

Instructors and Coordinators:

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Prerequisite: EE207, EE203**Textbook:**Lathi, B., *Modern Digital & Analog Communication Systems*, 3rd Ed., 1998**Course Description:**

This course introduces and emphasizes essential analytical tools and theories of communication systems. Knowledge of Fourier series, transforms, and transmission of signal through linear systems is fundamental for this course. Analog communications, such as Amplitude Modulation and Angle Modulation (FM, PM), are major parts of this course. Sampling theorem and quantization are also covered followed by an introduction to digital communications, line coders, pulse shaping and M-ary modulation.

Course Objectives:

The course objectives are to enable the students to:

1. Understand the fundamental concepts of communication systems.
2. Understand and compare several analog modulation schemes.
3. Apply sampling and quantization theorems to convert analog signals to digital.
4. Design basic communications systems.
5. Enhancing group work through a course project.

Learning Outcomes:

At the end of the course, the students will be able to:

1. Design Analog communication systems to meet desired needs.
2. Convert analog signals to digital while satisfying certain specs.
3. Evaluate fundamental communication system parameters, such as bandwidth, power, signal to quantization noise ration, and data rate.
4. Understand practical implementation issues such as aliasing and intersymbol-interference (ISI)

Grading Policy:

Major Exam I	15 %
Major Exam II	15 %
Class work (Quizzes 9, HW 3, Attendance + class Performance 3)	15 %
Term Project	5 %
Laboratory	20 %
Final Exam	30 %

Absence Policy:

- Only excuses obtained from the Students Affairs Dept. are accepted. Personal excuses are not accepted.
- Every unexcused absence results in -1/3 , 9 absences results in 0 out of 3 in the attendance and class performance, Three late arrivals= One absence.
- A grade of DN will be reported after the 9th unexcused absence
- No make-up will be provided for quizzes or exams. If an official excuse exists, the student will be given the average of his grades.

Course Breakdown:

W	SUBJECT	SECTION	#	HW	LABORATORY
1 3-7 Oct	Introduction: Communication Systems, Signal Classifications and Operations, Unit Impulse Function, Review of Trigonometric and Exponential Fourier Series.	1, 2.1 – 2.4, 2.8 - 2.9	1	2.3-1, 2.4-1(e), 2.8-4(d), 2.9-1(b), 2.9-2	No Lab
2 10-14 Oct	Review of Fourier Transform, Properties of FT, Convolution, Linear Time-invariant Systems, Filters (LPF and BPF)	3.1 – 3.5	2	3.1-4(b), 3.1-7(a), 3.3-6(a),(b),3.4-1	Review Session: Fourier Series & Transform
3 17-21 Oct	Baseband and Carrier Communication, Amplitude Modulation (AM), Double Sideband Suppressed Carrier (DSBSC)	4.1 – 4.3	3	4.2-1, 4.2-4, 4.2-9, 4.3-1, 4.3-2	Exp. # 1 – Part a: Fourier Series (Matlab)
4 24-28 Oct	Quadrature Amplitude Modulation (QAM), Hilbert Transform, Single Sideband Modulation (SSB)	4.4 – 4.5	4	4.4-1, 4.5-1, 4.5-2, 4.5-5	Exp. # 1 – Part b: Fourier Transform (Matlab)
5 Oct 31- Nov 4	Vestigial Sideband (VSB) Modulation, Superheterodyne AM Receiver	4.6, 4.8	5	4.6-1, 4.8-1, 4.8-2	Exp. # 2: Analog Communication Board (ACB)
6 7-11 Nov	Angle Modulation: Instantaneous Frequency, Frequency Modulation (FM) and Phase Modulation (PM). Bandwidth of Angle Modulated waves	5.1 – 5.2	6	5.1-1, 5.1-2, 5.1-3, 5.2-1, 5.2-2	NO LAB

Week 6: Major Exam I: Wednesday Nov.11, 7:00 – 9:00 pm

7 14-18 Nov	Wide-band FM, Generation of FM Waves	5.2 cont. – 5.3	7	5.2-4, 5.2-5, 5.2-6, 5.3-1, 5.4-2	Exp. # 3: AM (Matlab)
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Id al-Adha Vacation (After Week 7)

8 5-9 Dec	Demodulation of FM, Phase-Locked Loop (PLL), FM Receiver, Stereo FM	5.4, 5.6			Exp. # 4: DSB-SC & AM (ACB)
9 12-16 Dec	Sampling Theorem, Signal Reconstruction	6.1	8	6.1-1, 6.1-2(a), (b), (c), 6.1-3, 6.1-4, 6.1-5	Exp. # 5: FM (Matlab)
10 19-23 Dec	Digital Modulation, Pulse Code Modulation (PCM), Uniform and Non-uniform Quantization	6.2.1, 6.2.2	9	6.2-1, 6.2-2, 6.2-3, 6.2-5, 6.2-6, 6.2-8	Exp. # 6: FM (ACB)
11 26-29 Dec	T1 Carrier System, Differential Pulse Code Modulation, Delta Modulation	6.2.4 – 6.4			Exp. # 7: Sampling & Quantization (Matlab)
12 2-6 Jan	Digital Communication systems, Line Coding (excluding PSD analysis)	7.1-7.2	10	7-2.2 (a), 7.3-1, 7.3-2, 7.3-4, 7.3-5	Exp. # 8: PAM (DCB)

Week 12: Major Exam II: Saturday Jan. 2, 7:00 – 9:00 pm

13 9-13 Jan	ISI and Pulse Shaping	7.3			Exp. # 9: PCM and TDM (DCB)
14 16-20 Jan	M-ary Communication, Digital Carrier Systems	7.7-7.8	11	7.7-2,7.7-3, 7.8-1,7.8-2	Exp. # 10: Channel Effects (DCB)
15 23-27 Jan	Topics in communication technologies, Review	Selected topics			Lab Exam

Homework Due Dates

Homework #	1	2	3	4	5	6	7	8	9	10	11
Due Week	2	3	5	6	7	8	9	10	12	13	15
Due Day	Mon	Mon	Sat	Sat	Mon	Mon	Sat	Mon	Sat	Sat	Mon