:50-14:35)/ Wed.(14:45-15:30)
  - Office : 3-321A @ Zone 3
- **TA :** Doris, and Tony
  - Office Hrs : To be announced.
- **Course Format**
  - Lecture, and Active Participation (i.e. Quiz, *Quiz Presentation*, etc.)
- **Course Grading**
  - One Midterm, Final, Homework, Quiz, and Attitude (ex. Attendance, Focus, Engagement, Punctuality for HW, etc.)
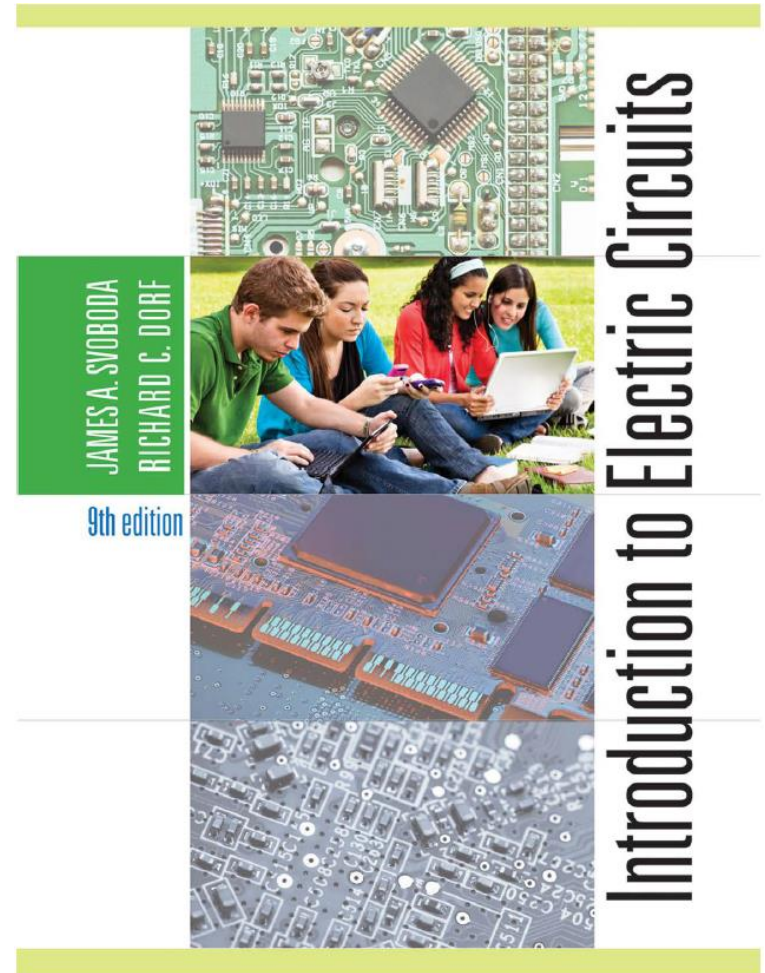
2. Course Introduction

• 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 & Group Presentation (5%), Midterm (40 %),
  Final (40%) Attitude(5% : Attendance, Engagement, Punctuality for HW, etc.)
  → < 60% attendance (might be failed for the course!)

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 (8/29-9/4)	Break		
Week 2 (9/5-9/11)	Introduction & Chap1	**Syllabus**	
Week 3 (9/12-9/18)	Chap2	**Electric Circuit Variables**	HW1
Week 4 (9/19-9/25)	Chap 2 & Chap 3	**Circuit Elements**	HW2
Week 5 (9/26-10/02)	Chap 3 & Chap 4	**Resistive Circuits**	HW3
Week 6 (10/03-10/09)	Chap 4 & Chap 5	**Analysis of Resistive Circuits**	HW4
Week 7 (10/10-10/16)	Chap 5	**Circuit Theorems**	
Week 8 (10/17-10/23)	Chap 5 & Chap 6		HW5
Week 9 (10/24-10/30)	Review & **Mid Term**		
Week 10 (10/31-11/06)	Chap 6	**The Operational Amplifier**	HW6
Week 11 (11/7-11/13)	Chap 6		HW7
Week 12 (11/14-11/20)	Chap 7	**Energy Storage Elements**	HW7
Week 13 (11/21-11/27)	Chap 8	**RL and RC Circuits**	
Week 14 (11/28-12/04)	Chap 8		HW8
Week 15 (12/05-12/11)	Chap 9	**RLC Circuits**	
Week 16 (12/12-12/18)	Chap 9		HW9
Week 17 (12/19-12/25)	Chap 10	**Sinusoidal Steady-State Analysis**	
Week 18 (12/26-1/1)	Chap 10 & Review		HW10
Week 19 (1/2-1/8)	**Final**	**AC Steady-State Power**	
Week 20 (1/9-1/15)	**Final**		

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

- Brief Overview of the chapters
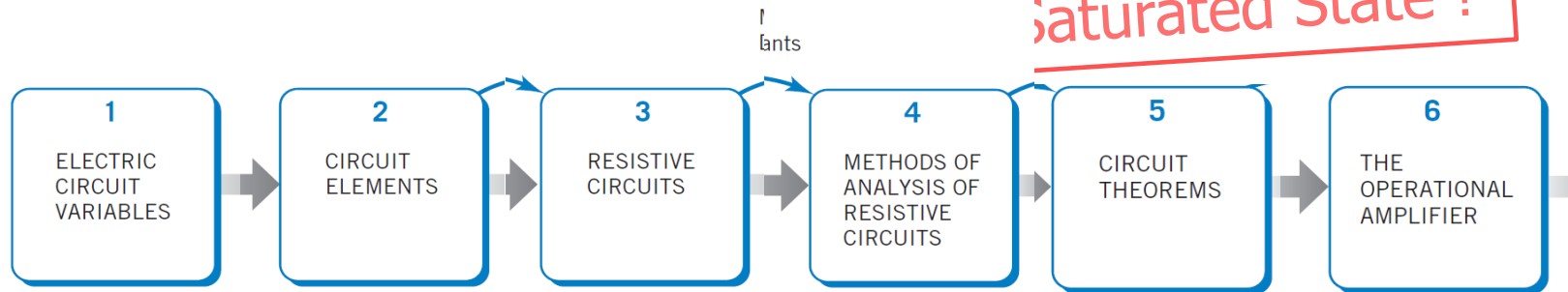- Structure of the chapter

• **Brief Overview of the Chapters**

Where KVL & KCL come from ?

✓ All Chapters : Mainly Categorized to Three Parts!

Most Important Part !

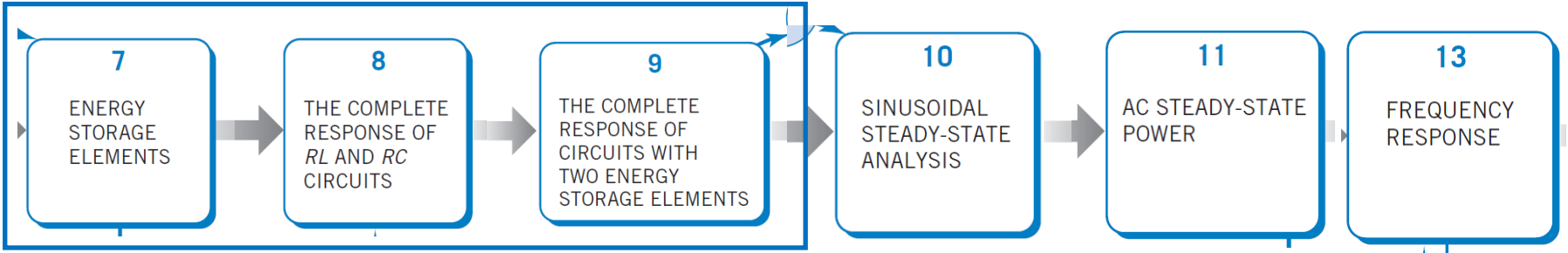**1). First Part :** Steady State of "Simple" Circuit

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

Just KVL & KCL!

- New Electric Component : Op Amp (Operational Amplifier) for Mathematical Calculation
→ Not really Mathematically New!!

3. Brief Overview of Chapters and Chapter 1

2). Second Part : Time Varying Circuit

7		8		9		10		11		13
ENERGY STORAGE ELEMENTS	→	THE COMPLETE RESPONSE OF *RL* AND *RC* CIRCUITS	→	THE COMPLETE RESPONSE OF CIRCUITS WITH TWO ENERGY STORAGE ELEMENTS	→	SINUSOIDAL STEADY-STATE ANALYSIS	→	AC STEADY-STATE POWER	→	FREQUENCY RESPONSE

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)

14	15	16
THE LAPLACE TRANSFORM	FOURIER SERIES AND FOURIER TRANSFORM	FILTER CIRCUITS
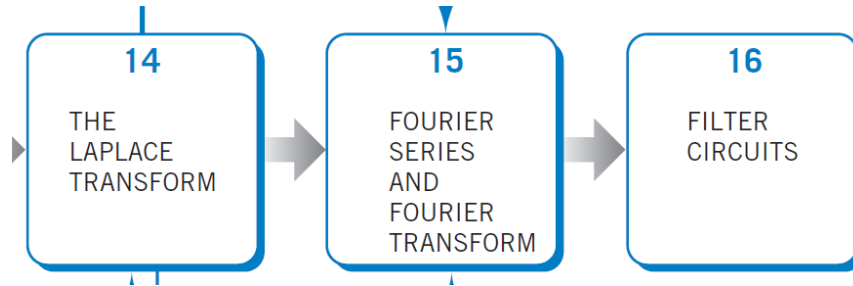
It is good to know !

Transient+ Steady State Output

Frequency Analysis

• **Course Learning Key Points**   Revisiting!

- **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

Skip these parts!