Course Unit Descriptor

**Study Programme:** Power, Electronic and Telecommunication Engineering (Communications Technologies and Signal Processing)

**Course Unit Title:** Digital Signal Processing

**Course Unit Code:** EK314

**Name of Lecturer(s):** Milan Sečujski

**Type and Level of Studies:Bachelor level**

**Course Status (compulsory/elective): compulsory**

**Semester (winter/summer): summer**

**Language of instruction:english**

**Mode of course unit delivery (face-to-face/distance learning): face-to-face**

**Number of ECTS Allocated:7**

**Prerequisites: none**

**Course Aims:**

As an introductory course in the series of course related to digital processing of certain types of signals, this course has an educational objective to offers students fundamental knowledge about digital processing and its application. The objective is to introduce students to digital signals and systems for their processing after they learned about analog signals. It is necessary to know digital signals in the frequency domain, digital filters and methods of their design.

**Learning Outcomes:**

In the lectures students are introduced to the basic algorithms of the signal processing in the discrete time and to the most important transforms of discrete signals. The central part of the course is the Fourier transform. Digital filters are introduced through specific examples, and then the basic scientific methods for their design while using adequate software tools are learnt. Based on the gained knowledge, students are able to analyze the given problem, choose adequate class of digital filter and the design method, design and implement the digital filter. In the practice students gain practical experience with Matlab DSP Toolbox. They are able to evaluate and calculate basic parameters of the digital filter. They are able to identify and qualify potential problems in implementation of digital filters and to find the solution.

**Syllabus:**

Practical aspects of A/D and D/A conversion and the sampling theorem. Transform of discrete signals and connections between them (ZT, FTD, DFT). Fast FT and fast convulsion. Examples of digital FIR and IIR filter and their characteristics. Basic methods of the digital filter design (while getting introduced to the Matlab DSP Toolbox).

**Required Reading:** Relevant literature in English TBD

| **Weekly Contact Hours:4** | **Lectures:3** | **Practical work:1** |
|---|---|---|

**Teaching Methods:**

The entire course of lectures (3 hours per week) is continually followed by synchronized auditory and computer practice (1 hour each). Lectures are carried out by the professor using the PowerPoint presentation available to the students in the .pdf format. Presentations with animations illustrate critical details in the lectures. In the auditory practice problems of spectral analysis of digital signals and the design of digital filters are solved. The entire course is followed by the Practice in the computer center of the Faculty of Technical Sciences, where students gain practical experience working with software tools for digital signal processing. Practice preparation and Homework Assignments are done through the Web portal of the Department using the specially designed on-line exercises. Acquired theoretical knowledge is tested during the

semester in the form of tests (colloquiums), while the practical work is verified through short project and homework assignments. Those are all examination prerequisites, and at the final examination the entire gained knowledge in this course is tested.

**Knowledge Assessment (maximum of 100 points):100**

| **Pre-exam obligations** | points | **Final exam** | points |
|---|---|---|---|
| Test | 10 | Written part of the exam | 70 |
| Test | 10 | | |
| Test | 10 | | |
| Colloquim exam | 20 | | |

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.