

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Hybrid vehicles		Code 1010322331010322246
Field of study Electrical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 3
Elective path/specialty Electrical and Computer Systems in	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: - Classes: - Laboratory: - Project/seminars: 15		No. of credits 1
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 %) 1 100% 1 100%
Responsible for subject / lecturer: Dr hab. inż. Grażyna Jastrzębska, prof. nadzw. email: grazyna.jastrzebska@put.poznan.pl tel. 616652382 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of all major subjects of in semesters 1-2, second degree.
2	Skills	Ability to understand and interpret the information conveyed and continuous self-education in a field related to the chosen course of study.
3	Social competencies	Is aware of the need to further enhance their competence, willingness to work individually and in a team. Is aware of the need to expand own competences. Willingness to work in a team.
Assumptions and objectives of the course: 1. Acquisition of knowledge concerning selected drive systems in electric and hybrid vehicles. 2. Presentation of the new development trends in this area.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. has an ordered and theoretically founded knowledge, concerning the design of electrical equipment and systems, taking into account their impact on the environment - [K_W05++] 2. has the knowledge concerning equations of simple drive systems, application of the principles of identification, using the software to analyze the results of computer simulations, can design a simple drive system - [K_W10++]		
Skills: 1. has ability to develop detailed documentation of the results of an experiment or research project, including preparation of specification of the results - [K_U03++] 2. can use the learned methods and mathematical models - modifying them if necessary - to the analysis and design of components, devices and electrical systems - [K_U06++]		
Social competencies: 1. is able to think in a creative and enterprising way - [K_K01++]		
Assessment methods of study outcomes		

Project: - evaluation of the skills to solve project tasks, - check of skills in every class, - discussion and evaluation of the project.		
Course description		
Electric vehicles: history, drive systems, motors, kinetic and hydraulic accumulator, battery, fuel cells, solar cells, charging and recharging methods. Prototypes, producers. Hybrid system with synergy, power splitting device, operating conditions.. Parameters, maximal range. Hybrid vehicle Toyota Prius, hybrid bus Solaris Urbino, Experimental journey. Influence on the environment.		
Basic bibliography:		
1. Miller J. M.: "Propulsion systems for hybrid vehicles"; The IEE, London 2004. 2. Westbrook M.: "The electric car. Development and future of battery, hybrid and fuel-cell cars"; The IEE, London 2001. 3. Jastrzębska G.: "Odnawialne źródła energii i pojazdy proekologiczne"; WNT, Warszawa 2009.		
Additional bibliography:		
1. Larminie J., Lowry J.: "Electric vehicle technology. Explained"; Wiley, West Sussex 2003. 2. Carroll D. R.: "The winning solar car"; SAE International, Warrendale 2003. 3. Wakefield E. H.: "History of the electric automobile. Hybrid electric vehicles"; SAE, Warrendale 1998.		
Result of average student's workload		
Activity	Time (working hours)	
1. participation in project classes	15	
2. participation in consulting	4	
3. preparation of the project	20	
Student's workload		
Source of workload	hours	ECTS
Total workload	39	1
Contact hours	19	1
Practical activities	39	1