

## **EEL 4514C Communication Systems and Components (Spring 2020)**

1. Catalog Description:  
Theory of communications and applications to radio, television, telephone, satellite, cellular telephone, spread spectrum and computer communication systems.  
Laboratory exercises. (4 credit hours)
2. Pre-requisites and Co-requisites:  
{EEL 3112 and EEL 3135} or equivalent
3. Course Objectives:  
Upon completion of this course, the student should be able to:
  - i. identify common considerations and techniques in the design of communication systems;
  - ii. understand the basics of analog and digital modulation techniques;
  - iii. proficiently employ Fourier analysis to the design of communication systems; and
  - iv. use a simple software-defined radio and other communication equipment to implement some of the communication techniques covered in class.
4. Contribution of course to meeting the professional component (ABET only)  
Teaches engineering design through system-level design and evaluation of communication systems.
5. Relationship of course to program outcomes (ABET only)  
Teaches application of mathematics and engineering to solve engineering problems (Criteria A, E); applies knowledge to contemporary issues (Criterion J); teaches use of techniques, skills, and modern engineering tools necessary for engineering practice (Criterion K).
6. Instructor: Tan F. Wong
  - i. Office location: NEB461
  - ii. Telephone: 352-392-2665
  - iii. E-mail address: [twong@ufl.edu](mailto:twong@ufl.edu)
  - iv. Web site: <http://wireless.ece.ufl.edu/~twong>
  - v. Office hours: MWF 4:00–5:00pm
7. Teaching Assistant: TBA
  - i. Office location: TBA
  - ii. Telephone:
  - iii. E-mail address:
  - iv. Office hours: TBA
8. Meeting Times: MWF 8 (3:00-3:50pm)
9. Class/laboratory schedule: 3 sessions of 50-min. class and 1 session of lab each week

10. Meeting Location: 202 NEB

11. Material and Supply Fees: A lot of coffee and snacks for the long hours of work

12. Textbooks and Software Required:

- a. Title: *Modern digital and analog communication systems*
- b. Authors: B. P. Lathi and Z. Ding
- c. Publication date and edition: 2009, 4th edition
- d. ISBN number: 978-0-19-533145-5
  
- e. GNU Radio (freeware)

13. Recommended Reading:

- a. L. W. Couch, *Digital and Analog Communication Systems*, Prentice Hall, 7th ed., 2007. (ISBN 0-13-142492-0)

14. Course Outline:

<b>Class</b>	<b>Topic</b>	<b>Text</b>
1	Overview & Introduction	1-3.3, 3.5, 3.9
2	Communication channels, E&M wave propagation	3 <sup>rd</sup> ed. 9.3
3	Baseband vs. passband signaling	3.3.5, 4.1
4	Transmission through linear systems	3.4
5	Signal distortions over communication channels	3.6
6	Signal representation, signal energy & bandwidths	2.5-2.5, 3.7
7	Power spectral density	3.8
8	Power spectral density	3.8
9	Amplitude modulation	4.2
10	Amplitude modulation	4.3
11	Quadrature AM	4.4.2
12	Single-sideband AM	4.4.1
13	Carrier Acquisition	4.6, 4.8
14	Superheterodyne AM receiver	5.6
15	Instantaneous frequency and angle modulations	5.1
16	Phase and frequency modulations	5.2
17	Phase and frequency modulations	5.2
18	Generation & reception of FM	5.3-5.5, 5.7
19	Generation & reception of FM	5.3-5.5, 5.7
20	Review of sampling theorem	6.1
21	Pulse-code modulation & quantization	6.2-6.3
22	Pulse-code modulation & quantization	6.2-6.3
23	Differential PCM & delta modulation	6.5-6.7
24	Introduction to digital communications	7.1
25	Line coding	7.2, 7.7
26	Line coding	7.2, 7.7
27	Intersymbol interference & pulse shaping	7.3, 7.4, 7.6

28	Intersymbol interference & pulse shaping	7.3, 7.4, 7.6
29	Equalization	7.5
30	Equalization	7.5
31	Equalization	7.5
32	Digital carrier modulations	7.8, 7.9
33	Signal space	2.5, Apps. A, C
34	Signal space	2.5, Apps. A, C
35	Digital carrier modulations	7.8, 7.9
36	Digital multiplexing	6.4
37	Preview of source coding (Huffman code & vocoders)	14.2, 6.8
38	Preview of channel coding (Linear block codes)	15.1-15.3
39	<i>Advanced topics</i>	<i>12, 13, 15</i>
40	<i>Advanced topics</i>	<i>12, 13, 15</i>
41	<i>Advanced topics</i>	<i>12, 13, 15</i>
42	<i>Advanced topics</i>	<i>12, 13, 15</i>
43	<i>Advanced topics</i>	<i>12, 13, 15</i>

The topics in *red* are additional material which will be covered only if time permits.

15. Attendance and Expectations: Attendance is required.
16. Grading – methods of evaluation: Homework 10%, Midterm 25%, Lab exercises and reports 35%, Final exam 30%.
17. Grading Scale: 90-100 A, 85-89 B+, 80-84 B, etc. (may change to match class average)
18. Make-up Exam Policy: No make-up exam.
19. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
20. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.
21. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.

- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

22. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.