COURSE DESCRIPTION CARD

<table>
<tr><td colspan="11">Faculty of Electrical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="7">Erasmus</td><td>Degree level and programme type</td><td>bachelor's degree, full time programme</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="7">-</td><td>Study profile</td><td>-</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="7" rowspan="2">Digital Signal Processing</td><td>Course code</td><td>IS-FEE-10026S</td></tr>
<tr><td>Course type</td><td>elective</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>summer</td></tr>
<tr><td>30</td><td></td><td>30</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>6</td></tr>
<tr><td>Entry requirements</td><td colspan="10">-</td></tr>
<tr><td>Course objectives</td><td colspan="10">The aim of the course is to acquaint the students with the basics of the digital signal processing. Student is familiar and can apply methods of signal analysis in time and frequency domains. Student is able to use methods of digital filter design and is familiar with issues of digital filter analysis and implementation.</td></tr>
<tr><td>Course content</td><td colspan="10">Lecture: Areas of application of digital signal processing methods. Signal classification. Sampling of continuous time signals: the sampling theorem, anti-aliasing filter, quantization, practical aspects of A/D and D/A conversion, digital resampling. Properties and application of the Discrete Fourier Transform; Fast Fourier Transform algorithms; analysis of nonstationary signals. Z-transform: properties and application. Description methods of discrete time signals and systems: difference equation, impulse response, Z-transform, transfer function, frequency response, state space representation. Overview of digital filter analysis, synthesis and application: infinite impulse response filters, finite impulse response filters, commonly used filters, time and frequency domain parameters, windowing, linear phase filters. Stability. Linear and circular convolution. DSP implementation issues.
Laboratory classes: Sampling of continuous time signals, anti-aliasing filter, quantization; properties and application of the Fast Fourier Transform; impulse response, frequency response, digital filter analysis, filter synthesis, IIR and FIR filters, linear phase filters.</td></tr>
<tr><td>Teaching methods</td><td colspan="10">lecture, problem solving, laboratory experiments</td></tr>
<tr><td>Assessment method</td><td colspan="10">lecture: written exam;
laboratory class: evaluation the student's reports and performance in classes.</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="8">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="8">Student is familiar with issues of sampling of continuous time signals and analysis of discrete-time signals;</td><td colspan="2"></td></tr>
<tr><td>LO2</td><td colspan="8">Student knows description methods of digital systems and can describe methods of digital filters synthesis and</td><td colspan="2"></td></tr>
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	analysis;	
LO3	**Student performs sampling of continuous time signals and performs spectral analysis;**	
LO4	**Student performs design process of the basic digital filters and performs properties verification of their implementation.**	
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	**exam**	**L**
LO2	**exam**	**L**
LO3	**evaluation of student's reports and performance in classes**	**LC**
LO4	**evaluation of student's reports and performance in classes**	**LC**
Student workload (in hours)		**No. of hours**
Calculation	**lecture attendance**	**30**
	preparation for and participation in exams	**35**
	participation in laboratory classes	**30**
	preparation for laboratory classes	**20**
	work on reports	**30**
	participation in student-teacher sessions (2L+3LC)	**5**
	TOTAL:	**150**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**65**	**2,5**
Student workload – practical activities	**83**	**3**

Basic references	1. Oppenheim A. V., Schafer R., Discrete-time Signal Processing. Prentice Hall, 2010. 2. Rao K., Swamy M., Digital Signal Processing. Theory and Practice, Springer, 2018. 3. Rawat T. K., Digital Signal Processing. Oxford University Press, 2015. 4. Gazi O., Understanding Digital Signal Processing. Springer, 2018. 5. Hussain Z. M., Sadik A. Z., Digital Signal Processing. Springer, 2011.
Supplementary references	1. Manolakis D. G., Ingle V. K., Applied Digital Signal Processing: Theory and Practice. Cambridge University Press, 2011. 2. Schilling R. A., Harris S. L., Introduction to digital signal processing using MATLAB. Cengage Learning, 2012. 3. Smith S. K., Digital Signal Processing; A Practical Guide for Engineers and Scientists. Elsevier Science, 2003. 4. Gopi E. S., Multi-Disciplinary Digital Signal Processing: A Functional Approach Using Matlab. Springer, 2018. 5. Lyons R., Understanding Digital Signal Processing. Prentice Hall, 2001.

Organisational unit conducting the course	**Department of Photonics, Electronics and Lighting Technology**	**Date of issuing the programme**
Author of the programme	**Dariusz Jańczak, PhD, DSc**	**24.04.2020**

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work,