

**University of Southern California**  
**Department of Electrical Engineering**

**EE 475 Wireless Communication Technology**  
Fall Semester 2018

**Schedule:** Tuesday & Thursday 3:30 pm – 4:50 pm

**Location:** ZHS 252

**Instructor:** SungWon Chung

Office: PHE 416

Office Hours: Tuesday & Thursday, 5:00 pm – 5:50 pm

Contact Information: [chungsun@usc.edu](mailto:chungsun@usc.edu)

**Teaching Assistant:** Haolin Cong

Office: PHE 320

Office Hours: Thursday, 11:00 am – 12:00 pm

Contact Information: [haolinco@usc.edu](mailto:haolinco@usc.edu)

**Catalog Description:**

Fundamentals of wireless communication from a device point of view. Lab experiments and design project.

**Required Pre-Requisite:**

None

**Recommended Pre-Requisite:**

EE 241 Applied Linear Algebra for Engineering

EE 301 Linear Systems

EE 364 Introduction to Probability and Statistics for Electrical Engineering and Computer Sci.

EE 483 Introduction to Digital Signal Processing

**Related Courses:**

EE 467 Introduction to Communication Systems

EE 484 Communication System Design

**Learning Objective:**

This course will examine the fundamentals of wireless communication from a device and technology point of view. The basic concepts and designs of cellular systems, wireless networks and satellite communication systems will be discussed, and the devices and hardware used in present and future systems will be discussed. The course covers link budget analysis that tracks the signal to noise ratio through the link, digital data rate determination and limitations and bit-error rate calculation.

**Recommended Textbook:**

Microwave and RF Design of Wireless Systems, by David Pozar (Wiley) 2001.

Wireless Communications: Principles and Practice, by T. Rappaport (Prentice Hall) 1996.

**References:**

Microwave and RF Design: A Systems Approach, by Michael Steer, (Scitech Publishing) 2009.

Microwave Engineering, 4<sup>th</sup> Edition, D. Pozar (Wiley) 2012.

RF Microelectronics, 2<sup>nd</sup> Edition, Behzad Razavi (Prentice Hall) 2011.

Antennas and Propagation for Wireless Communication Systems, by S. Saunders (Wiley) 1999.

Digital Communications, 5<sup>th</sup> Edition, by Proakis 2007

Wireless Communications: Principles and Practice, by T. Rappaport (Prentice Hall) 1996.

Principles of Digital Communications and Coding, A. Viterbi 2009.

Analog and Digital Communications Systems, by M. Roden (Prentice Hall) 1996.

Microwave Engineering, by S. Pennock and P. Shepard (McGraw-Hill) 1998.

Handbook of Radio and Wireless Technology, by S. Gibilisco (McGraw) 1999.

Microwave and Wireless Communications Technology, by J. Carr (Newnes) 1997.

**Grading:**

Class Discussion      10%

Homework              20%

Midterm                30%

Project                 40%

**Grading Guideline:**

Absolute evaluation based on overall point score (ranging from 0 to 100)

Grade A	90-100	Grade C+	65-70
Grade A-	85-90	Grade C	60-65
Grade B+	80-85	Grade C-	55-60
Grade B	75-80	Grade D	45-55
Grade B-	70-75	Grade F	0-45

**Tentative Class Schedule** (subject to change)

#	Date	Topics
1	8/21	Introduction & Class Information
2	8/23	Channel : Free-Space Path Loss
3	8/28	Channel : Multipath
4	8/30	Channel : Rayleigh Fading
5	9/4	AM I : Modulation
6	9/6	AM II : Demodulation
7	9/11	FM I : Modulation
8	9/13	FM II : Demodulation
9	9/18	Digital Modulation I: Synchronous
10	9/20	Digital Modulation II: Asynchronous
11	9/25	Digital Modulation III: M-ary Modulation
12	9/27	Digital Modulation IV: OFDM
13	10/2	Noise I: Thermal noise, Noise temperature
14	10/4	Noise II: Noise figure, Noise in cascaded system
15	10/9	Linearity: Cascaded system design for linearity, Linearization techniques
16	10/11	Midterm
17	10/16	Synchronization I: Time synchronization, Frequency synchronization
18	10/18	Channel Equalization
19	10/23	Antenna I
20	10/25	Antenna II
21	10/30	Link Analysis I
22	11/1	Link Analysis II
23	11/6	Channel Coding I: Error correction codes
24	11/8	Channel Coding II: Viterbi decoder
25	11/13	Source Coding I: Huffman coding
26	11/15	Source Coding II: Lempel-Ziv-Welch coding
27	11/20	Class Cancelled (Thanksgiving Week)
	11/22	Thanksgiving
28	11/27	MIMO & Phased Array
29	11/29	Project Presentation
	11/30	Final Project Report Due

## **Statement on Academic Conduct and Support Systems**

### **Academic Conduct**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity <http://equity.usc.edu/> or to the Department of Public Safety <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage [sarc@usc.edu](mailto:sarc@usc.edu) describes reporting options and other resources.

### **Support Systems**

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.