



## Subject card

|  |  |  |                                     |  |  |         |     |
|--|--|--|-------------------------------------|--|--|---------|-----|
| Subject name and code  | District Heating, PG_00043392  |  |                                     |  |  |         |     |
| Field of study   | Environmental Engineering  |  |                                     |  |  |         |     |
| Date of commencement of studies  | October 2020   | Academic year of realisation of subject  |                                     |  | 2022/2023  |         |     |
| Education level  | first-cycle studies  | Subject group  |                                     |  | Obligatory subject group in the field of study<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  | Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering   |  |                                     |  |  |         |     |
| Name and surname of lecturer (lecturers)   | Subject supervisor   | dr inż. Arkadiusz Ostojski   |                                     |  |  |         |     |
|  | Teachers   | dr inż. Arkadiusz Ostojski<br>dr hab. inż. Ewa Zaborowska  |                                     |  |  |         |     |
| Lesson types and methods of instruction  | Lesson type  | Lecture  | Tutorial                            | Laboratory   | Project  | Seminar | SUM |
|  | Number of study hours  | 30.0   | 0.0                                 | 0.0  | 30.0   | 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                                 |  | 60.0   | 128     |     |
| Subject objectives   | The aim of the subject is to acquaint students with the basic knowledge in the range of heating, current regulations and standards related to the subject, the systems performance and fittings. The subject objective is to acquire skills in the range of professional nomenclature, utilising and converting different sources of information and data bases, application of calculation methodology and the principles of designing. |  |                                     |  |  |         |     |
| Learning outcomes  | Course outcome   | Subject outcome  |                                     |  | Method of verification   |         |     |
|  | [K6_U12] can design installations, networks and facilities: water supply, sewage, heating and gas  | Student prepares a project of a heating system with a gas boiler in a multi-family residential building.   |                                     |  | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject          |         |     |
|  | [K6_W09] has ordered, theoretically founded knowledge in the field of water supply, sewage, heating, ventilation and air conditioning, and the principles of shaping the microclimate of rooms; knows legal regulations, standardization issues and recommendations for the design of water supply, sewage, heating and gas networks and installations   | Student knows basic types of heating systems and tap hot water systems. Classifies heating substations. Specifies elements, describes and explains principles of automatic control systems in heating systems and heating substations. |                                     |  | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects        |         |     |
| [K6_U11] can use selected computer programs to support design, including CAD graphics programs | Student uses CAD software for the preparation of drawings in technical documentation.  |  |                                     | [SU4] Assessment of ability to use methods and tools |  |         |     |

| Subject contents  | <p>Lecture:</p> <p>Types of low-temperature heating systems (gravitational - pumping, with a lower or upper distribution pipings, single and double-pipe system, floor system). Safety devices for open and closed heating systems. Controlling and balancing of heating installations. Domestic hot water heating systems. Regulations and standards. Heating substations classification. Direct and indirect heating substations. Hydraulic schematic diagrams. Heat exchange and heat exchangers. Functional modules of heating substations. Fittings, devices and piping. Automatic control system. Safety device. Filling and refilling water system. Heating substation rooms. Water and wastewater installations in heating substation room. Regulations, standards, technical requirements.</p> <p>Project:</p> <p>Principles of hydraulic calculations of heating installation. Central heating project: Selection and location of radiators. Setting of thermostatic radiator valves. Developed view of heating systems. Linear and local pressure losses. Gravitational and active pressure. Selection of circulating pump. Symbols of heating systems elements on the drawings. Selection of boiler and circulating pump. Safety devices of closed, water heating system with a diaphragm expansion tank. Safety valves. Discussion of the requirements for the technical description of the heating system project. Method of final testing of the installation.</p> |   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
|---|---|---|--|--------------------------|-------------------|-------------------------------|---|-------|-------|------------------------------------|-------|-------|---------|--------|-------|
| Prerequisites and co-requisites                                       | Fundamental knowledge in the range of thermal engineering. Drawing skills in AutoCAD. Knowledge from the courses: Basics of thermal engineering (PG_00043370).  |   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Assessment methods and criteria                                       | <table border="1" data-bbox="448 741 1497 904"> <thead> <tr> <th data-bbox="448 741 794 779">Subject passing criteria</th> <th data-bbox="794 741 1141 779">Passing threshold</th> <th data-bbox="1141 741 1497 779">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 779 794 835">Written exam - heat protection of the building + heating installation</td> <td data-bbox="794 779 1141 835">50.0%</td> <td data-bbox="1141 779 1497 835">40.0%</td> </tr> <tr> <td data-bbox="448 835 794 869">Written exam - heating substations</td> <td data-bbox="794 835 1141 869">50.0%</td> <td data-bbox="1141 835 1497 869">30.0%</td> </tr> <tr> <td data-bbox="448 869 794 904">Project</td> <td data-bbox="794 869 1141 904">100.0%</td> <td data-bbox="1141 869 1497 904">30.0%</td> </tr> </tbody> </table>   |   |  | Subject passing criteria | Passing threshold | Percentage of the final grade | Written exam - heat protection of the building + heating installation | 50.0% | 40.0% | Written exam - heating substations | 50.0% | 30.0% | Project | 100.0% | 30.0% |
| Subject passing criteria  | Passing threshold   | Percentage of the final grade   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Written exam - heat protection of the building + heating installation | 50.0%   | 40.0%   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Written exam - heating substations                                    | 50.0%   | 30.0%   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Project   | 100.0%  | 30.0%   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Recommended reading   | Basic literature  | 1) Koczyk H. (red.): Ogrzewnictwo. Podstawy projektowania cieplnego i termomodernizacji budynków. Poznań: Wydawnictwo Politechniki Poznańskiej 2000 2) Krygier K., Klinke T., Sewerynik J.: Ogrzewnictwo, wentylacja i klimatyzacja. Warszawa: Wydawnictwa Szkolne i Pedagogiczne 1997. 3) Pierkowski K., Krawczyk D., Tumul W.: Ogrzewnictwo. T. 1. Białystok: Rozprawy Naukowe nr 63, 1999. |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
|   | Supplementary literature  | 1) Koczyk H. (red.): Ogrzewnictwo praktyczne. Projektowanie, montaż, eksploatacja. Poznań: Systherm Serwis 2005.  |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
|   | eResources addresses  | Adresy na platformie eNauczenie:  |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Example issues/<br>example questions/<br>tasks being completed        |   |   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |
| Work placement  | Not applicable  |   |  |                          |                   |                               |   |       |       |                                    |       |       |         |        |       |