

| Faculty of Civil and Environmental Engineering | | | | | |
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| Study programme: | Environmental Engineering | Degree level: part-time programme Third degree | | | |
| Specialization | Heating and Ventilation Engineering | Diploma path: - | | | |
| Module name: | Acquisition and storage of energy | | | | |
| Module type: | elective | Semester: VI | ECTS 3 | Module ID: Ś16045 | |
| No. of hrs in semester: | L - 10 | C - | LC- | P- 10 | SW- S- |
| Prerequisites: | <i>Complete with prerequisites or "-"</i> | <i>Ś13012, Ś14020, Ś15023, Ś16028</i> | | | |
| Teaching methods: | <i>lecture, project</i> | Assessment: | <i>Evaluation must be relevant to the intended learning outcomes</i> | | |
| | | Written and oral exam; project - completion, presentation and discussion of the project | | | |
| Aims and objectives: | <i>Learning methods of acquisition and accumulation of energy. Education ability to choose alternative technical solutions.</i> | | | | |
| Module content: | <i>Types and sources of energy. Methods of energy obtaining. Passive heat storage systems in buildings: direct absorption of heat from the intermediate heat absorption of the isolated storage of thermal energy. Solar ponds without salinity, the salinity gradient. Characteristics of solar energy storage of short-term storage and long-term storage. The energy storage using phase change phenomena and chemical reactions. Storage by a kinetic energy. The use of electricity for hydrogen production.</i> | | | | |
| Learning outcomes | <i>Write min. 4, max. 8 learning outcomes in the following order: knowledge - skills - competences. Each learning outcome must be verifiable.</i> | | | <i>Relevance to the programme learning outcomes</i> | |
| LO1 | PhD student has a good theoretical knowledge that is made up of a specific, associated with the acquisition and accumulation of energy, which are a source of particular scientific publications, including the latest achievements of science. | | | EK_1 IS3_W02 | |
| LO2 | PhD student is able to efficiently obtain information related to the scientific activities of the various sources, including in foreign languages and make the proper selection and interpretation of this information. | | | EK_2 IS3_U01 | |
| LO3 | PhD student is able to recognize and formulate complex tasks and problems associated with the acquisition and accumulation of energy. | | | EK_3 IS3_U03 | |

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| LO4 | PhD student is able to think and act in an independent and creative initiative manifested in the creation of new ideas and finding innovative solutions; show initiative in identifying new areas of research. | EK_4 IŚ3_K02 |
| basic references: | [1] Chwieduk D. Energetyka Słoneczna Budynku. Arkady, 2011, Warszawa. [2] Domański R. Magazynowanie energii cieplnej. PWN, Warszawa 1990. [3] Pluta Z. Słoneczne instalacje energetyczne. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 2008. [4] Energy Storage - Technologies and Applications [5] Edited by Ahmed Faheem Zobaa, Publisher: InTech 2013, under CC BY 3.0 license (open access book). [6] Edited by Jonathan M. Bowen. Energy Storage: Issues and Applications. Nova Science Publishers, Incorporated, 2011 | |
| learning outcomes | <i>methods of assessing learning outcomes</i> | type of class (if more than one) where the outcomes are assessed |
| LO1 | Discussion of the solutions adopted to design classes, exam. | L, P |
| LO2 | Presentation of the subsequent stages of the project with the use of multimedia presentation and collected documents, exam. | L, P |
| LO3 | Execution of design work, exam. | L, P |
| LO4 | Defense prepared project, exam. | L, P |
| Department: | of Heat Engineering | Group instructors: prof. nzw. dr hab. inż. Mirosław Żukowski |
| Date: | 1.03.2013 | Coordinator: prof. nzw. dr hab. inż. Mirosław Żukowski |