

Course Number: EE 370

Course Title: Communication Engineering I (Required Course)

Course Description :

Review of signal and linear systems. Amplitude modulation (AM, DSB, SSB, VSB). Angle modulation (FM, PM). Sampling, Quantization, PCM, DPCM, DM. Multiplexing. Line coding and baseband transmission. Bandlimited channels and ISI. Digital carrier modulation (PSK, ASK, FSK, and M-ary). Examples of modern communication systems

Prerequisites :

EE 207 and EE 203

Textbook :

Lathi, B., *Modern Digital & Analog Communication Systems*, 4th Ed., 2010.

The course objectives are to enable the students to:

1. Understand the fundamental concepts of communication systems.
2. Understand and compare different analog modulation schemes.
3. Understand and compare different digital modulation schemes.
4. Understand the design tradeoffs and performance of communications systems.
5. Learn about practical communication systems

Topics Covered :

- Review of Fourier series and transforms
- Amplitude modulation
- AM, DSB-SC, SSB and VSB
- Carrier acquisition
- Superheterodyne AM receivers
- Angle modulation
- Narrow-band and Wide-band FM and PM
- Demodulation of FM
- Phase Locked Loop (PLL)
- FM receiver
- Sampling theorem and quantization
- Sampling theorem and signal reconstruction
- Pulse Code Modulation (PCM), Differential PCM and Delta modulation
- Uniform and Non-uniform quantization
- T1 Carrier system
- Introduction to Digital communications
- ISI and Pulse shaping
- Line coding
- M-ary communication and digital carrier systems

List of Experiments (if applicable)

- Fourier Series and Transform
- AM analog board and simulation
- FM analog board and simulation
- Sampling and Quantization
- PCM and TDM
- Channel effects

Class/Laboratory Schedule .:

3 lectures per week, 50 minutes each and 3 hours lab per week

Contribution of course to Meeting the professional component :

The students will represent electrical signals and systems in time and in frequency domains. The course will emphasize the use of essential analytical tools and theories of communication systems. This course focuses on analog communications, such as Amplitude Modulation and Angle Modulation (FM, PM). Sampling theorem and quantization are also covered in this course followed by an introduction to digital communications.

Course Outcomes:

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

- Design Analog communication systems to meet desired needs.
- Convert analog signals to digital while satisfying certain specs.
- Evaluate fundamental communication system parameters, such as bandwidth, power, signal to quantization noise ration, and data rate.
- Understanding practical implementation issues, such as non-ideal filters, non-ideal sampling pulses, aliasing, and intersymbol-interference (ISI)

Course Outcomes to Program Outcome Mapping:

| Course Outcome | Program Outcome | | | | | | | | | | | | |
|----------------|-----------------|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | j | k | l | m |
| 1 | | X | X | | | | | X | | | X | | |
| 2 | X | | | | X | | | | | | | | |
| 3 | X | | | | | | | | X | | X | | |
| 4 | | | | | X | | | X | | | | X | |

Prepared by: Dr. Wessam Mesbah (July 2012)