GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Computer Control Systems, PG_00038129 | | |
| Field of study | Automation, Robotics and Control Systems | | |
| Date of commencement of studies | October 2023 | Academic year of realisation of subject | 2025/2026 |
| Education level | first-cycle studies | Subject group | Optional subject group<br>Subject group related to scientific research in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 3 | Language of instruction | Polish |
| Semester of study | 6 | ECTS credits | 5.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Faculty of Electrical and Control Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Jarosław Tarnawski | |
| | Teachers | | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 30.0 | 0.0 | 30.0 | 0.0 | 0.0 | 60 |

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 | 60 | 8.0 | 57.0 | 125 |

**Subject objectives**

Presentation of centralized and distributed / decentralized control structures.The introduction of advanced adaptive, predictive control methods.Acquainted with the infrastructure of computer control systems - DCS and SCADA / PLC systems.The integration of knowledge from different fields to the needs of a computer control system synthesis.Introduction to methods of decision support - multi-purpose and multi-attribute-approach.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W07] has basic knowledge related to control and automation systems | The student is able to define the role of all necessary elements and build a control system | [SW1] Assessment of factual knowledge |
| [K6_K02] can work in a group taking on different roles in it | The student during laboratory classes on the synthesis of advanced control system performs tasks in groups by changing roles within the team. | [SK2] Assessment of progress of work |
| [K6_U07] can build and analyze models of systems and systems in the field related to control systems and automation | The student is able to build an advanced computer-controlled control system | [SU5] Assessment of ability to present the results of task |

**Subject contents**

Control systems structures: classical, centralized, multilayer, decentralized, distributed. Implementation of centralized/decentralized with/without data exchange with communication aspects (time relationships, data loss, stability). Multilayer and distributed control systems based on real large scale systems: drinking water distribution systems, sewer system, oil refinery. Requirements for computer controlled systems. Information structure of CCS. Software and hardware selection for practical implementation of CCS. Implementation of selected complex control algorithms in computer-like devices: microcontrollers, PLCs, PACs and industrial computers. SCADA system realization supervisory control with coordination among all control layers. Process data acquisition and archivisation. Realization of optimization layer. Solver selection for optimization purposes.

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| Prerequisites and co-requisites | Finished courses:<br><br>- Dynamic Systems<br><br>- Real Time Systems<br><br>- Programmable Logic Controllers<br><br>- Industrial Communication Networks |

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Written exam | 50.0% | 40.0% |
| Midterm colloquium | 50.0% | 30.0% |
| Practical exercise | 50.0% | 30.0% |

**Recommended reading**

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| Basic literature | Korbicz J., Kościelny J., Modelowanie, diagnostyka i sterowanie nadrzędne procesami<br>Implementacja w systemie DiaSter, WNT, 2009<br><br>Tatjewski P. Sterowanie zaawansowane obiektów przemysłowych, Akademicka Oficyna Wydawnicza EXIT, 2002<br><br>Grega W. Metody i algorytmy sterowania cyfrowego w układach scentralizowanych i rozproszonych, Wydawnictwo AGH, 2004<br><br>Niederliński A. Systemy komputerowe automatyki przemysłowej, tom 1, Sprzęt i oprogramowanie, WNT, 1984.<br><br>Niederliński A. Systemy komputerowe automatyki przemysłowej, tom 2, Zastosowania, WNT, 1985. |
| Supplementary literature | Trybus L. Regulatory wielofunkcyjne, WNT, 1992<br><br>Astrom K., Wittenmark B., Computer-Controlled Systems: Theory and Design (3rd Edition), Prentice Hall, 1996 |
| eResources addresses | Adresy na platformie eNauczanie: |

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| Example issues/ example questions/ tasks being completed | What are the differences between centralized and distributed control systemOutline the main features and benefits of predictive controlEnter the difference between direct and indirect adaptive controlIntroduce hierarchicynego structure of the control system and specify the tasks of each layerWhat is the method of AHP?What are the principles of the design of the control system |
| Work placement | Not applicable |