San Francisco State University
School of Engineering

Course Outline for ENGR 452: Communications Laboratory

Elective

Electrical Engineering

Bulletin Description

ENGR 452: Communications Laboratory (1 units)
Prerequisite: ENGR 449 and ENGR 450. ENGR 450 may be taken concurrently. Laboratory to cover topics in communications and microwaves. Amplitude and angular modulation and demodulation, phase-looked loops, frequency division multiplexing, transmission lines, waveguides and antennas.

Textbooks

- Lathi, B. P. *Modern Digital and Analog Communication Systems*. 3rd ed. Oxford University Press, 1998.
- Ulaby, F. *Fundamentals of Applied Electromagnetics*. Prentice-Hall, 2001.

References

1. Sadiku, M. *Elements of Electromagnetics*. Saunders College Publishing, 1993.
2. Sklar, B. *Digital Communications: Fundamentals and Applications*. Prentice Hall, 1988.

Coordinator

Todor Cooklev, Assistant Professor of Electrical Engineering

Prerequisites by Topic

1. Amplifiers and oscillators (electronics – ENGR 353)
2. Amplitude and phase modulation (communications – ENGR 449)
3. Transmission lines and waveguides (electromagnetics – ENGR 450)
4. Antennas (electromagnetics – ENGR 450)
5. Circuit components (circuit theory – ENGR 205, electromagnetic field theory – ENGR 450)

Course Objectives[1]

1. To learn to design communications and microwave components and systems. [B.1]
2. To learn basic modulation and demodulation techniques used in analog communication systems. [A.1, A.2, B.1]

[1] Numbers in brackets refer to the educational objectives and outcomes of the School of Education.

3. To acquire an ability to use modern electronic equipment design and conduct experiments in communication systems. [B.2]
4. To learn to use modern engineering tools, software and instrumentation through hands on experience. [B.3]
5. To acquire ability to work in teams. [A.4]

Topics

1. L-C and crystal oscillators
2. Class C amplifiers and frequency multipliers
3. Non-ideal behavior of circuit components (resistors, capacitors, inductors)
4. Mixers and balanced modulators
5. Amplitude and angular modulation (AM – SSB&DSB, FM/PM)
6. Phase locked loops and their applications in FSK signal generation, demodulation and frequency synthesis
7. Network Analyzer - transmission and reflection coefficients, input impedance
8. Transmission lines, waveguides, cavities, and antennas

Professional Component

Engineering Science 0%
Engineering Design 100%

Evaluation

1. Laboratory reports 60%
2. Lab attendance and participation 20%
3. Closed-book quiz 20%

Performance Criteria[2]

Objective 1

- *1.1* The student demonstrates an understanding of the circuits to implement communication systems. [1, 2, 3]
- *1.2* The student will demonstrate an ability to analyze and design oscillators. [1, 3]
- *1.3* The student will demonstrate an ability to analyze and design class-C amplifiers and frequency multipliers. [1, 3]
- *1.4* The student will demonstrate an ability to analyze and design mixers and balanced modulators. [1, 3]
- *1.5* The student will demonstrate an ability to analyze and design amplitude and angular modulators and demodulators [1, 3]
- *1.6* The student will demonstrate an ability to analyze and design phase-locked loops for application in modulation, demodulation and frequency synthesis. [1, 3]
- *1.7* The student will demonstrate an ability to analyze transmission lines, waveguides and antennas. [1,3]

[2] Numbers in brackets refer to the evaluation methods used to assess student performance.

1.8 The student can sketch signal waveforms at various points of the circuit. [1, 2, 3]

Objective 2

2.1 The student will demonstrate an ability to design and conduct experiments, and analyze and interpret data. [1, 2, 3]

Objective 3

3.1 The Student will demonstrate an ability to use modern electronics equipment (frequency generators, oscilloscopes, multimeters, spectrum analyzers and similar). [1, 2]

3.2 Student will demonstrate an ability to use scalar and vector network analyzers. [1, 2]

3.3 Student will demonstrate an ability to use PSPICE for circuit analysis. [1]

Objective 4

4.1 The student will demonstrate an ability to work in teams. [1, 2]

Spring Semester, 2005

Instructor: Afshaneh Pakdaman
Office: SCI 110

Class/Laboratory Schedule

One 2-hour-45-minute lab session/week

Prepared by

Todor Cooklev, Spring, 2005