

| STUDY MODULE DESCRIPTION FORM | | |
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| Name of the module/subject Connected production of thermal and electrical energy | | Code 1010311451010316012 |
| Field of study Power Engineering | Profile of study (general academic, practical) (brak) | Year /Semester 3 / 5 |
| Elective path/specialty - | Subject offered in: Polish | Course (compulsory, elective) obligatory |
| Cycle of study: First-cycle studies | Form of study (full-time, part-time) full-time | |
| No. of hours Lecture: 30 Classes: 30 Laboratory: - Project/seminars: - | | No. of credits 5 |
| Status of the course in the study program (Basic, major, other) (brak) | | (university-wide, from another field) (brak) |
| Education areas and fields of science and art technical sciences Technical sciences | | ECTS distribution (number and %) 5 100% 5 100% |
| Responsible for subject / lecturer: Krzysztof Sroka email: krzysztof.sroka@put.poznan.pl tel. 61 665 22 75 Elektryczny ul. Piotrowo 3A, 60-965 Poznań | | |
| Prerequisites in terms of knowledge, skills and social competencies: | | |
| 1 | Knowledge | Basic knowledge of thermodynamics, fluid mechanics, energy technology and equipment, fuels and their utilization |
| 2 | Skills | Solving tasks of the balance of mass and energy in simple circuits of thermal power plants |
| 3 | Social competencies | Is aware of the need to broaden their competence, willingness to work together as a team |
| Assumptions and objectives of the course: Acquire skills to carry out energy and economic analysis of complex combined heat and power (CHP) technological systems with the use of different types of primary energy. | | |
| Study outcomes and reference to the educational results for a field of study | | |
| Knowledge: | | |
| 1. He has structured and theoretically founded knowledge in the basics of combined heat and power - [K_W13+++] 2. He knows and understands the phenomena, processes, and technological systems that are capable of converting energy from renewable sources to electricity and heat - [K_W09+++] | | |
| Skills: | | |
| 1. Able to recognize and explain patterns for various cogeneration technologies - [K_U22+++] 2. Able to evaluate CHP technologies in terms of their efficiency and environmental impact - [K_U07++K_U16++] 3. Able to identify and justify prospective cogeneration technologies - [K_U01+] | | |
| Social competencies: | | |
| 1. Is aware of the social effects of the rational use of energy resources to satisfy the energy needs of the country - [K_K02++] | | |
| Assessment methods of study outcomes | | |

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| <p>Lectures:</p> <ul style="list-style-type: none"> - evaluation of the knowledge and skills listed on the written exam, - continuous evaluation for each class skills and expertise by conducting discussions on current issues related to the development of cogeneration. <p>Classes:</p> <ul style="list-style-type: none"> - credit on the basis of the current check messages and two written tests of the accounting tasks | | |
| Course description | | |
| <p>Heating systems and CHP-plant parameters. Backpressure and heat extraction-backpressure turbine sets. Gas power plants and gas-steam power plants. Distributed cogeneration using low-power gas turbines and internal combustion piston engines. Innovative technologies - fuel cells, Stirling engines, ORC systems. Technical and economic grounds selection of technological solution of CHP-plant. Energy analysis of CHP plant operation and costs of combined heat and power. Evaluation of cost-CHP. Certificates of origin as instruments of promotion of cogeneration. Methodology for determining the electricity generated in cogeneration. Content of accounting practice is closely related to the lectures.</p> | | |
| Basic bibliography: | | |
| <ol style="list-style-type: none"> 1. J. Szargut, A. Ziębik - Skojarzone wytwarzanie ciepła i elektryczności ? elektrociepłownie, Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2007 2. J. Skorek, J. Kalina: Gazowe układy kogeneracyjne, WNT, Warszawa 2005 3. J. Marecki ? Gospodarka skojarzona ciepłno-elektryczna, WNT, W-wa 1991 | | |
| Additional bibliography: | | |
| <ol style="list-style-type: none"> 1. R. Bartnik: Elektrownie i elektrociepłownie gazowo-parowe, WNT 2017 2. K. Buczek - Skojarzone wytwarzanie ciepła i energii elektrycznej w małych elektrociepłowniach, Wydawnictwo i Handel Książkami; Krosno.2001 3. B. Kolanowski : Small Scale Cogeneration Handbook, Fairmont Press, 2011 4. M. Pawlik, F. Strzelczyk ? Elektrownie, WNT W-wa 2012, 2017 5. R. Turschmid ? Kotłownie i elektrociepłownie przemysłowe, Arkady, W-wa 1988 | | |
| Result of average student's workload | | |
| Activity | Time (working hours) | |
| 1. participation in the lectures | 30 | |
| 2. participation in the auditorium exercises | 30 | |
| 3. preparation to the auditorium exercises | 30 | |
| 4. participation in the consulting on the auditorium exercises and lectures | 5 | |
| 5. preparation to the exam | 24 | |
| 6. participation in the exam | 3 | |
| Student's workload | | |
| Source of workload | hours | ECTS |
| Total workload | 122 | 5 |
| Contact hours | 68 | 3 |
| Practical activities | 0 | 0 |