GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer-aided Prototyping, PG_00038350		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Controlled Electric Drives -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Drzewiecki	
	Teachers	dr inż. Marcin Drzewiecki	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	10.0	0.0	0.0	20

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	20	4.0	51.0	75

Subject objectives

The aim of object are to improve the knowledge and know-how of rapid and computer aided prototyping problems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] has in-depth knowledge of industrial electronics, microprocessor control systems, programmable logic systems and printed circuit design and prototyping computer-aided prototyping	knows the principles of CNC programming using G code, knows pronciples of magnetic elements design using FEM software, knows principles of PCB design, has knowledge on 3D prototyping	[SW2] Assessment of knowledge contained in presentation
[K7_U12] is able to design and program computer applications using object-oriented programming, produce technical documentation technical documentation using CAD technology	is able to design magnetic elements with FEM software use and prepare the project draft	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K7_U06] is able to analyse, model, simulate and design electrical systems	is able to prepare a model of power electronics ciruict and to select the parameters of the converter, is able to design PCB circuit	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents

LECTURES The basics on CAx - computer aided, history. Rapid prototyping. CAD/CAM systems in electrical engineering. Computer aided design of magnetic elements, FEMM software, LUA scripting. Prototyping of PCB boards, basic rules, EAGLE software, manufacturing of PCB, Gerber format. CNC programming. Automatic control in CNC. Axis notation in CNC. Control systems in CNC. Trajectories in CNC. G language for CNC programming. Examples on CNC devices: milling machine, electro-erosion machine. CAE software, numerical methods, FEM method. Geometrical modelling in CAD. Data formats in CAx. 3D rapid prototyping: stereolitography, STL format. CD techniques: SLS, LOM, FDM. Injection moulding machine.

LABORATORY

Practical exercises in techniques of CAx CAE system using the example of the FEMM: modelling air coil, planar inductor, the use of LUA scripting language. Design of power electronic systems in the CAE software. Design of PCB board, preparation of documentation in the process of CAM on the example of the Eagle. CNC machine language G code.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Basic know-how on design process using CAD software, program languages, and knowledge on power electronics systems.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercise</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Class tests</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Włodzimierz Przybylski, Mariusz Deja: Komputerowo wspomagane wytwarzanie maszyn Podstawy i zastosowanie, WNT 2007.
2. Konopiński T., Pac R.: Transformatory i dławiki elektronicznych urządzeń zasilających. WNT, Warszawa 1979.
3. David Meeker FiniteElement Method Magnetics. Users Manual.
4. H. Wieczorek: Eagle pierwsze kroki. Wyd. BTC, Warszawa 2007.
5. Web page of TCAD software: http://www.tcad.com.pl/</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Kazimierczuk M.K.: High-frequency magnetic components. John Wiley & Sons, 2009.
2. Z. Rymarski: Materiałoznawstwo i konstrukcja urządzeń elektronicznych. Wyd. PŚ, Gliwice 2000.
3. R. Kisiel, A Bajera: Podstawy konstruowania urządzeń elektronicznych. Oficyna Wyd. PW, Warszawa 1999.
4. Web page of Matlab/SIMULINK software: http://www.mathworks.com.
5. M. Jankowski: Elementy grafiki komputerowej, WNT, Warszawa 1990.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Design of air-core coil.
2. Design of pot-core reactor.
3. Development of Lua script.
4. Design of 1-phase transformer.
5. Design of 3-phase reactor.
6. Design of power electronics converter.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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