Załącznik nr 9
do Zarządzenia Rektora PŚk Nr 35/19
w brzmieniu ustalonym Zarządzeniem Nr 12/22

COURSE DESCRIPTION

Course code	full-time studies	**X**
	part-time-studies	**X**
Course name	**Projektowanie układów stosowanych w elektronice**	
Course name in English	**Design of circuits used in electronics**	
Valid from academic year	**2022/23**	

PLACEMENT IN THE TEACHING PROGRAM

Field of study	**Computer Science**
Level of education	**1st degree**
Studies profile	**General**
Form and method of teaching classes	**Full-time and part-time studies**
Specialization	**All specializations**
Organizational unit responsible for the course	**Department of Information Systems**
Course coordinator	**Jacek Wilk-Jakubowski**
Approved by	**Dean of the Faculty of Electrical Engineering, Automatic Control and Computer Science Roman Deniziak, KUT prof., DSc, PhD**

GENERAL CHARACTERISTIC OF THE COURSE

Course affiliation		**Directional course**
Course status		**Elective**
Language		**English**
Semester	full-time studies	**Semester VI**
	part-time-studies	**Semester VII**
Requirements		**Fundamentals of Electronics Digital measurements**
Exam (YES/NO)		**NO**
ECTS		**4**

Course form		**lecture**	**classes**	**laboratory**	**project**	**other**
Hours per semester	full-time studies	**30**			**30**	
	part-time-studies	**18**			**18**	

LEARNING RESULTS

Category	Result Symbol	Learning Results	References to the field of study results
Knowledge	W01	Student knows and understands selected issues of electrical engineering, electronics and metrology, allowing the student to understand the design and operation of digital circuits and basic measurement systems and methods.	INF_W05
	W02	Student knows and understands the methods of design, management and administration as well as virtualization of the complex data communication systems functioning in different spaces of the hypercommunicated world, methods of communication and object location including real-time requirements.	INF_W30
Skills	U01	Student can relate computer science to other areas of technical sciences (electrical engineering, electronics, metrology) and other fields of science (science, natural science, social science) and transfer good practices developed in these areas to computer science and apply computer methods in the above mentioned fields.	INF_U05
	U02	Student is able to design, implement, configure and test complex data communications systems together with the preparation of dedicated virtual environments and selected hardware components.	INF_U30
Social competence	K01	Student is ready to recognize the significance of knowledge in solving engineering problems and the need for its continuous expansion to improve professional, personal and social competences.	INF_K1
	K02	Student is ready to critically evaluate his/her qualifications and understands the potential consequences of decisions/actions taken on the basis of incomplete knowledge/poor skills.	INF_K2

COURSE CONTENT

Course Form	Content
lecture	1-3. Introduction to electronic circuit design and prototyping. Directions of development. Overview of available software. Familiarization with Computer-Aided Design (CAD) of electronic circuits. 4. Principles of printed circuit board design. Verification of circuits to meet ERC rules. 5. Exporting and editing data to PCB file. Creating shapes. 6. Dimensioning of circuit elements. 7. Electronic component placement and schematic update. 8-10. Creating schematic symbols and footprints for PCBs. 11. Layer theory. 12. Principles of routes and vias. 13. Printed circuit board optimization and copper poured areas. 14. Verification of circuits to meet DRC rules. 15. Data update. Final design of the electronic circuit.

project	To assign a project task to be completed (printed circuit board) in groups of 3-5 (each person on the project group has an assigned role) and to complete it based on the knowledge acquired in lecture classes. As part of the project students should: - design the circuit in CAD application according to the guidelines, - check the correctness of its operation, - create technical documentation, - present the finished circuit (physical implementation) and its technical documentation for the defense.

LEARNING RESULTS VERIFICATION METHODS

Result Symbol	Learning results verification methods					
	Oral Exam	Written Exam	Midterm	Project	Report	Other
W01			X			
W02			X			
U01				X	X	
U02				X	X	
K01				X	X	
K02				X	X	

ASSESSMENT FORMS AND CRITERIA

Course Form	Assessment Form	Assessment Criteria
lecture	Passing grade	Obtain min. 50% of the points in the final written/oral colloquium.
project	Passing grade	Defense of the project (personal demonstration of the circuit with the ability to explain it and presentation of technical documentation) for a positive grade.

STUDENT'S VOLUME OF WORK

ECTS Balance													
No.	Activity Type	Student Involvement										Unit
		full-time studies					part-time-studies					
1.	Participation in classes according to the schedule	Lec	C	Lab	P	S	Lec	C	Lab	P	S	h
		30	-	-	30	-	18	-	-	18	-	
2.	Other (consultations, exams)	2	-	-	2		2	-	-	2	-	h
3.	**Total with the direct assist of an academic teacher**	**64**					**40**					h
4.	**Number of ECTS, that students obtains with the direct assist of an academic teacher**	**2,56**					**1,6**					ECTS
5.	**Hours of unassisted student work**	**36**					**60**					h
6.	**Number of ECTS that student obtains working unassisted**	**1,44**					**2,4**					ECTS

7.	**Practical classes volume of work**	**30**	**18**	h
8.	**Number of ECTS obtained by student at practical classes**	**1,88**	**1,80**	ECTS
9.	**Total student's volume of work expressed in hours**	**100**	**100**	h
10.	**ECTS**	**4**		ECTS

BIBLIOGRAPHY

1. McMahon C., Browne J. CAD/CAM – from principles to practice. Addison-Wesley Publishing Company. Taipei 1994.
2. Rymarski Z. Materiałoznawstwo i konstrukcja urządzeń elektronicznych. Projektowanie i produkcja urządzeń elektronicznych. Wydawnictwo Politechniki Śląskiej. Gliwice 2000.
3. Blackwell G. R. The Electronic Packaging Handbook. CRC Press. Boca-Raton 2000.
4. Wilk-Jakubowski J., Ciosmak J. Wspomagane komputerowo projektowanie płytek drukowanych z wykorzystaniem pakietu Cadstar. Wydawnictwo Politechniki Świętokrzyskiej. Kielce 2017.
5. Kisiel R., Bajera A. Podstawy konstruowania urządzeń elektronicznych. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 1999.
6. Horowitz P., Hill W. Sztuka elektroniki. Tom 1, 2. Wydawnictwa Komunikacji i Łączności. Warszawa 2018.