Class Syllabus – Spring Semester, 114Academic Year

Department of Mechanical Engineering, National Chung Cheng University

國立中正大學機械工程學系 113 學年度第 2 學期教學大綱表

<table>
<tr><td colspan="5">(English) Circuits and Electronics (I)
(中文) 電子電路學(一)</td><td>Dept.</td><td>ME</td></tr>
<tr><td colspan="5"></td><td>Class No.</td><td>4222751-02
4212352-02</td></tr>
<tr><td>Instructors</td><td>J.-W. John Cheng
Shyh-Leh Chen</td><td>Credit</td><td>3</td><td>Required</td><td>Level</td><td>2 AB</td></tr>
<tr><td>EMI
全英文授課</td><td colspan="6">■ Yes □ No</td></tr>
<tr><td>course type
課程類別</td><td colspan="6">□ 人文關懷課程 □ 競賽專題課程 ■ 問題導向課程
□ 專題導向課程 □ 總整課程 □ 實作課程
□ 實習 □ 其他</td></tr>
<tr><td colspan="7">Prerequisites: Engineering Mathematics (Ordinary Differential Equations)

Class Description：The class is broadly divided into the following three parts.
● Part I. Basics of Circuit Analysis
■ 1. Mesh and node analyses
■ 2. Equivalent circuits (when time allows)
● Part II. Circuit Analysis for Different Circuit Components
■ 1. RLC circuits (linear circuits)
■ 2. Diode circuits (nonlinear circuits)
● Part III. Circuit Analysis of Switched-Mode Power Supply
■ 1. Signal analysis of pulse-width modulation
■ 2. DC-DC converters

Class Objective：Provide for mechanical engineering students
● Sufficient skills to analyze basic RLC and diode circuits
● Basic understanding of switched-mode power supply for further study on drive circuits of electrical motors.</td></tr>
<tr><td>Textbooks</td><td colspan="6">Textbooks
1. Class notes.
2. A. R. Hambley, Electrical Engineering, Principles and Applications, 7th ed., Pearson Education (2018)</td></tr>
<tr><td colspan="7">教學要點概述</td></tr>
<tr><td>Teaching Materials
教材編選</td><td colspan="6">■ 自製簡報(ppt) ■ 課程講義 □自編教科書
□ 教學程式 □自製教學影片 □其他</td></tr>
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Teaching Methods 教學方法	■講述 □小組討論 □學生口頭報告 □問題導向學習 □個案研究 □其他
Evaluation Tools 評量工具	■期中考 ■期末考 ■隨堂測驗 □隨堂作業 ■課後作業 □期中報告 □期末報告 □專題報告 □評量尺規 ■其他
Teaching Resources 教學資源	□課程網站 ■教材電子檔供下載 □實習網站
Instructor's Information 教師相關訊息	

Agenda		Teaching Hours				Achievable core competence
Topics	Content Outline	Lec-ture	Demo	Exer-cise	Others	
Ch 3. Circuit Analysis	1. Kirchhoff's current & voltage laws 2. Mesh current & node voltage analysis methods 3. Thevenin & Norton equivalent circuits (when time allows)	9				B1, B2, B5 B6
Ch 4. RLC Circuits	1. i-v characteristics of R, L, C 2. Analysis of RLC circuits 3. Common RLC circuits	9				B1, B2, B5 B6
Ch 5. Impedance Analysis of AC Circuits	1. Mathematical basis 2. i-v characteristics and impedance 3. Impedance analysis of AC circuits	9				B1, B2, B5 B6
Ch 7. Diode Circuits	1. i-v characteristic of diodes 2. Analysis of diodes 3. Diode rectifiers 4. Zener diode and voltage regulators	9				B1, B2, B5 B6
Ch 13. Power Transistor Circuits	1. Signal analysis of pulse-width modulation 2. Principle of switched-mode power supply 3. DC-DC converters	9				B1, B2, B5 B6

Achievable Core Competence		Achievable Objective
B1	Capable of basic engineering mathematics, solid mechanics, thermodynamics, automatic control and material science analysis	Capable of performing basic circuit analysis
B2	Capable of independent acquisition and integration of cross-disciplinary knowledge	Capable of independent acquisition and integration of circuit-related knowledge

B5	Capable of mechanical system, component design and manufacturing process planning	Capable of performing basic circuit designs
B6	Ability to discover, analyze and solve professional problems	Ability to discover, analyze and solve circuit problems

Overview of teaching plan: Theoretical analysis and understanding practical example circuits

Class date	Class room	Exam.	Office hour	Teaching quality evaluation method
Wed. 10:10 – 13:00	Room 213, Mechanical Engineering	● 2 midterms + final + quizzes ● score 1 = average (best one of midterms, final) ● score 2 = min(final, 65) ● exam credit = max(score 1, score 2) ● attendance credit = 5 if absences ≤ 3 ● quiz credit = average(all quizzes)*0.05 ● if (exam credit ≥ 60) Grade = exam credit elseif (exam credit + attendance credit ≥ 60) Grade = 60 else Grade = min (exam credit +attendance credit+quiz credit, 60)	Wednesdays 15:00 – 16:00 (by appointment) imecheng@ccu.edu.tw	Teaching evaluation survey and Core competence achievement survey

Weekly	Teaching plan	Remark
1	Ch 1. Introduction Ch 3. Circuit analysis: Mesh current and node voltage methods	
2	Ch 3. Circuit analysis: Mesh current and node voltage methods	
3	Ch 3. Circuit analysis: Mesh current and node voltage methods	
4	Ch 4. RLC circuits: i-v characteristics of R, L and C Appendix. Laplace transform and analysis of 1st & 2nd order LTI ODEs	
5	Appendix. Laplace transform and analysis of 1st & 2nd order LTI ODEs Ch 4. RLC circuits: RC and RL circuits	
6	**1st midterm exam**	
7	Ch 4. RLC circuits: RLC circuits	
8	Ch 5. Impedance analysis of AC circuits: Mathematical basis	
9	Ch 5. Impedance analysis of AC circuits: i-v characteristic and impedance	
10	Ch 5. Impedance analysis of AC circuits	
11	Ch 7. Diode circuits: Diode circuit analysis	

12	**2nd midterm exam**	
13	Ch 7. Diode circuits: Diode rectifiers	
14	Ch 7. Diode circuits: Diode rectifiers	
15	Ch 13. Switched-mode power supply: Signal analysis of pulse-width modulation	
16	Ch 13. Switched-mode power supply: DC-DC converters	
17	Ch 13. Switched-mode power supply: DC-DC converters	
18	**Final Exam**	
*** Midterm and final exam's will take place at off-class hours agreed upon by both Classes A and B**		