

National Chung Cheng University

Department of Electrical engineering

Course Title：微波主動電路設計 Microwave Active Circuit Design

Course ID: 電機系 4155560

Lecturer：張盛富教授 Professor Sheng-Fuh Chang

Credits：3 Units; 選修

Class hour：14:45 to 17:30, Tuesday, EE building A 225

Office Hour：Friday, EE Building I, RM 431B, ext. 33218.

E-mail：ieesfc@gmail.com

Pre-requisite: 電磁波。熟悉 ADS (或相當功能)微波模擬軟體、布局軟體、電路板蝕刻
Electromagnetic Wave, ADS simulation software, PCB layout, etching, soldering skills

Course outline：

第五章 阻抗匹配 Impedance match

第八章 低雜訊放大器 Low-noise amplifiers

第十章 振盪器 Oscillator

第十一章 混頻器 Mixer

Text Book：

1. 無線通訊射頻模組設計-射頻晶片篇

Course Materials:

Lecture notes and announcements will be post on the CCU e-course web system.

<http://ecourse.webedu.ccu.edu.tw/>

Reference Materials：

[1] Reinhold Ludwig and Pavel Bretchko, *RF Circuit Design-Theory and Applications*, Prentice Hall, 2000.

[2] P. Vizmuller, *RF Design Guide—Systems, Circuits, and Equations*, Artech House, 1995.

[3] K. Chang, I. Bahl, and V. Nair, *RF and Microwave circuits and component design for Wireless Systems*, Wiley, 2002

[4] Les Besser and Rowan Gilmore, *Practical RF Circuit Design for Modern Wireless System*, vol. 2.

Grading:

Project 1-Impedance match (15%),

Project 2 Bias-T(10%),

Project 3 LNA (30%),

Project 4 OSC (20%)

Project 5 Mixer(20%)

Class participation and involvement (5%)

Detailed Course Schedules

Week	Date (Monday)	Topic
1	9/14	
2	9/21	Mid-Autumn Festival Project 1 Impedance match assignment
3	9/28	Chapter 5 Impedance Match 5.1 Introduction 5.2 L match 5.3 π match 5.4 T match 5.5 Ladder match 5.6 SL match 5.7 SLS match 5.8 Single line
4	10/5	Project 1 Match, 1st Design Review Project 1 Match, On-site Measurement
5	10/12	Project 1 Impedance match Oral Presentation Project 2 RF Bias-T Assignment Project 2 RF Bias-T On-site Measurement
6	10/19	Project 2 RF Bias-T Oral presentation Project 3 LNA Assignment
7	10/26	Chapter 8 LNA 8.1 Introduction, 8.2 Gain, 8.3 Signal Flow
8	11/2	8.4 Stability, 8.5 Stabilization, 8.6 DC bias 8.7 U. Gain match, 8.8 B. Gain match, 8.9 Power match, 8.10 Noise match 8.11 RF Choke
9	11/9	Project 3 LNA 1st Design Review
10	11/16	Project 3 LNA 2nd Design Review
11	11/23	Project 3 LNA 3rd Design Review Project 3 LNA On-site Measurement (Lab 543)
12	11/30	Project 3 LNA Oral Presentation Project 4 OSC Assignment Chapter 10 OSC 10.1 Introduction, 10.2 Negative Resistance, 10.3 Feedback 10.4 Small-signal S parameter,
13	12/7	10.5 Root Trajectory, 10.6 Impedance Trajectory 10.7 Large-signal Y parameter, 10.8 Large-signal S parameter,

14	12/14	10.9 Load Pulling 10.10 Injection Locking Project 4 OSC1st Design Review Project 4 OSC Measurement On-site Measurement (Lab 543)
15	12/21	Project 4 OSC Oral Presentation Project 5 Mixer Assignment
16	12/28	Chapter 11 Mixer 11.1 Developement of Mixer and Parameters 11.2 Single Ended Diode Mixer 11.3 Single Balanced Diode Mixer 11.4 Double Balanced Diode Mixer 11.5 Single Gate MESFET Mixer 11.6 Dual Gate MESFET Mixer 11.7 Balanced MESFET Mixer 11.8 Resistive MESFET Mixer
17	1/4	11.9 Single Ended MOSFET Mixer 11.10 Balanced MOSFET Mixer 11.11 Resistive MOSFET Mixer 11.12 Balanced BJT Mixer 11.13 Sub-Harmonic Driven Mixer 11.14 Image-Rejection Down-Mixer 11.15 Single-Side-Band Up-mixer Project 5 Mixer 1st Design Review Project 4 OSC Measurement On-site Measurement (Lab 543)
18	1/11	Project 5 Mixer Oral Presentation