

(faculty stamp)

**COURSE DESCRIPTION**

Z1-PU7

WYDANIE N1

Strona 1 z 2

<b>1. Course title:</b> : Mixed-signal circuits design		<b>2. Course code</b>		
<b>3. Validity of course description:</b> 2013/2014				
<b>4. Level of studies:</b> BSc programme				
<b>5. Mode of studies:</b> intramural studies				
<b>6. Field of study:</b> <i>Macrocourse on Automatic Control and Robotics, Electronics and Telecommunication, and Computer Science.</i>			(FACULTY SYMBOL): RAU	
<b>7. Profile of studies:</b> general academic				
<b>8. Programme:</b> Electronics and Telecommunication				
<b>9. Semester:</b> 6				
<b>10. Faculty teaching the course:</b> Faculty of Automatic Control, Electronics and Computer Science				
<b>11. Course instructor:</b> dr inż. Jerzy Fiołka				
<b>12. Course classification:</b> Macrocourse specialization: Electronics and Telecommunication				
<b>13. Course status:</b> compulsory				
<b>14. Language of instruction:</b> English				
<b>15. Pre-requisite qualifications:</b> Course attendants have to possess basic knowledge in algebra, physics, circuit theory, electronic, signal processing, digital circuits. Students are also supposed to possess practical skills concerning design, simulation and construction of electronic systems.				
<b>16. Course objectives:</b> The main purpose of this course is to provide theoretical and practical knowledge to the students about the design of mixed-signal circuits.				
<b>17. Description of learning outcomes:</b>				
Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	He/She knows principles of operation, parameters and characteristics of basic semiconductor devices, analog, digital and mixed circuits.	written test	multimedia lecture	
2.	He/She knows the basic methods of analysis and designing of a mixed-signal circuits	written test	multimedia lecture	
3.	He/She can elaborate documentation that includes description of the realization of a project.	project realisation, written report	Project	
4.	He/She can design and simulate electronic circuits using a computer-aided design tools	project realisation, written report	Lecture, Project	
5.	He/She can work in a team and take responsibility for a task realized together	project realisation, written report	Project	
<b>18. Teaching modes and hours</b>				
<b>Lecture / BA /MA Seminar / Class / Project / Laboratory</b>				
Lecture: 30h, Project: 30h				
<b>19. Syllabus description:</b>				
Lecture:				
Mixed signal circuits design lecture covers the following topics:				
1) Definitions and basic features of mixed-signal circuits;				
2) Hardware and software subsystems od mixed-signal systems;				
3) CAD tools for circuits design and simulation;				
4) Sampling of continuous-time signals;				
5) Operational amplifiers: types, structures, operation, parameters, applications;				
6) Analog filters: fundamentals, design, simulation, realizations;				

- 7) A/D converters: types, principle of operation, parameters;
- 8) D/A converters: types, principle of operation, parameters;
- 9) Sensor signal conditioning;
- 10) Phase-locked loop (PLL): principle of operation, parameters, applications;
- 11) Switched capacitor circuits (SC): principle of operation, parameters, applications;
- 12) Direct digital synthesis (DDS): principle of operation, parameters, applications;
- 13) Power supplies: types, structures, simulation, design
- 14) Interfacing Analog to Digital Circuits;
- 15) PCB Design for mixed-signal circuits;

Project:

Group of students (max. 3 people) choose project concerning design, simulation, construction and development of a mixed-signal circuit. The final result of the project is a working circuit and documentation.

**20. Examination:** no

**21. Primary sources:**

1. Tietze U, Schenk Ch.: „Electronic Circuits: Handbook for Design and Application”, Springer; 2nd edition
2. Hill W, Horowitz P.: „The Art of Electronics”, Cambridge University Press; 3 edition, 2011
3. Savant C.J, Roden M.S, Carpenter G.L.: „Electronic Design: Circuits and Systems”, Benjamin/Cummings, 1991
4. Doboli A, E.H Currie, „Introduction to Mixed-Signal, Embedded Design”, Springer; 2011

**22. Secondary sources:**

1. Kester W, „Mixed-signal and DSP Design Techniques (Analog Devices), Newnes; 1 edition, 2003
2. Wilson P. , The Circuit Designer's Companion”, Newnes; 3 edition (January 26, 2012)
3. R.G Lyons, „Understanding Digital Signal Processing” Prentice Hall; 3 edition 2010

**23. Total workload required to achieve learning outcomes**

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/10
2	Classes	0/0
3	Laboratory	0/0
4	Project	30/25
5	BA/ MA Seminar	0/0
6	Other	5/5
	Total number of hours	65/40

**24. Total hours:** 105

**25. Number of ECTS credits:** 4

**26. Number of ECTS credits allocated for contact hours:** 2

**27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):** 2

**26. Comments:**

Approved:

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(date, Instructor's signature)

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(date, the Director of the Faculty Unit signature)