GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Modeling and automation of technological processes, PG_00064938 | | |
| Field of study | Mechanical Engineering | | |
| Date of commencement of studies | February 2025 | Academic year of realisation of subject | 2025/2026 |
| Education level | second-cycle studies | Subject group | Specialty subject group<br>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 | 2 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Bogdan Ścibiorski | |
| | Teachers | | |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 18.0 | 0.0 | 0.0 | 9.0 | 0.0 | 27 |
| | 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 | 27 | 5.0 | 43.0 | 75 |

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| Subject objectives | Familiarization with the principles of creating realistic models of manufacturing processes for simulation purposes in automated production environments. |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [K7_K13] is ready for responsible performance of proffesional roles, considering ever-changing need of the society, including self developement and supporting and fullfiling work ethics | The student is prepared to responsibly perform professional roles in the field of analysis, modeling, and optimization of production systems, considering the dynamic development of technology and its impact on society and the economy. | [SK1] Assessment of group work skills |
| [K7_W13] explains the main principles of individual and teamwork organization, including various forms of entrepreneurship utilizing knowledge from the field of engineering and technical sciences and disciplines relevant to the course of study | The student understands the fundamental principles of individual and team work organization in the context of designing and implementing automated production systems, taking into account aspects of production engineering and process optimization. | [SW3] Assessment of knowledge contained in written work and projects |
| [K7_W02] demonstrates a structured and theoretically grounded knowledge of the key topics in Mechanical Engineering enabling the analysis and modelling of mechanical systems, processes and devices | The student demonstrates structured and theoretically grounded knowledge in the field of modeling and automation of technological processes, enabling the analysis and simulation of production systems and their optimization. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K7_U02] formulates and solves technical problems specific to Mechanics and Mechanical Engineering using appropriate tools including CAD and MES systems, and prepares technical documentation | The student formulates and solves technical problems specific to mechanics and machine construction, using appropriate tools for modeling and analyzing production processes. The student is able to develop simulation reports and assess the efficiency of production systems. | [SU1] Assessment of task fulfilment |

## Subject contents

Lecture: Simulation model. Characteristics of the manufacturing system. Forms of automated production. Manufacturing flexibility. Machining automation. Production system modeling techniques. The concept of the system. Problems of stochastic processes. Modeling methods. Description of simulation objects. Techniques for measuring simulation results. Selected models of production systems in the conditions of automated production.

Project: design of a manufacturing structure model, determination of values for the parameters describing the efficiency of the manufacturing system. Model optimization. Decomposition and simulation

## Prerequisites and co-requisites

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| Assessment test | 56.0% | 50.0% |
| Project | 56.0% | 50.0% |

## Recommended reading

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| Basic literature | 1. Symulacja stosowana Modelowanie i analiza przy wykorzystaniu FlexSim / Malcolm Beaverstock, Allen Greenwood, William Nordgren ; przekład Katarzyna Gdowska. Beaverstock, Malcolm, Kraków : InterMarium, 2019,<br>2. Flexim, Podręcznik użytkownika, Krzysztof Andrzej Jurczyk, InterMarium, 2022. |
| Supplementary literature | 1. Zdanowicz R., Świder J.: Komputerowe Modelowanie procesów wytwórczych, Wydawnictwo Politechniki Śląskiej, Gliwice 2013<br>2. Hromada J., D. Plinta D.: Modelowanie i symulacja systemów produkcyjnych, Wydawnictwo Politechniki Łódzkiej, Bielsko- Biała 2000. Lasota A.: Modelowanie procesów produkcyjnych z wykorzystaniem diagramów aktywności języka UML i sieci Petriego Warszawa Exit 2012<br>3. Antczak P., Antaczak A., Witkowski T.: Optymalizacja przepływu produkcji seryjnej, PWE Warszawa 2016<br>4. Palchevskyi B., Świć A., Pavlysh V., Banaszak Z., Gola A., Krestianpol O., Lozynskyi V.: Komputerowo zintegrowane projektowanie elastycznych systemów produkcyjnych, Monografia, Politechnika Lubelska 2015 |
| eResources addresses | Adresy na platformie eNauczanie: |

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| Example issues/ example questions/ tasks being completed | Creating a simulation model for a selected production system<br><br>Analysis of production system efficiency based on simulation results<br><br>Identification and optimization of bottlenecks in the production process<br><br>Evaluation of the impact of manufacturing flexibility on system performance<br><br>Application of modeling methods for the analysis of automated production systems<br><br>Techniques for measuring simulation results and their interpretation. |
| Work placement | Not applicable |

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