

| STUDY MODULE DESCRIPTION FORM | | |
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| Name of the module/subject Connected production of thermal and electrical energy | | Code 1010314471010316012 |
| Field of study Power Engineering | Profile of study (general academic, practical) (brak) | Year /Semester 4 / 7 |
| Elective path/specialty - | Subject offered in: Polish | Course (compulsory, elective) obligatory |
| Cycle of study: First-cycle studies | Form of study (full-time,part-time) part-time | |
| No. of hours Lecture: 15 Classes: 15 Laboratory: - Project/seminars: - | | No. of credits 3 |
| 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 %) 3 100% 3 100% |
| 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: | | |
| <p>1. J.Szargut, A.Ziębik - Skojarzone wytwarzanie ciepła i elektryczności ? elektrociepłownie, Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2007</p> <p>2. J. Marecki ? Gospodarka skojarzona ciepłno-elektryczna, WNT, W-wa 1991</p> | | |
| Additional bibliography: | | |
| <p>1. K.Buczek - Skojarzone wytwarzanie ciepła i energii elektrycznej w małych elektrociepłowniach, Wydawnictwo i Handel Książkami &#38;#38;#34;KaBe&#38;#38;#34; Krosno.2001</p> <p>2. R. Turschmid ? Kotłownie i elektrociepłownie przemysłowe, Arkady, W-wa 1988</p> <p>3. D.Laudyn, M.Pawlik, F.Strzelczyk ? Elektrownie, WNT W-wa 2000</p> | | |
| Result of average student's workload | | |
| Activity | Time (working hours) | |
| 1. participation in the lectures | 18 | |
| 2. participation in the auditorium exercises | 18 | |
| 3. preparation to the auditorium exercises | 27 | |
| 4. participation in the consulting on the auditorium exercises and lectures | 10 | |
| 5. preparation to the exam | 30 | |
| 6. participation in the exam | 5 | |
| Student's workload | | |
| Source of workload | hours | ECTS |
| Total workload | 108 | 3 |
| Contact hours | 51 | 1 |
| Practical activities | 0 | 0 |