MODULE DESCRIPTION

Module code	
Module name	**Cyfrowe przetwarzanie sygnałów**
Module name in English	**Digital Signal Processing**
Valid from academic year	**2012/2013**

MODULE PLACEMENT IN THE SYLLABUS

Subject	**Computer Science**
Level of education	**1st degree** *(1st degree / 2nd degree)*
Studies profile	**General** *(general / practical)*
Form and method of conducting classes	**Full-time** *(full-time / part-time)*
Specialisation	**Computer Graphics**
Unit conducting the module	**The Department of Systems and Systems in Automatic Control**
Module co-ordinator	**Robert Kazała, PhD, Eng.**
Approved by:	

MODULE OVERVIEW

Type of subject/group of subjects	**Major** *(basic / major / specialist subject / conjoint / other HES)*
Module status	**Compulsory** *(compulsory / non-compulsory)*
Language of conducting classes	**Polish**
Module placement in the syllabus - semester	**6th semester**
Subject realisation in the academic year	**Summer semester** *(winter / summer)*
Initial requirements	**Mathematical Analysis, Algebra** *(module codes / module names)*
Examination	**No** *(yes / no)*
Number of ECTS credit points	**4**

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	**30**		**30**		

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the module is to familiarise students with the most important issues which concern gaining and processing one-dimensional and multidimensional digital signals. Another aim is to acquaint students with the ability of using specialist programming libraries as well as creating computer programs to process digital signals.

Effect symbol	Teaching results	Teaching methods *(l/c/l/p/other)*	Reference to subject effects	Reference to effects of a field of study
W_01	A student is able to characterise various types of signals; a student also knows the methods of obtaining signals and processing them into a digital form.	l	K_W05	T1A_W02
W_02	A student is familiar with the methods of describing digital signals.	l	K_W12	T1A_W07
W_03	A student knows different methods of signal processing.	l	K_W07, K_W16	T1A_W07
W_04	A student knows specialist function libraries to process signals.	l	K_W15	T1A_W07
U_01	A student is able to generate digital signals and process signals between diverse representations.	l	K_U07	T1A_U08
U_02	A student is able to implement algorithms of processing digital signals	l	K_U13	T1A_U09
U_03	A student can utilise specialist function libraries to process and visualise digital signals.	l	K_U18	T1A_U08
U_04	A student can present (both in an oral and written form) the issues concerning signal processing.	l	K_U03 K_U04	T1A_U03 T1A_U04
K_01	A student can co-operate in a team in order to complete the assigned tasks.	l	K_K03	T1A_K03

Teaching contents:

Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	Introduction to digital signal processing. The application of digital signal processing. The types of signals.	W_01
2	The methods of obtaining one- and multidimensional signals. Acoustic signal converters and visual converters. Signal spectrum. Signal parameters.	W_01
3	Signal discretisation and quantisation. AC and CA converters, the phenomenon of aliasing, and antialiasing filters. Representing digital signals.	W_01
4	Digital signals distortion. Random signals. The types of interferences. The methods of generating interferences.	W_01
5	Discrete linear systems. Discrete differential equations. The Z transform.	W_02
6	Digital filtering of one- and two-dimensional signals. Convolution function. FIR and IIR filters. Filter characteristics.	W_03 W_04
7	Designing digital filters.	W_03 W_04
8	Filtering in a frequency domain. Discrete Fourier transform. Fast Fourier Transform.	W_03 W_04
9	Signal decimation and interpolation.	W_03

		W_04
10	The methods of compressing digital signals. Discrete cosine transform.	W_03 W_04
11	The methods of transforming visual signals.	W_03 W_04
12	Optimal and adaptation filters. Signal correlation. Radon and Hough transforms.	W_03 W_04
13	Signal reconstruction. Inverse filtering. Wiener filter. Deformation correction.	W_03 W_04
14	Hardware acceleration of signal processing. Signal processors. Programmable matrices. A graphics card.	W_03 W_04
15	A final test.	U_04

Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module
1	Familiarising students with signal processing and visualisation tools.	U_03 K_01
2	Generating and visualisation of digital signals.	U_01 K_01
3	Signal discretisation and quantisation. Conversion among various signal representations.	U_01 K_01
4	Generating and determining random signals characteristics.	U_01 K_01
5	Investigating discrete linear systems.	U_03 K_01
6	Implementing algorithms realising digital filters.	U_02 U_03 K_01
7	Designing and determining digital filter characteristics.	U_03 K_01
8	Filtering realisation in a frequency domain.	U_02 U_03 K_01
9	Signal decimation and interpolation.	U_02 U_03 K_01
10	Digital signal compression.	U_03 K_01
11	Visual signal processing.	U_03 K_01
12	Optimal and adaptation filtering.	U_03 K_01
13	Signal correction and reconstruction.	U_03 K_01
14	Utilising Radon and Hough transforms.	U_03 K_01
15	Discussing reports and obtaining a credit for laboratory classes.	U_04

The methods of assessing teaching results

Effect symbol	Methods of assessing teaching results *(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)*

W_01	A test
W_02	A test
W_03	A test
W_04	A test
U_01	A report on laboratory classes No 2-4
U_02	A report on laboratory classes No 5
U_03	A report on laboratory classes No 1, 6-14
U_04	A test, a discussion concerning reports on laboratory classes
K_01	Students' work during laboratory classes No 1-14 and preparing reports

STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	**Student's workload**
1	Participation in lectures	**30**
2	Participation in classes	
3	Participation in laboratories	**30**
4	Participation in tutorials (2-3 times per semester)	
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	
8		
9	**Number of hours requiring a lecturer's assistance**	**60** *(sum)*
10	**Number of ECTS credit points which are allocated for assisted work** *(1 ECTS credit point=25-30 hours)*	**2**
11	Unassisted study of lecture subjects	**15**
12	Unassisted preparation for classes	
13	Unassisted preparation for tests	**10**
14	Unassisted preparation for laboratories	**5**
15	Preparing reports	**30**
16	Preparing for a final laboratory test	
17	Preparing a project or documentation	
18	Preparing for an examination	
19	Preparing questionnaires	
20	**Number of hours of a student's unassisted work**	**60** *(sum)*
21	**Number of ECTS credit points which a student receives for unassisted work** *(1 ECTS credit point=25-30 hours)*	**2**
22	**Total number of hours of a student's work**	**120**
23	**ECTS credit points per module** *1 ECTS credit point=25-30 hours*	**4**
24	**Work input connected with practical classes** *Total number of hours connected with practical classes*	**60**
25	**Number of ECTS credit points which a student receives for practical classes** *(1 ECTS credit point=25-30 hours)*	**2**