

## 通信系统设计 II (EE417) 课程大纲

- 1、2023 秋季学期起 (P1)
- 2、2023 秋季学期前 (P5)

## 课程详述

### COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1. 课程名称 <b>Course Title</b>	通信系统设计 II <b>Communication system design II</b>
2. 授课院系 <b>Originating Department</b>	电子与电气工程系 Department of Electrical and Electronic Engineering
3. 课程编号 <b>Course Code</b>	EE417
4. 课程学分 <b>Credit Value</b>	2
5. 课程类别 <b>Course Type</b>	专业选修课 Major Elective Courses
6. 授课学期 <b>Semester</b>	秋季 Fall
7. 授课语言 <b>Teaching Language</b>	中文 Chinese
8. 授课教师、所属学系、联系方式 (如属团队授课, 请列明其他授课教师) <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	待公布 To be announced
9. 实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 To be announced
10. 选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other ( Please specify )	总学时 Total
学时数 Credit Hours			64		64
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	EE206 通信原理 EE316 微波工程 EE307 天线与电波传播				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	EE206 Communication Principles EE316 Microwave Engineering EE307 Antennas and Radio Propagation				
14. 其它要求修读本课程的学系 Cross-listing Dept.					

**教学大纲及教学日历 SYLLABUS**

**15. 教学目标 Course Objectives**

1. 学习射频通信基础及测试、设计；

2. 学习射频通信器件、电路和系统的设计方法；

3. 学习常用的通信器件优化设计方法

Students will learn: 1. RF/Microwave basics, measurement and design; 2. RF/microwave component, circuit and system design; 3. RF/Microwave component design optimization

**16. 预达学习成果 Learning Outcomes**

(1) 掌握射频通信器件、电路和系统的设计理论和方法

(2) 掌握射频通信基础及测试原理和方法

(3) 应用理论和方法分析射频通信系统，辅以仿真和仪器分析解决问题

(4) 了解常用优化方法并将之应用于设计

(5) 应用理论和技术完成项目

(6) 能独立学习和开展通信系统研究

After completing this course, the students will be able to

(1) understand the basic principles and design optimization approaches to RF/microwave communication system

(2) apply RF/microwave theory and techniques to analyse RF front-end of communication system

(3) solve typical RF/microwave problems

(4) conduct basic analysis and design/optimization of RF/microwave communication system, by using simulating software and operating instruments.

(5) apply theory and techniques to projects.

(6) conduct further study and research in RF/microwave communication system

17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）  
**Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)**

<p>1. 通信系统简介，射频通信元器件介绍</p> <p>2. CST Studio电磁仿真概述</p> <p>3. 射频通信元器件建模</p> <p>4. CST Studio电磁仿真设置详解</p> <p>5. 高频渐进方法</p> <p>6. 数据后处理，参数扫描与优化</p> <p>7. 天线设计与匹配</p> <p>8. 反射面天线设计与混合算法</p> <p>9. 多物理场等算法详解</p> <p>10. CST与MATLAB联合仿真</p> <p>11. 射频滤波器设计</p> <p>12. 电磁算法</p> <p>13-16. 课程项目</p>	<p>1. Introduction to communication system and radio frequency components</p> <p>2. Overview of CST Studio Suite</p> <p>3. Modeling of radio frequency communication components</p> <p>4. Detailed explanation of CST Studio simulation settings</p> <p>5. High frequency asymptotic algorithm</p> <p>6. Post processing, parameter scanning and optimization</p> <p>7. Antenna design and impedance matching</p> <p>8. Reflector antenna design and hybrid algorithm</p> <p>9. Multiphysics and other algorithms</p> <p>10. MATLAB-CST co-simulation</p> <p>11. RF filter design</p> <p>12. Computational electromagnetics</p> <p>13-16. Course project</p>
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18. 教材及其它参考资料 **Textbook and Supplementary Readings**

Microwave Engineering, 3rd Edition, D.M. Pozar

Antenna, 3rd Edition, J.D. Kraus

无线通信原理与应用, 2nd Edition, Theodore S. Rappaport

ADS 使用手册, Keysight

HFSS 使用手册, Ansys

CST 使用手册, CST

**课程评估 ASSESSMENT**

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		50		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		40		
其它 (可根据需要 改写以上评估方式) Others (The above may be modified as necessary)				

20. 记分方式 **GRADING SYSTEM**

- A. 十三级等级制 **Letter Grading**
- B. 二级记分制 (通过/不通过) **Pass/Fail Grading**

**课程审批 REVIEW AND APPROVAL**

21. 本课程设置已经过以下责任人/委员会审议通过  
**This Course has been approved by the following person or committee of authority**

## 课程详述

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9. 实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 To be announced
10. 选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	20

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other ( Please specify )	总学时 Total
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  3. 学习常用的通信器件优化设计方法
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**16. 预达学习成果 Learning Outcomes**

- (1) 掌握射频通信器件、电路和系统的设计理论和方法
  - (2) 掌握射频通信基础及测试原理和方法
  - (3) 应用理论和方法分析射频通信系统，辅以仿真和仪器分析解决问题
  - (4) 了解常用优化方法并将之应用于设计
  - (5) 应用理论和技术完成项目
  - (6) 能独立学习和开展通信系统研究
- After completing this course, the students will be able to
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**Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)**

1. 射频通信元器件和模块测试  
Chapter 1: Measurement of RF components and modules

2. 卫星通信导航基础及测试  
Chapter 2: Satellite navigation basics and measurement

3. 示波器基础及测试  
Chapter 3: Oscilloscope basics and measurement

4. 移动通信基础及测试  
Chapter 4: Mobile communication basics and measurement

5. 频谱分析  
Chapter 5: Spectrum analysis

6. 射频电路基础  
Chapter 6: RF circuit basics

7-9. 信号完整性  
Chapter 7-9: Signal integrity

10. 射频有源模块  
Chapter 10: Active RF module

11-12. 移动通信射频子系统及分析  
Chapter 11-12: RF system for mobile communication

13-15. 射频通信器件的 3D 建模  
Chapter 13-15: 3D modeling of RF component

16. 射频通信器件设计优化  
Chapter 16: Design Optimization of RF component

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小测验 Quiz				
课程项目 Projects		50		
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