GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Computer-aided Prototyping, PG_00065788 | | |
| Field of study | Electrical Engineering | | |
| Date of commencement of studies | February 2025 | Academic year of realisation of subject | 2024/2025 |
| Education level | second-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 1 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Electric Drives and Energy Conversion -> Faculty of Electrical and Control Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Marek Adamowicz | |
| | Teachers | dr hab. inż. Marek Adamowicz | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 0.0 | 15.0 | 0.0 | 0.0 | 30 |

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 | 30 | 5.0 | 15.0 | 50 |

**Subject objectives**

The aim of the course is to expand skills related to computer-aided rapid prototyping. The student will learn about selected systems for use in electrical engineering. Aditionally, the student will master the skills of designing, building, assembling, starting and testing a prototype of a power electronic device.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_W06] has an in-depth knowledge of industrial electronics, microprocessor control systems and in the field of power electronics and drive systems, their control and diagnostic methods | Knows the principles of designing printed circuits, designing and analyzing magnetic structures using the FEM method, designing and making 3D structural elements. | [SW1] Assessment of factual knowledge |
| [K7_U06] is able to analyse, model, simulate and design electrical systems | Makes models of magnetic elements such as chokes and transformers for the FEMM program. Symulates the models done in FEMM. Develops simulation results. | [SU3] Assessment of ability to use knowledge gained from the subject |
| [K7_U12] is able to design and program computer applications using object-oriented programming, produce technical documentation technical documentation using CAD technology | Designs magnetic elements such as chokes and transformers using FEMM field program, prepares documentation of power electronic converters. | [SU1] Assessment of task fulfilment |

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|---|---|
| Subject contents | **LECTURES** Examples of the computer-aided designing programs. The rules of the construction prototyping environments. Creating sketches tools and methods of sketching. Methods and instruments of the 3D modelling. Logic operations on regular solids. The principles of designing the technological process in computer-aided programs. Modelling and visualization of the technological processing. Analysis of the designed construction. Making use of the choice of materials to design and analyse constructions. The Lua script language. Design of magnetic components: coils, chokes, transformers. Design of power electronics systems. Methods and devices for 3D printing.<br><br>**LABORATORIES** Exercises in the field of CAx techniques using CAD/CAM/CAE systems. Modeling of inductors and transformes using FEMM software. Design of power electronics systems in the LTSpice sofware. Preparation of manufaturing files for CAM process on the example of the Eagle/KiCad program. Numerically controlled machine tool in the G-Code language. Design of theprinted circuits PCB. Design, assembling and testing of a DC/DC switching converter. |
| Prerequisites and co-requisites | Basic know-how on design process using CAD software, program languages, and knowledge on power electronics systems. |

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Laboratory project | 60.0% | 70.0% |
| Class test | 60.0% | 30.0% |

**Recommended reading**

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|---|---|
| Basic literature | 1. Włodzimierz Przybylski, Mariusz Deja: Komputerowo wspomagane wytwarzanie maszyn Podstawy i zastosowanie, WNT 2007.<br>2. MTS: Podstawy obróbki CNC, Wyd. REA, Warszawa 1999.<br>3. Kosmol J.: Serwonapedy obrabiarek sterowanych numerycznie, WNT, Warszawa, 1998.<br>4. Chlebus E.: Techniki komputerowe CAx w inżynierii produkcji. WNT, Warszawa 2000.<br>5. Wieczorek H.: Eagle, pierwsze kroki, Wydawnictwo BTC, Warszawa 2007. |
| Supplementary literature | 1. Kaźmierczak M. i inni: Programowanie obrabiarek sterowanych numeryczie, Wyd. PŚ, Gliwice 2007.<br>2. Kazimierczuk M.K.: High-frequency magnetic components. John Wiley & Sons, 2009.<br>3. Konopiński T., Pac R.: Transformatory i dławiki elektronicznych urządzeń zasilających. WNT, Warszawa 1979.<br>4. Jankowski M.: Elementy grafiki komputerowej, WNT, Warszawa 1990. |
| eResources addresses | Adresy na platformie eNauczanie: |

**Example issues/ example questions/ tasks being completed**

1. Design of air-core coil.
2. Design of pot-core reactor.
3. Development of simulation of power electronics converter.
4. Design of printed board.
5. Assembling of electronics circuit.
6. Programming of microprocessor system.
7. Axisymmetric and planar models in the FEMM program.
8. Explain the orientation of coordinate systems in the CNC.
9. What types of instructions are used in G-code? Give examples.
10. Write a program in G code for manufacturing an example of a simple element on CNC machine.

**Work placement**

Not applicable

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