



## Subject card

|   |  |   |  |            |  |         |     |
|---|--|---|--|------------|--|---------|-----|
| Subject name and code                       | Thermodynamics, PG_00055279  |   |  |            |  |         |     |
| Field of study                              | Design and Construction of Yachts  |   |  |            |  |         |     |
| Date of commencement of studies             | October 2021   | Academic year of realisation of subject                       |  |            | 2021/2022  |         |     |
| Education level                             | first-cycle studies  | Subject group   |  |            | Obligatory subject group in the field of study                       |         |     |
| Mode of study                               | Full-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                            | practical profile  | Assessment form   |  |            | assessment   |         |     |
| Conducting unit                             | Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology  |   |  |            |  |         |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor   | dr hab. inż. Damian Bocheński                                 |  |            |  |         |     |
|   | Teachers   | mgr inż. Patrycja Puzdrowska<br>dr hab. inż. Damian Bocheński |  |            |  |         |     |
| Lesson types and methods of instruction     | Lesson type  | Lecture   | Tutorial   | Laboratory | Project  | Seminar | SUM |
|   | Number of study hours  | 30.0  | 15.0   | 0.0        | 0.0  | 0.0     | 45  |
|   | E-learning hours included: 0.0   |   |  |            |  |         |     |
|   | Termodynamika, W, PiBJ, sem. 2, lato 2021/22 - Moodle ID: 22569<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22569">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22569</a><br>Termodynamika, C, PiBJ, sem. 2, letni 21/22 (PG_00055279) - Moodle ID: 22598<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22598">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22598</a>  |   |  |            |  |         |     |
| 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  | 45  | 10.0   |            | 20.0   |         | 75  |
| Subject objectives                          | acquaint with the basic concepts of classical thermodynamics, laws of thermodynamics, properties of thermodynamic substances, energy and exergy balances for thermodynamic systems, ideal cycles of thermal machines, and explain the importance of lecture subjects in engineering practice   |   |  |            |  |         |     |
| Learning outcomes                           | Course outcome   |   | Subject outcome  |            | Method of verification   |         |     |
|   | K6_K01   |   | The student applies knowledge of thermodynamics to solve technical problems.   |            | [SK5] Assessment of ability to solve problems that arise in practice |         |     |
|   | K6_W03   |   | The student knows the basic concepts of the terminology used in thermodynamics. It describes the properties of thermodynamic systems using zero and first and second laws of thermodynamics. Shows the energy metabolism in the system work and entropic systems. Specifies balances: mass, energy, and exergy. Presents the ideal gas law and describes the properties of the energy of IC engines, steam power plant, refrigeration and heat pumps with respect to their theoretical circuits. |            | [SW1] Assessment of factual knowledge                                |         |     |
| Subject contents                            | LECTURE Introduction. Fundamentals of thermodynamics. The zeroth law of thermodynamics. The principle of conservation of amount of substances. The first law of thermodynamics. Energy balance. Equations of ideal, semi-ideal and real states. Entropy. Changes in ideal gases. The second law of thermodynamics. Theoretical cycles in internal combustion piston engines. Theoretical cycles in internal combustion turbine engines. Thermodynamics of solids and fluids. Thermodynamics of steams. Theoretical cycles in steam power plant. Theoretical cooling cycles and heat pumps. |   |  |            |  |         |     |
| Prerequisites and co-requisites             | Subject knowledge of Physics, Fluid Mechanics, Mathematics   |   |  |            |  |         |     |

| Assessment methods and criteria                                | Subject passing criteria   | Passing threshold  | Percentage of the final grade |
|--|--|--|-------------------------------|
|  |  | test   | 60.0%                         |
| Recommended reading  | Basic literature   | Pudlik W.: Termodynamika. Wyd. PG, Gdańsk 1995. 2. Szargut J.: Termodynamika. PWN, Warszawa 1980. 3. Szargut J.: Termodynamika techniczna. PWN, Warszawa 1991. 4. Szargut J.: Termodynamika techniczna. PWN, Warszawa 1998. 5. Wiśniewski S.: Termodynamika techniczna. WNT, Warszawa 1980. 6. Wiśniewski S.: Termodynamika techniczna. WNT, Warszawa 1999. 7. Wiśniewski S., Wiśniewski T.S.: Wymiana ciepła. WNT, Warszawa 1994. 8. Pudlik W., Grudziński D., Cieśliński J., Jasiński, W.: Termodynamika zadania i przykłady obliczeniowe. Gdańsk 2008 |                               |
|  | Supplementary literature   | Buchowski H, Ufnalski W.: Podstawy termodynamiki, WNT, Warszawa 1998. 2. Domański R., Jaworowski M., Redow M., Kołdyś J.: Wybrane zagadnienia z termodynamiki w ujęciu komputerowym. PWN, Warszawa 2000. 3. Staniszewski B.: Termodynamika. PWN, Warszawa 1982.  |                               |
|  | eResources addresses   |  |                               |
| Example issues/<br>example questions/<br>tasks being completed | 1. Present the First Law of Thermodynamics in descriptive and analytical terms, 2. Describe the entropy of solids and liquids, 3. Draw a simple Joule cycle diagram and show graphs of such a cycle in "T-s" and "i-s" systems, and determine the formula for its efficiency, 4. Prove that the work performed by a piston machine in isothermal transformations is not equal for the same piston displacement, 5. Draw a heat graph for water, excluding heat of its pushing, and mark on it the heat |  |                               |
| Work placement   | Not applicable   |  |                               |