

**COURSE OUTLINE**

Instructor: Dr. M.A. Al-Andalusi

Office: Bldg. 14/217-2

E-mail: [andalusi@kfupm.edu.sa](mailto:andalusi@kfupm.edu.sa),

Phone: 1498

O.H.: Sat & Mon: 11:00–11:50am, Wed: 12:10-1:00pm, or by appointment.

**TEXT BOOK:**

Lathi, B., *Modern Digital & Analog Communication Systems*, 3<sup>rd</sup> Ed., 1998

**REFERENCES:**

Martin R., *Analog and Digital Communication Systems*,

Couch, L., *Digital and Analog Communication Systems*.

Haykin, S., *Communication Systems*.

| 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 | No Lab  |
| 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 & Transforms   |
| 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          | No Lab  |
| 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, 19 October, Time & Location: To be decided**

|    |   |                 |                                   |  |
|----|---|-----------------|-----------------------------------|--|
| 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, 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 Systems, 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) |

**Major Exam II, 7 December, Time & Location: To be decided**

|    |   |                 |                     |                                  |
|----|---|-----------------|---------------------|----------------------------------|
| 12 | Digital Communication systems, Line Coding            | 7.1-7.2         | 7.2-1, 7.2.2, 7.2.3 | Exp. # 8: PAM (DCB)              |
| 13 | ISI and Pulse Shaping                                 | 7.3             | To be decided       | Exp. # 9: PCM and TDM (DCB)      |
| 14 | M-ary Communication, Digital Carrier Systems          | 7.7-7.8, 7.9    | 7.7-3, 7.8-1, 7.9-2 | Exp. # 10: Channel Effects (DCB) |
| 15 | Selected Topics in communication technologies, Review | Selected topics |                     | Lab Exam                         |

• **Grade Distribution**

- Class work (Quizzes 10%, HW 2.5%, Attendance 2.5%) 15%
- Laboratory 20%
- Major Exam I 15%
- Major Exam II 15%
- Design Project 5%
- Final Exam (Comprehensive) 30%
- **Official Excuses:** Official excuses have to be verified from the Students Affairs Dept. Personal excuses will not be accepted.