



Subject card

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|---|--|--|-------------------------------------|------------|--|---------|-----|
| Subject name and code | Mathematical modeling and optimization, PG_00062660 | | | | | | |
| Field of study | Naval Architecture and Offshore Structures | | | | | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | | | 2023/2024 | | |
| 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 | | | 5.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Zakład Informatyki Technicznej -> Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Aleksander Kniat | | | | | |
| | 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 | 18.0 | 0.0 | 36 |
| | 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 | 36 | 9.0 | | 80.0 | | 125 |
| Subject objectives | The aim of the subject is to apply mathematical modelling for solving physical problems. In particular subject includes numerical methods and enhances the skills to create algorithms / computer programs, as well as using ready-made software tools to perform simulations in shipbuilding. | | | | | | |
| Learning outcomes | Course outcome | Subject outcome | | | Method of verification | | |
| | [K7_W03] Demonstrates advanced skills in applying analytical methods and problem-solving techniques related to ocean engineering, using appropriate tools | Student is able to describe physical phenomena with differential equation and implements numerical solution method. | | | [SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects | | |
| | [K7_W04] Conducts thorough analysis of complex problems, based on credible data and appropriately chosen methods, striving to achieve logical solutions | Student knows principles of algorithm creation and uses structural/objective programming language to implement algorithms. | | | [SW1] Assessment of factual knowledge | | |
| | [K7_K02] Is aware of their social role as a graduate of a technical institution, understanding the importance of adhering to professional ethics and respecting diverse perspectives | Student is able to present results of her/his work, assesses it and understands its impact on the environment. | | | [SK5] Assessment of ability to solve problems that arise in practice | | |

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| Subject contents | <p>Fundamentals in C# programming:</p> <ul style="list-style-type: none"> • structural and object oriented programming, • algorithms and data, • implementing/executing a program, • command line dialog/controls in Windows Forms, • file system usage <p>Solving one dimensional physical problems defined with differential equation:</p> <ul style="list-style-type: none"> • damping oscillations of a mass hanged on spring, • damping oscillations of a of cuboid fallen into water <p>Accessing the functionality of other programs:</p> <ul style="list-style-type: none"> • creating complex operations in Excell, • calculating wetted surface and buoyancy for different draughts of a ship hull in a 3D CAD program. | | |
| Prerequisites and co-requisites | fundamental skills in using personal computer, basic knowledge about operating system and file system, bachelor's course in mathematics | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | exercises completion | 60.0% | 100.0% |
| Recommended reading | Basic literature | <p>Nagel Ch., Professional C# and .Net, 8th edition, Wrox Press, 2021</p> <p>Albahari J., Albahari B., C# 10 Pocket Reference: Instant Help for C# 10 Programmers, O'Reilly UK Ltd., 2022</p> <p>Sharp J., Microsoft Visual C# Step by Step, 9th edition, Microsoft Press US, 2018</p> | |
| | Supplementary literature | Wirth N., Algorytmy + struktury danych = programy, ISBN: 83-204-2740-1, WNT 2002 | |
| | eResources addresses | Adresy na platformie eNauczanie: | |
| Example issues/ example questions/ tasks being completed | <ol style="list-style-type: none"> 1. defining variables and performing arithmetic calculations, 2. printing in console and retrieving input data from console, 3. simple calculation algorithm implementation e.g. system of linear equations, 4. creation of vectors/matrices and performing operations on them e.g. search, sort, 5. creation of procedures and functions e.g. factorial 6. defining class hierarchy and objects, 7. window programming (controls) 8. graphics context and painting in a window 9. simulating motion in a graphic window (timer application) e.g. damped movements 10. accessing other programs e.g. geometric calculations in SolidEdge | | |
| Work placement | Not applicable | | |

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