Course title in English: Applied signal processing

ECTS credits	6.00
Course code:	IEEXXXX
Course title in Estonian	**Rakenduslik signaalitöötlus**
Course title in English	**Applied signal processing**
Assessment form	Examination
Teaching semester	
Lecturer	Muhammad Mahtab Alam, Julia Berdnikova
Course aims	The aim of this course is to provide knowledge of techniques and applications in signal processing. The main implementation areas are communication, data measurement systems, control and real-time processing system design. The practical part include real-time and semi-real time signal processing tasks.
Learning outcomes in the course	After having successfully passed the course a student: • is able to understand the digital communication system, signal estimation and detection methods, digital filters, and software defined radio. • is able to apply basic methods for signal time and frequency domain analysis • to apply linear filter design techniques • to use most common signal detection and reception methods • to implement signal processing algorithms in real-time processing platforms such as DSPs and FPGA
Brief description of the course	Digital communication systems, signal detection, estimation and modulation methods. Matched filters and optimal estimation of signal parameters. Time and frequency-domain analysis. Linear filters: FIR and IIR filters, linear filter design techniques. LMS, RLS and Kalman filters. Optimal filtering. Multirate signal processing, uppsampling, downsampling, rate conversion, poly-phase representation, filter banks. Complex envelopes, IQ channels, ambiguity functions. Beamforming and analyzing methods. Wiener Filters for filtering and prediction. Signal processing application in telecommunication. Implementation of processing algorithms on a DSP-system.
Study literature	
Full-time studies: weekly hours	4.0
lectures	2.0
practices	1.0
exercises	1.0

ASSESSMENT METHOD	ASSESSMENT CRITERIA
Practices (learning outcome 2-5)	The practical assignments must be presented in order to be able to take the exam. • Each student is given **five** individual assignments. Each assignment gives a maximum **5 points** and presenting all lab assignments will give a maximum of **25 points (25 %)** which will count towards the final course mark. Practical work is given maximum points if: - the assignment is done correctly, possible errors and shortcomings are corrected - the assignment is presented on time (presenting the assignment 2 weeks late will give a maximum of 3 points and presenting more than 2 week late will give a maximum of 0 points) **Penalties for late submission will count towards the final course mark** - The results of the lab assignments are presented in a report form.
Individual work (project), that is related to the learning outcomes (1-3, 5)	Assessment preconditions: The project is submitted to the supervisor on time in the way and format the supervisor requests. Deviations need to be agreed with the supervisor before the deadlines. Individual work should be **presented.** Assessment: **The individual work will be assessed** by the supervisor if all the learning outcomes are fulfilled and will give a maximum of **25 points (25 %)**
Presentation of the individual work that is related to the learning outcomes (1)	Assessment preconditions: The presentation is given on time in the way and format the supervisor requests. Deviations need to be agreed with the supervisor before the deadlines.
Written exam, that is related to the learning outcomes (1, 4)	Assessment preconditions: Both, the practices and presented individual work are assessed. Assessment: The exam will consist of at least two tasks. The student will have 90 minutes to demonstrante the fulfillment of the relevant learning outcome. According to this the supervisor evaluates if the learning outcome is fulfilled. The grade depends on the level, the work was done according to the point of view of the supervisor. The exam will give a maximum of **50 points (50 %)**
PREREQUISITES FOR FINAL ASSESSMENT	**Five practices and individual work with presentation are assessed.**

(EXAMINATION)	
FINAL GRADE (all learning outcomes)	The final grade will be formed as the sum of the three grades: **practices, individual work and written exam**. Final Grade = Practices (25%) + Individual work (25%) + Exam (50%) *The grades given for the amount of points are as follows:* *„0“*- „fail“ *less than 51 points* *„1“* - „sufficient“ *51-60 points* *„2“* - „satisfactory“ *61-70 points* *„3“* - „good“ *71-80 points* *„4“* - „very good” *81-90 points* *„5“* - „excellent“ *91 and more points*