

## Subject card

K7_K01  student can critically evaluate the received content and use the acquired view to solve cognitive and practical problems  K7_K03  understands the non-technical aspects of the operation of a chemical engineer master's  [SK5] Assessment of a solve problems that are practice	to scientific		
Studies   Studies   Subject group   Subject   Subjec	to scientific 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  General academic profile  Assessment form  Conducting unit  Name and surname of lecturer (lecturers)  Lesson types and methods of instruction  Feleraming hours included: 0.0  Learning activity  and number of study hours  Learning activity  Subject objectives  Introducing students to the renewable energy sources.  Learning outcomes  K7_K01  Subject outcome  K7_K03  Subject objectives  Mode of delivery  At the university  Polish  Fexam  Subject of chemistry  Subject Onemistry  Assessment form  Example Carry  Assessment form  Assessment form  Fexample  Assessment form  Assessment form  Consultation hours  Self-study  Consultation hours  Subject outcome  Method of verification and use the acquired view to solve cognitive and practical problems  K7_K01  Subject outcome  Method of verification for a chemical engineer master's  Subject outcome  Method of verification for a chemical engineer master's  Solve problems that an practical problems  K7_K03  Subject outcome  Method of verification for a chemical engineer master's solve problems that an practical problems  Method of verification for a chemical engineer master's solve problems that an practical problems  Method of verification for a chemical engineer master's solve problems that an practical problems  Method of verification for a chemical engineer master's solve problems that an practical problems  Subject outcome  Method of verification for a chemical engineer master's solve problems that an practical problems	to scientific of study		
Year of study  Year of study  Learning profile  Department of Energy Conversion and Storage -> Faculty of Chemistry  Name and surname of lecturer (lecturers)  Lesson types and methods of instruction  Number of study hours  Learning activity and number of study hours  Learning outcomes  Course outcome  Conducting unit  Department of Energy Conversion and Storage -> Faculty of Chemistry  Subject supervisor  Teachers  Lesson types and methods of instruction  Learning hours included: 0.0  Learning activity and number of study hours  Course outcome  Course outcome  Course outcome  Subject outcome  Subject outcome  Method of verification of the received content and use the acquired view to solve cognitive and practical problems  K7_K03  Learning stivity and practical problems  K7_K03  Learning outcomes  Method of verification of the received content and use the acquired view to solve cognitive and practical problems  Learning outcome (SK5) Assessment of a solve problems that an practice of the operation of a chemical engineer master's			
Semester of study   2   ECTS credits   3.0			
Learning profile general academic profile Assessment form exam  Conducting unit Department of Energy Conversion and Storage -> Faculty of Chemistry  Name and surname of lecturer (lecturers)  Lesson types and methods of instruction  Learning activity and number of study hours  Learning activity and number of study hours  Learning activity and number of study hours  Course outcome  Course outcome  K7_K01  Earning active to the renewable energy sources.  K7_K03  Learning active to the renewable subject outcome approaches the acquired view to solve cognitive and practical problems  K7_K03  Learning outcome approaches the non-technical aspects of the operation of a chemical engineer master's practice			
Conducting unit  Name and surname of lecturer (lecturers)  Lesson types and methods of instruction  Learning activity and number of study hours  Learning outcomes  Course outcome  Course outcome  Earning outcomes  Course outcome  K7_K03  Department of Energy Conversion and Storage -> Faculty of Chemistry  dr inż. Anna Dettlaff  Teachers  Laboratory Project Seminar  Tutorial Laboratory Project Seminar  Number of study 30.0 0.0 0.0 0.0 0.0 0.0 0.0  Learning activity Participation in didactic classes included in study plan  Number of study hours  Course outcome  Subject outcome  Method of verification of a chemical engineer master's  K7_K03  Learning outcomes  Method of verification of a chemical engineer master's practice			
Name and surname of lecturer (lecturers)  Lesson types and methods of instruction  Lesson type   Lecture   Tutorial   Laboratory   Project   Seminar   Number of study   Number of study   Number of study   Number of study   Project   Seminar   Number of study   Number of study   Project   Seminar   Number of study   Number of study   Project   Seminar   Number of study   Number of study   Participation in didactic   Classes included in study   Participation in   Consultation hours   Number of study   Number of stud			
Teachers   Teachers   Teachers   Lesson types and methods of instruction   Lesson type   Lecture   Tutorial   Laboratory   Project   Seminar			
of instruction  Number of study hours  E-learning hours included: 0.0  Learning activity and number of study hours  Number of study hours  Learning activity  I classes included in study plan  Number of study hours  Number of study hours  Number of study plan  Number of study hours  Number of study hours  Introducing students to the renewable energy sources.  Learning outcomes  Course outcome  Subject outcome  K7_K01  Student can critically evaluate the received content and use the acquired view to solve cognitive and practical problems  K7_K03  Understands the non-technical aspects of the operation of a chemical engineer master's  SUBJECT ONLY  Self-study  Self-study  Self-study  Self-study  Self-study  Self-study  Self-study  Self-study  Self-study  Subject outcome  Method of verifically evaluate the received content and use the acquired view to solve cognitive and practice  Self-study  Self-			
Learning activity and number of study hours   Learning activity   Participation in didactic classes included in study plan	30		
Learning activity and number of study hours    Dearning activity   Participation in didactic classes included in study plan			
and number of study hours    Number of study hours   N			
Subject objectives   Introducing students to the renewable energy sources.	SUM		
Course outcome   Subject outcome   Method of verification	75		
K7_K01  student can critically evaluate the received content and use the acquired view to solve cognitive and practical problems  K7_K03  understands the non-technical aspects of the operation of a chemical engineer master's  [SK5] Assessment of a solve problems that are practice	Introducing students to the renewable energy sources.		
received content and use the acquired view to solve cognitive and practical problems  K7_K03  understands the non-technical aspects of the operation of a chemical engineer master's  solve problems that are practice  [SK5] Assessment of a solve problems that are practice	Course outcome Subject outcome Method of verification		
aspects of the operation of a solve problems that ar chemical engineer master's practice	[SK5] Assessment of ability to solve problems that arise in practice		
degree, including the impact on the environment, is aware of the responsibility for the decisions made			
K7_W07 the student has knowledge of biotechnological processes such as biogas production [SW1] Assessment of knowledge	factual		
water level differences, energy of waves, energy of tides, energy of currents); solar energy (low- and high-temperature solar energy systems, active and passive systems, decentralized systems systems, solar collectors, photovoltaic cells); wind energy (lifting force, wind farm capacity, onsh offshore wind farms); geothermal energy (geothermal energy resources, heat pumps); solid, liqu gaseous biofuels (energy wood, straw, biodiesel, bioethanol, biomethanol, biohydrogen, biogas, energy storage (technologies of mechanical, electrochemical, electric, chemical and thermal ene- hydrogen energy, galvanic cells, fuel cells, electrochemical capacitors); conventional energy soc coal, lignite, crude oil, natural gas); nuclear energy (principle of operation, construction of the co	Resources and characteristics of renewable energy sources; hydropower (energy of water flow, energy of water level differences, energy of waves, energy of tides, energy of currents); solar energy (low-temperature and high-temperature solar energy systems, active and passive systems, decentralized systems, centralized systems, solar collectors, photovoltaic cells); wind energy (lifting force, wind farm capacity, onshore and offshore wind farms); geothermal energy (geothermal energy resources, heat pumps); solid, liquid and gaseous biofuels (energy wood, straw, biodiesel, bioethanol, biomethanol, biohydrogen, biogas, wood gas); energy storage (technologies of mechanical, electrochemical, electric, chemical and thermal energy storage, hydrogen energy, galvanic cells, fuel cells, electrochemical capacitors); conventional energy sources (hard coal, lignite, crude oil, natural gas); nuclear energy (principle of operation, construction of the core of a nuclear power plant, types of nuclear reactors, nuclear energy in Poland); environmental contamination		
Prerequisites and co-requisites	re of a		
Assessment methods Subject passing criteria Passing threshold Percentage of the f	re of a		
and criteria Test 60.0% 100.0%	re of a nination		

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Recommended reading	Basic literature	Bogdanienko J.: Odnawialne Źródła Energii. Biblioteka Problemów, t. 290. Warszawa, PWN 1989. Brinkworth B.J.: Energia Słoneczna w Służbie Człowieka. Biblioteka Problemów, t. 254. Warszawa, PWN 1979. 2. Cieśliński J., Mikielewicz J.: Niekonwencjonalne źródła energii. Gdańsk, Wydawnictwo Politechniki Gdańskiej 1996. 3. Mikielewicz J., Cieśliński J.T.: Niekonwencjonalne urządzenia i systemy konwersji energii. Seria Maszyny Przepływowe, t. 24. Wrocław, Ossolineum 1999. 4. Lewandowski W.M., Klugmann-Radziemska E., Proekologiczne odnawialne źródła energii - kompendium, PWN Warszawa 2017. 5. Klugmann E., Klugmann-Radziemska E.: Alternatywne źródła energii. Energetyka fotowoltaiczna. Białystok, Wydawnictwo Ekonomia i Środowisko 1999. 6. Klugmann-Radziemska E., Klugmann E.: Systemy słonecznego ogrzewania i zasilania elektrycznego budynków. Wyd. Ekonomia i Środowisko, Białystok 2002. 7. Planning and Installing Solar Thermal Systems, a guide for installers, architects and engineers, The German Solar Energy Society (DGS LV Berlin BRB), Ecofys 2005	
	Supplementary literature	No recommendations	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	What are the differences between a solar collector and a photovoltaic cell?  Describe how the heat pump works.  How does a nuclear power plant work?		
Work placement	Not applicable		

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