

**EE 370 – COMMUNICATIONS ENGINEERING I****Course Syllabus****(071)**

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O.H.'s: Sun, Tue: 11:15 – Noon Prayer Time, Mon, Wed: 10:15 - 11:30 AM or by appointment via e-mail.

**Prerequisite:** EE207, EE203**Textbook:**Lathi, B., *Modern Digital & Analog Communication Systems*, 3<sup>rd</sup> 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, and pulse shaping.

**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, FDMA and TDMA.
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 ratio, and data rate.
4. Understanding practical implementation issues, such as non-ideal filters, non-ideal sampling pulses, aliasing, and intersymbol-interference (ISI).

**Grading Policy:**

Major Exam I	15 %
Major Exam II	15 %
Classwork (Quizzes 8, HW 3, Attendance & 3)	15 %
Term Project	5 %
Laboratory	20 %
Final Exam	30 %

- **Official Excuses:** Only excuses obtained from the Students Affairs Dept. are accepted. Personal excuses are not accepted.
- Every unexcused absence results in -0.5 , 6 absences results in 0 out of 3 in the attendance and class performance, Two late arrivals= One absence.
- **No make-up** tests will be provided. If an official excuse exists, the student will be given the average of his grades.

**Course Breakdown:**

W	SUBJECT	SECTION	HW	LABORATORY
1	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	2.3-1, 2.4-1(e), 2.8-4(d), 2.9-1(b), 2.9-2	<b>No Lab</b>
2	Review of Fourier Transform, Properties of FT, Convolution, Linear Time-invariant Systems, Ideal and Practical Filters (LPF and BPF)	3.1 – 3.5	3.1-4(b), 3.1-7(a), 3.3-6(a),(b),3.4-1	Review Session: Fourier Series & Transform
3	Baseband and Carrier Communication, Amplitude Modulation (AM), Double Sideband Suppressed Carrier (DSBSC)	4.1 – 4.3	4.2-1, 4.2-4, 4.2-9, 4.3-1, 4.3-2	<b>No Lab</b>
4	Quadrature Amplitude Modulation (QAM), Hilbert Transform, Single Sideband Modulation (SSB)	4.4 – 4.5	4.4-1, 4.5-1, 4.5-2, 4.5-5	Exp. # 1 – Part a: Fourier Series (Matlab)
5	Vestigial Sideband (VSB) Modulation, Carrier Acquisition, Superheterodyne AM Receiver	4.6 – 4.8	4.6-1, 4.8-1, 4.8-2	Exp. # 1 – Part b: Fourier Transform (Matlab)
6	Angle Modulation: Instantaneous Frequency, Frequency Modulation (FM) and Phase Modulation (PM). Bandwidth of Angle Modulated waves	5.1 – 5.2	5.1-1, 5.1-2, 5.1-3, 5.2-1, 5.2-2	Exp. # 2: Analog Communication Board (ACB)

**Major Exam I: Sunday October 28<sup>th</sup>, 7:00 – 8:30 pm, Location: To be decided later**

7	Wide-band FM, Generation of FM Waves	5.2 cont. – 5.3	5.2-4, 5.2-5, 5.2-6, 5.3-1, 5.4-2	Exp. # 3: AM (Matlab)
8	Demodulation of FM, Phase-Locked Loop (PLL), FM Receiver, Stereo FM	5.4, 5.6		Exp. # 4: DSB-SC & AM (ACB)
9	Sampling Theorem, Signal Reconstruction	6.1	6.1-1, 6.1-2(a), (b), (c), 6.1-3, 6.1-4, 6.1-5	Exp. # 5: FM (Matlab)
10	Digital Modulation, Pulse Code Modulation (PCM), Uniform and Non-uniform Quantization	6.2.1, 6.2.2	6.2-1, 6.2-2, 6.2-3	Exp. # 6: FM (ACB)
11	T1 Carrier System, Differential Pulse Code Modulation, Delta Modulation	6.2.4 – 6.4	6.2-5, 6.2-6, 6.2-8	Exp. # 7: Sampling & Quantization (Matlab)
12	Digital Communication systems, Line Coding	7.1-7.2	7.2-1, 7.2.2, 7.2.3	Exp. # 8: PAM (DCB)

**Major Exam II: Sunday Dec 9<sup>th</sup>, 7:00 – 8:30pm, Location: To be decided Later**

13	ISI and Pulse Shaping	7.3	7.3-1, 7.3-2, 7.3-4, 7.3-5	Exp. # 9: PCM and TDM (DCB)
14	M-ary Communication, Digital Carrier Systems	7.7-7.8, 7.3	7.7-3, 7.8-1, 7.9-2	Exp. # 10: Channel Effects (DCB)
15	Topics in communication technologies, Review	Selected topics		<b>Lab Exam</b>