Miami Dade College

Course Description

EET2351C | Digital and Data Communications | 4.00 credits

This course is intended for students majoring in Electronics or Computer Engineering Technology. It provides a theoretical and practical background in the basic concepts and applications of digital and data communications. Students will learn analog-to-digital (A/D) and digital-to-analog (D/A) conversions; data communications codes and standards; wired and wireless digital communications; modulation, transmission impairment, the telephone system, modems, multiplexers, and electrical interface standards. Prerequisite: CET 2123C.

Course Competencies

Competency 1: The student will demonstrate an understanding of the concepts of data by:

1. Discussing the history of data communications from the invention of the telegraph to the present and general trends for the future.
2. Discussing the basic elements of microwave and satellite communications.
3. Defining common data communications terminology, such as information, bits, bauds, etc.
4. Computing the communication channel capacity using Shannon's Law.

Competency 2: The student will demonstrate knowledge of Direct Current (DC) and Alternating Current (AC) signals by:

1. Describing how baseband signals operate, including pulse characteristics (measurement of rise and fall times, tilt, pulse width, overshoot, root mean square, power in pulse train, offset).
2. Explaining DC transmission line effects.
3. Explaining the basic concepts of carrier modulation of baseband signals.
4. Defining common AC terminology such as spectrum, power and bandwidth and their applications.
5. Explaining AC transmission line effects.
6. Generating and measuring baseband signals in laboratory environments.

Competency 3: The student will demonstrate an understanding of communications codes by:

1. Encoding and decoding the data communications codes, including ASCII, EBCDIC, BCD, GRAY, MANCHESTER, Return to Zero and non-Return to Zero, A Law and Mu Law etc.
2. Applying the concepts of parity, error detection and correction towards the recovery of transmitted digital data.
3. Explaining the methods of operation of various data terminals as they relate to the various codes and
4. protocols.

Competency 4: The student will demonstrate an understanding of digitization by:

1. Describing the processes of analog-to-digital conversion, and digital-to-analog conversion as applied to voice communications (CODEC).
2. Distinguishing the different modulation and demodulation techniques used in pulse amplitude modulation (PAM), pulse position modulation (PPM), pulse density modulation (PDM), delta modulation (DM) and pulse code modulation (PCM).
3. Building, testing, and evaluating an analog-to-digital converter (ADC) and digital-to-analog converter (DAC) using PCM techniques.
4. Calculating the Nyquist sampling frequency for a PCM system and describing the aliasing effects in the
5. sampling process.
6. Explaining the various schemes used to transmit digital signals, including frequency shift keying (FSK), phase shift keying (PSK) and amplitude shift keying (ASK).
7. Analyzing a function generator and using it to encode digital information into an FSK signal and to convert an FSK signal back into digital data.
8. Describing the quadrature amplitude modulation (QAM) systems using both PSK and ASK.
9. Discussing the multiplexing process both in the frequency (FDM) and time domains (TDM).

10. Testing and evaluating a PAM modulator and demodulator that utilize TDM.

Competency 5: The student will demonstrate an understanding of communication cables by:

1. Identifying the various types of cables and wires used in data communications and explaining how and where they are used, including: open wire pairs (twisted pairs), loaded lines, co-axial cables, ribbon cables and fiber optic links, USB and IEEE 1394 (Firewire).
2. Defining and differentiating between the various types of noise including: thermal noise, impulse noise, quantization noise, crosstalk, and inter-symbol interference.
3. Explaining the effects of noise on data communications.
4. Applying techniques for minimizing the effects of noise on data communications.
5. Applying conditioned circuits, regenerative repeaters, coding and protocols for combating transmission
6. defects.

Competency 6: The student will demonstrate an understanding of data communications hardware and Standards by:

1. Explaining modem circuitry, including the line interface duplexer, filters, modulator, demodulator, and control circuits and how signals are processed by modems.
2. Identifying and describing the industry standards that that allow different systems to communicate on common lines.
3. Discussing the serial electrical hardware interface standards including RS-232-C, RS-422, 423, 449.
4. Identifying parallel data interfaces including the centronics parallel interface and the IEEE- 488 Standard (GPIB) and explaining their applications.
5. Discussing the USB 1.0, 2.0, and IEEE 1394 serial transmission protocols and their applications.

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively