

(faculty stamp)

**COURSE DESCRIPTION**

Z1-PU7

WYDANIE N1

Strona 1 z 2

<b>1. Course title: PRINTED CIRCUIT BOARD DESIGN</b>		<b>2. Course code PCBDLab</b>		
<b>3. Validity of course description:</b> 2013/2014				
<b>4. Level of studies:</b> MSc programme				
<b>5. Mode of studies:</b> intramural studies				
<b>6. Field of study:</b> MAKROKIERUNEK		(FACULTY SYMBOL) RAU3		
<b>7. Profile of studies:</b> general				
<b>8. Programme:</b>				
<b>9. Semester:</b> 7				
<b>10. Faculty teaching the course:</b> Institute of Electronics (RAU3)				
<b>11. Course instructor:</b> Dariusz Wójcik, PhD, Eng				
<b>12. Course classification:</b>				
<b>13. Course status:</b> elective				
<b>14. Language of instruction:</b> English				
<b>15. Pre-requisite qualifications:</b> It is assumed that students have mastered the material in the circuit theory, design of analog and digital circuit and design for manufacture.				
<b>16. Course objectives:</b> The main goal of the course is to introduce students to fundamental aspect of printed circuit board design techniques using sophisticated EDA tools. The subject matter of the lecture encompasses – among other things – logical system design through schematic capture, constraints driven design, physical design using PCB layout and manufacturing data creation. Some introductory information about printed circuit board routability issues as well as high speed design aspects are provided.				
<b>17. Description of learning outcomes:</b>				
Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	can use advanced schematic editor	lab work	laboratory	
2.	can define constrains for high-speed interconnections	lab work	laboratory	
3.	can prepare documentation for PCB manufacturing	lab work	laboratory	
4.	can design PCB taking into account EMC requirements	lab work	laboratory	
<b>18. Teaching modes and hours</b>				
<b>Lecture / BA /MA Seminar / Class / Project / Laboratory</b>				
Laboratory: 30 h				
<b>19. Syllabus description:</b>				
<ol style="list-style-type: none"> <li>1. Introduction to Expedition Enterprise Suite</li> <li>2. Library creation</li> <li>3. Creation o schematics for advanced disignes</li> <li>4. Constraints driven design</li> <li>5. Manual and automatic routing design</li> <li>6. Costrains for high-speed circuits</li> <li>7. Power planes in multilayer PCB</li> <li>8. Manufacturing output creation</li> <li>9. Simulation os signal integrity aspects using HyperLynx</li> </ol>				
Project				
<ol style="list-style-type: none"> <li>1. Library creation for PCI card design.</li> <li>2. Creation of schematics.</li> </ol>				

- 4. Constraints creation.
- 5. Pre-layout simulations.
- 6. Manual and automatic routing.
- 6. Post-layout simulations.
- 7. Power planes creation.
- 8. Manufacturing output creation.

**20. Examination:** none

**21. Primary sources:**

IPC standards (www.ipc.org)  
 Clyde F. Coombs, Printed Circuits Handbook, McGraw Hill, 2007  
 Charles Harper, High Performance Printed Circuit Boards, 2005  
 Expedition Enterprise Flow documentation (www.mentor.com)

**22. Secondary sources:**

Archambeault, Bruce R., Drewniak, James, PCB Design For Real-World EMI Control  
 Stephen C. Thierauf, High-Speed Circuit Board Signal Integrity  
 Mark I. Montrose, Printed Circuit Board Design Techniques For EMC Compliance: A Handbook For Designers  
 Mark I. Montrose, EMC And The Printed Circuit Board: Design, Theory, And Layout Made Simple Michel  
 Douglas Brooks, Signal Integrity Issues And Printed Circuit Board Design

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

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	0/0
2	Classes	0/0
3	Laboratory	30/15
4	Project	0/0
5	BA/ MA Seminar	0/0
6	Other	10/5
	Total number of hours	40/20

**24. Total hours:**55

**25. Number of ECTS credits:** 2

**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)