SIGNAL PROCESSING

1. SYLLABUS INFORMATION

1.1. Course title
Signal Processing

1.2. University
Pázmány Péter Catholic University

1.3. Semester
1st year, 1st semester

2. COURSE DETAILS

2.1. Course nature
Compulsory

2.2. ECTS Credit allotment
0

2.3. Faculty data
Dr. Reguly István Zoltán

3. COMPETENCES AND LEARNING OUTCOMES

3.1. Course objectives
Using a unified framework and terminology, the subject surveys and discusses both the theory and practice of analog and digital signal processing. After giving the definitions of deterministic signals and random processes the Fourier analysis of LTI systems is discussed and the analysis of analog LTI systems is performed in both the time- and frequency-domains. In most cases the digital signals are generated by digitizing analog ones. Therefore, the sampling theorem, effect of quantization and the reconstruction of analog signals from their samples are studied and the A/D and D/A converters are discussed. After characterizing the discrete-time and digital signals the analysis of discrete-time and digital LTI systems are discussed, the theory of z-Transform, DFT and FFT is explained. Finally the design of FIR and IIR filters is reviewed.

3.2. Course contents
1. Analog signals and systems
   a. Representation of deterministic signals and systems
   b. Random processes
   c. Fourier analysis of continuous-time signals and systems
   d. Definition, characterization, properties and response of continuous-time LTI systems in the time- and frequency domains

2. Transformation between the real-world analog signals and the data sequences processed by computers
   a. Sampling theorem and quantization
   b. Reconstruction of analog signals from their samples
   c. A/D and D/A converters

3. Discrete-time and digital signals and systems
   a. Representation of digital signals and systems
   b. The z-transform
   c. Discrete Fourier transform
   d. The fast Fourier transform
   e. Up- and down-sampling
   f. FIR and IIR filters, their stability and causality

4. Analysis of mixed-signal processing systems: A case study and problem session

3.3. Course bibliography
V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Prentice Hall Inc., Signal Processing Series, 1983, ISBN 0-13-811175-8

H. P. Hsu, "Signals and Systems," Schaum's Outlines Series, McGraw-Hill, 1995, ISBN 0-07-030641-9.
M. H. Hayes, "Digital Signal Processing," Schaum's Outlines Series, McGraw-Hill, 1995, ISBN 0-07-027389-8

S. Haykin, "Communication Systems," Wiley, 2000, ISBN: 9780471571766

4. EVALUATION PROCEDURES AND WEIGHT OF COMPONENTS IN THE FINAL GRADE
Baseline test at the beginning of the course. Those who score a defined number of points are exempted from attending this prep/recap course. Those who do not must attend the course and take a written exam at the end of the course.