STUDY MODULE DESCRIPTION FORM

Name of the module/subject **A-D and D-A conversion systems**		Code **1010832131010832941**

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **2 / 3**

Elective path/specialty **Telecommunication Systems**	Subject offered in: **Polish**	Course (compulsory, elective) **elective**

Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**

No. of hours				No. of credits **3**
Lecture: **2**	Classes: **-**	Laboratory: **-**	Project/seminars: **1**	

Status of the course in the study program (Basic, major, other) **other**	(university-wide, from another field) **from field**

Education areas and fields of science and art
 	
technical sciences
          Technical sciences
	ECTS distribution (number and **%)**
	
	3 100%
	          3 100%

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	K1_W08 Has a wide, systematic knowledge of the properties and characteristics of electronic components, as well as of construction, analysis and design of electronic circuits.
		K1_W18 Has a systematic knowledge, together with necessary mathematical background, of the fundamentals of metrology, which is necessary to measure the signal properties and the parameters of electronic and telecommunication systems components. Has knowledge of measurement methods, measurement equipment and computerized measurement systems.
2	**Skills**	K1_U01 Is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions.
		K1_U03 Is able to prepare a well-documented study, in English or in Polish, on problems related to electronics and telecommunication.
3	**Social competencies**	K1_K01 Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study.

Assumptions and objectives of the course:

Study of problems related to the practical realization of the discretization of signals.

Knowledge acquisition about functional principle and properties of systems realizing these operations.

Knowledge acquisition about influence of discretization on characteristics of converted signal.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has in-depth knowledge of construction and operation of communication systems used to provide multimedia services. - [K2_W01]

2. Has knowledge of construction, architecture and practical application of programmable digital circuits. - [K2_W02]

3. Has a systematic practical knowledge of designing   ICT networks or sound processing techniques or measurement and embedded systems. - [K2_W14]

Skills:

1. Is able to prepare a scientific paper or technical report and give a presentation (in English or in Polish) on solving a problem in the area of electronics and/or telecommunication; is able to participate in a discussion related to the presented problem.   - [K2_U02]

2. Is able to use programmable IC chips and microcontrollers in implementation of electronic and telecommunication projects.   - [K2_U04]

3. Is able to use various measurement techniques.   - [K2_U13]

Social competencies:

1. Is aware of the limitations of his/her current knowledge and skills; is committed to lifelong learning. - [K2_K04]

2. Is aware of the necessity to approach solving technical problems with responsibility and professionalism. - [K2_K05]

Assessment methods of study outcomes

Exam from the range of programmatic contents.

Final report, elaboration of given project problem.

Current check of progresses from realization of project.

Course description

Sampling: sampled data systems, architectures and effects. Coherent sampling, window sampling.

Quantization in signal processing, statistical theory of quantization, uncertainty of quantized data.

A/D converters architectures (Nyquist A/D converters, noise shaping A/D converters ??).

D/A converters architectures.

Characterization and specification of A/D and D/A converters; static and dynamic parameters; accuracy, speed and power relation.

Test methods for A/D and D/A converters, test hardware, measurement methods.

Self testing and calibration in conversion systems.

Improving A/D converter performance using dither.

Improving A/D converter performance by oversampling and averaging.

Basic bibliography:

1. Domańska A., Cyfrowe metody badania przetworników analogowo-cyfrowych, WPP, 2010

2. Kester W., Przetworniki a-c i c-a. Teoria i praktyka, BTC, 2012

3. Maloberti F., Przetworniki danych, WKŁ, 2010

Additional bibliography:

1. Plassche R., Scalone przetworniki analogowo-cyfrowe i cyfrowo-analogowe, WKŁ 1997

2. Zieliński T., Cyfrowe przetwarzanie sygnałów, WKŁ 2009

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Preparation to exam	20
3. Exam	2
4. Project	15
5. Preparation to project	10
6. Elaboration of project report	10
7. Consultations	2

Student's workload

Source of workload	hours	ECTS
Total workload	90	3
Contact hours	50	2
Practical activities	35	1