

Week**Exercises**

1. **1. Digital Filters. Subject Review.**
1.1. History, motivation, experiences, intentions and aims. General rules: lectures, exercises, projects, credits, and examination. A review of lectures. A review of exercises. References.
2. **2. MATLAB: A Tool for Digital Filter Design and Simulation**
2.1. Signal Processing Toolbox. Basic functions for analysis, description and simulation of digital filters.
3. **3. Linear-Phase FIR Digital Filter Design by Windows (Windowing) Method.**
3.1. Linear-phase FIR digital filter design by windows (windowing) method. MATLAB based approach.
3.2. Linear-phase FIR digital filter design by windows (windowing) method. Solution of examples.
4. **4. Linear-Phase FIR Digital Filter Design by Frequency-Sampling Methods Method.**
4.1. Linear-phase FIR digital filter design by non-uniform frequency-sampling. Solution of examples.
4.2. Linear-phase FIR digital filter design by uniform frequency-sampling method. Solution of examples.
4.3. Individual work on student's projects.
5. *4.4. Linear-phase FIR digital filter design by non-uniform frequency-sampling. MATLAB based approach.*
4.5. Linear-phase FIR digital filter design by uniform frequency-sampling method. MATLAB based approach.
4.6. Design of equiripple linear-phase FIR digital filter. MATLAB based approach.
4.7. Individual work on student's projects.
6. **5. IIR Digital Filter Design. Bilinear Transformation Method.**
5.1. IIR digital filter design. Bilinear transformation method. Solution of examples.
5.2. Individual work on student's projects.
7. *5.3. IIR Digital Filter Design. Bilinear Transformation Method. MATLAB based Approach.*
5.4. Individual work on student's projects.
8. **6. Digital Filter Realization**
*6.1. Transformations from direct form of IIR to parallel and cascade realizations of IIR filters
Tools: MATLAB, specialized software.*
6.2. Individual work on student's projects.
9. *6.3. Testing of overlap-add convolution
Tool: MATLAB.*
*6.4. Transformations from direct form of IIR to some robust digital filter structures
Tool: MATLAB.*
6.5. Individual work on student's projects.
10. **7. Digital Filter Implementation**
*7.1. Description and demonstration of DSP based hardware (target hardware for student's projects)
Tools: 2181 EZKIT LITE from Analog Devices (16-bit fixed-point DSP), DSP56002 from Motorola (24-bit fixed-point DSP).*
*7.2. Demonstration of CPLD based FIR filter hardware
Tool: ALTERA based custom board, MAX+PLUS II development tool from Altera.*
7.3. Individual work on student's projects.
11. *7.4 Fixed-point scaling in cascade realizations of IIR filters
Tools: MATLAB, specialized software, DSP target hardware.*
7.5. Individual work on student's projects.
12. **8. Project Defense. Credits.**