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| **WSB University Branch/Department of Jaworzno**  |
| **Field of study: Computer Science**  |
| **Subject: Programming of computer calculations**  |
| **Educational profile: practical**  |
| **Level of education: undergraduate studies**  |
| **Number of hours per semester**  | 1  | 2  | 3  | 4  |
| I  | II  | III  | IV  | V  | VI  | VII  |
| **Full-time studies** (w/w/lab/pr/e)\*  |   |   |   |   | **12w /** **16ćw**  |   |   |
| **Part-time studies** (w/æw/lab/pr/e)  |   |   |   |   | **10w /** **12ćw**  |   |   |
| **LANGUAGE OF** **INSTRUCTION**  | Polish  |
| **LECTURER**   | Dr.-Ing. Buchwald Paweł, M.Sc. Popławski Krzysztof  |
| **FORM OF ACTIVITIES**  | Lecture, exercises, consultations  |
| **SUBJECT OBJECTIVES**   | The aim of the course is to familiarise students with the programming of selected computer calculation methods used in engineering practice.  |
| **Reference to learning outcomes**  | **Description of learning outcomes**  | **Means of verification of the effect learning**  |
| **Directional effect**  | **PRK**  |
| **NEWS**  |
| INF\_W02  | P6S\_WG  | Students will be familiar with methods of implementing selected computer calculations  | Test in the form of a test  |
| INF\_W10  | P6S\_WG  | The student is familiar with methods, techniques and tools for solving simple engineering problems in the field of programming computer calculations  | Test in the form of a test  |
| **SKILLS**  |
| INF\_U11  | P6S\_UW  | Students will be able to critically analyse the functioning of the software  | Test in the form of a test  |
|  |   |   |   |
| **SOCIAL COMPETENCES**  |
| INF\_K01  | P6S\_KK  | Students are able to critically evaluate their knowledge  | Observation of students during classes  |
| **Student workload (in teaching hours 1h =45 minutes)\*\***  |
| **Stationary** attendance at lectures = 12 participation in exercises = 16 preparation for exercise = 5 lecture preparation = 5 exam preparation =4 implementation of project tasks = e-learning = Pass/examination = 4 other (consultation) = 4 **TOTAL: 50h** **Number of ECTS credits: 2**  | **Part-time** attendance at lectures = 10 participation in exercises = 12 preparation for exercise = 8 lecture preparation = 8 exam preparation = 4 implementation of project tasks = e-learning = Pass/examination = 4 other (consultation) = 4 **TOTAL: 50h** **Number of ECTS credits: 2**  |
| **including in practical classes: 1**  | **including in practical classes: 1**  |
| **PREREQUISITES**  | Knowledge of the basics of mathematical analysis and have programming skills in any language, e.g. C, python.  |
| **SUBJECT CONTENT** (broken down into face-to-face and elearning classes)  | **Lecture** Content delivered in a face-to-face format: * Methods for solving systems of linear equations: Cramer's formulae, Gauss elimination method, iterative methods.
* Linear programming: formulation, interpretation and example of the task, simplex method, linear programming dual task.
* Square programming.
* Dynamic programming.
* The linear-quadratic problem.
* PID control algorithm.
* Fourier transform.
* Kalman filtration: extended Kalman filter, practical applications.
* The discrete Bayes filter algorithm.

 **Exercises** * Methods for solving systems of equations.
* Linear programming.
* Practical implementation of the PID algorithm.
* Filtering algorithms.
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| **LITERATURE** **COMPULSORY**  | * Klamka J., Ogonowski Z.: Numerical methods. Silesian University of Technology Publishing House, Gliwice 2013.
* Majchrzak E., Mochnacki B.: Numerical methods. Theoretical bases, practical aspects and algorithms. Wydawnictwo Politechniki Śląskiej, Gliwice 2004.
* Świerniak, A., Gałuszka, A. Optimization Methods and Decision Making. Wydawnictwo Politechniki Śląskiej, Gliwice 2003.
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| **LITERATURE** **SUPPLEMENTARY** (including min. 2 items in English; book publications or articles)  | * Choset, H. M., Hutchinson, S., Lynch, K. M., Kantor, G., Burgard, W., Kavraki, L. E., (2005).

Principles of robot motion: theory, algorithms, and implementation. MIT press. * Burgard, W., Thrun, S., Fox, D., (2005). Probabilistic robotics. MIT press.
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| **TEACHING** **METHODS** (broken down into face-to-face and e-learning classes)  | In direct form: Multimedia lecture with numerous examples. Use of laboratory instructions. E-learning: Moodle platform and MS Teams application  |
| **LEARNING AIDS**  | Moodle platform and MS Teams application  |
| **PROJECT** (insofar as it is carried out as part of a course module)  | Not applicable  |
| **FORM AND** **CONDITIONS OF** **PASSING** (broken down into face-to-face and elearning classes)  | Lecture: Written test Exercises: Credit for the course is based on completed laboratory exercises.  |