Name drie moduliculgiest Diplom project Field of study Field of st			STUDY MODULE D	ESCRIPTION FORM		
Electrical Engineering (general academic, practical) (brack) 2 / 4 Electrical Engineering Subject of tread in: Polish Course (computery, electrical) obligatory Cycle of study: Form of study (full-stare) in: Polish Course (computery, electrical) obligatory No. of hours Electrical Systems in Mechatronics Project/seminars: 9 1 Status of the course in the study program (Basic, major, other) (brack) (university-wide, from another field) Course (computery, electrical status of the course in the study program (Basic, major, other) Education areas and fields of sciences and at technical sciences 1 100% Technical sciences 1 100% Technical sciences 1 100% Responsible for subject / lecturer: dr in2, Marius Ebarnski@ gent_poznan.pl tel. 6852365 1 100% Prerequisites in terms of knowledge, skills and social competencies. Fundamentals of construction and design of electrical machines, Knowledges of construction and asging of electrical machines. Knowledges from the construction and asging of electrical machines. Knowledges of construction and asging of electrical machines. Scial Competencies 1 Knowledge of advanced numerical methods. Knowledges of construction and operation of electrical systems and mechatronics. 2 <td< td=""><td></td><td></td><td></td><td></td><td></td></td<>						
Elective pathspecially Course (computing), elective) Description Course (computing), elective) Option Status Point Course (computing), elective) No. of hours Description Project/seminars: 9 1 Status of the course in the study program (Basic, major, other) (university-wide, from another field) No. of credits Education areas and fields of science and att (brak) (brak) ECT3 electivation (number and %) Education areas and fields of science and att (drin2. Rafal M. Wojciechowski enalty) I 100% Responsible for subject / lecturer: Responsible for subject / lecturer: drin2. Rafal M. Wojciechowski enalty is and %) I 100% Faceulty of Electrical Engineering Electrical main field wojciechowski enalty is and sciences I 100% I. Knowledge Knowledge, skills and social competencies: Findamentals of construction and design of electrical machines. 1 Knowledges of computer science and numerical methods. Knowledges of computer science and numerical methods. 2 Skills Social computer science and numerical methods. Knowledges of construction and operation of electrical machines. 3	Field of study			(general academic, practical)		
Electrical Systems in Mechatronics Polish obligatory Cycle of study: Form of study (full-fune,part-time) Form of study (full-fune,part-time) Second-cycle studies part-time No. of credits Dot, of hours Lecture: Classes: Laboratory: Project/seminars: 9 1 Status of the course in the study program (Basic, major, other) (brak) (university-wide, from another feld) (brak) Education areas and fields of subience and at technical sciences (brak) (brak) 1 100% Technical sciences 1 100% 1 100% 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: drin2. Relafi M. Wojeiechowski eput.poznan.pl tel. 655236 Technical sciences drin2. Relafi M. Wojeiechowski Placity of Electrical Engineering u. Protrowo 3A 60-965 Poznan Piostrowo 3A str, 60-965 Poznan Piostrowo 3A str, 60-965 Poznan Prerequisites in terms of knowledge, skills and social competencies: Knowledges of electrical engineering, electrical machines. Knowledges of construction and design of electrical machines. Knowledges from the construction and operating system support. Fundamentals of construction and operating system support. Fundamentals of construction and operating system support.			g	/ /		
Cycle of study: Form of study (full-time.part-time) Second-cycle studies part-time No. of nours Lecture: Classes: Laboratory: Project/seminars: 9 1 Status of the course in the study program (Basic, major, other) (brak) (university-wide, from another field) No. of credits Education areas and fields of sciences (brak) (brak) ECTS distribution (number and %) Education areas and fields of sciences 1 100% 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: dr in Z. Rafat M. Wojciechowski @put poznan.pl tel. 6562383 1 100% Faculty of Electrical Engineering Leit. Ordix Wow 3A 60-965 Poznan Prostrow 3A str, 60-965 Poznan Protecture on power controls, power controls	Elective		ystems in Mechatronics			
No. of hours No. of credits Lecture: Classes: - Laboratory: Project/seminars: 9 1 Status of the course in the study program (Basic, major, other) (university-wide, from another field) (Drak) Education areas and fields of science and art ECT sciences 1 100% technical sciences 1 100% 1 100% responsible for subject / lecturer: Responsible for subject / lecturer: drin2. Rafe M. Wojciechowski and %) 1 100% responsible for subject / lecturer: drin2. Rafe M. Wojciechowski email: rafal.weijciechowski mole: det for subject / lecturer: drin2. Rafe M. Wojciechowski for det for subject / lecturer: for det for subject / lecturer: drin2. Rafe M. Wojciechowski for det for subject / sectore for det for subject / lecturer: for det for subject / sectore for det for subject / sectore </td <td>Cycle of</td> <td></td> <td><u> </u></td> <td>Form of study (full-time,part-time)</td> <td></td>	Cycle of		<u> </u>	Form of study (full-time,part-time)		
Lecture: Classes: Laboratory: Project/seminars: 9 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 ant technical sciences (brak) (brak) ECTS distribution (number and %) Technical sciences 1 100% 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: 1 1 100% I. Plotation do design of electrical angineering Leit of 55236 Electrical 1 1 100% Secting Nowled		Second-c	ycle studies	part-time		
Calculation: Calculation: Laboratory: Integleurseminats: Total Total State of the course in the study program (Basic, major, other) (university-wide, from another field) ECTS distibution (number and %i) Education areas and fields of sciences (brak) (brak) ECTS distibution (number and %i) technical sciences 1 100% 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: dr in2. Rafal M. Wojciechowski @put.poznan.pl tel. 665236 tel. 665236 tel. 655236 Faculty of Electrical Engineering Electrical ul. Potrowo 3A 60-865 Poznan Piostrowo 3A str, 60-965 Poznan Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical anghines. Knowledges of computer science and numerical methods. 2 Skills Student is aware of the need to broaden their competence, willingness to work together as a desumerent methods used in mechatronics. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a desumerent methods used in mechatronics.	No. of h	ours			No. of credits	
(brak) (brak) Education areas and fields of science and art Education areas and fields of science and art Education areas and fields of science and art technical sciences I 100% I 100% Responsible for subject / lecturer: Responsible for subject / lecturer: dr in2. Rafal M. Wojciechowski dr in2. Mariusz Barański dr in2. Rafal M. Wojciechowski email: rafal wojciechowski@put.poznan.pl teol. 6652036 teol. 0 6652036 Electrical Paculty of Electrical Engineering Electrical electrical ul. Piotrowo 3A 60-965 Poznan Piostrowo 3A str, 60-965 Poznan Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Knowledges of electrical engineering, electrical machines. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Student is aware of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromechanical devices. The acquisition of skills in computing package selected. Student us an extended knowledge of advanced numerical methods used to solve complex technical aproblems in electrical engineering - IK_W02 + I 1. Student has an extended knowledge of advanced numeri	Lectur	e: - Classes	s: - Laboratory: -	Project/seminars:	9 1	
Education areas and fields of science and art ECTS distribution (number and %). technical sciences 1 100%. Technical sciences 1 100%. Responsible for subject / lecturer: Responsible for subject / lecturer: dr in2. Mariusz Barański dr in2. Rafal M. Wojciechowski email: mariusz barański email: rafal Wojciechowski email: rafal M. Wojciechowski email: rafal M. Wojciechowski ul. Piotrowa 36 60-986 Poznań Piostrowa 3A str, 60-966 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 1 Mowledge of construction and design of electrical machinery, electrical metrology, electrical circui theory, power controls, power electronics, and operating system support. Fundamentals of construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Student is aware of the need to breaden their competence, willingness to work together as a team 3 Social competencies Student is aware of the need to solve complex construction and electronal results for a field of study 1.Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2.Student has knowledge of the development trends and the most important new developments in the field of electrical engineering	Status o				· · · ·	
technical sciences 1 100% Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: dr in2. Mariusz Barański dr in2. Rafal M. Wojciechowski email: mariusz baranski@put.poznan.pl email: rafal.wojciechowski@put.poznan.pl tel. 6652036 tel. 61 655 2396 Paculty of Electrical Engineering Electrical ul. Piotrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 1 Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, nower electronics, and operating system support. Fundamentals of construction and wisin of subjects of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Fundamentals of construction and ysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Asymptions and objectives of the course: Astulty of design, testing and analysis of mechatronics and actuators electromagnetic and electrical				(/	
Technical sciences 1 100% Responsible for subject / lecturer: Responsible for subject / lecturer: dr in2: Mariusz Barański dr in2: Rafał M. Wojciechowski @put.poznan.pl email: mariusz.baranski@put.poznan.pl email: rafal.wojciechowski@put.poznan.pl tel. 6655236 tel. 61 655 2396 Faculty of Electrical Engineering Electrical ul. Piotrowo 3A 60-965 Poznan Piostrowo 3A str, 60-965 Poznan Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 1 Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges form the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills 3 Social competencies Competencies Student is aware of the need to broaden their competence, willingness to work together as a team Acquining modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Student mas an extended knowledge of advanced numerical methods used to solve complex technical problems in electrica	Education	on areas and fields of sci	ence and art			
Responsible for subject / lecturer: Responsible for subject / lecturer: dr inż. Mariusz Barański email: mariusz.barański@put.poznan.pl tel. 6652636 dr inż. Rafał M. Wojciechowski email: rafal.wojciechowski@put.poznan.pl tel. 6655236 Faculty of Electrical Engineering Electrical gr. Jotrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: Imachinery, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Student is aware of the need to broaden their competence, willingness to work together as a team 3 Social competencies Student is aware of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge about the formulation of equations describing of simple propulsion systems application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing ingineering - (K_W02 ++)] 3. Student has knowledge of the development trends	techr	ical sciences			1 100%	
drinž. Mariusz Barański drinž. Rafał M. Wojciechowski emai: mariusz.baranski@put.poznan.pl tel. 6652636 Faculty of Electrical Engineering tel. 61655 2396 ul. Piotrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 1 Knowledge of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges for omputer science and numerical methods. Knowledges for the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatoronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Astuent has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering and - to a lesse extent - in electornics, intomation technology and powere e		Technical scie	ences		1 100%	
drinž. Mariusz Barański drinž. Rafał M. Wojciechowski emai: mariusz.baranski@put.poznan.pl tel. 6652636 Faculty of Electrical Engineering tel. 61655 2396 ul. Piotrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 1 Knowledge of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges for omputer science and numerical methods. Knowledges for the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatoronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Astuent has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering and - to a lesse extent - in electornics, intomation technology and powere e						
email: mariusz.baranski@put.poznan.pl email: rafal.wojciećhowski@put.poznan.pl tel. 6625636 tel. 61655 2396 Faculty of Electrical Engineering Electrical ul. Piotrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges form the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electrical engineering - (K_W02 + H) 1 Study outcomes and reference to the educational results for a field of study Knowledge Study outcomes and reference to the course: Acquisition of skills in computing package selected. Study out	Resp	onsible for subje	ect / lecturer:	Responsible for subjec	t / lecturer:	
tel. 6625636 tel. 61 655 2396 Faculty of Electrical Engineering Electrical Piostrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Rowledge Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of computer science and numerical methods. Knowledges from the construction and design of electrical systems of electronechanical transducers and measurement methods used in mechatronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge of the dovelopment trends and the most important new developments in the field of electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] <td></td> <td></td> <td></td> <td colspan="2"></td>						
Faculty of Electrical Engineering Electrical Piostrowo 3A 60-965 Poznań Piostrowo 3A str, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 2 Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical transducers and measurement methods used in mechatronics. 3 Social competencies: 3 Social competencies: 4 Fundamentals of construction and design of electrical systems and mechatronics with the use of tools. 3 Social competencies: 2 Skills 3 Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electrocechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study I. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+]			put.poznan.pl			
Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges of computer science and numerical methods. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team. Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge ob the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skudent has knowledge about the formulation of equations describing of simple propulsion systems, application of the			eering			
Knowledge Knowledges of electrical engineering, electrical machinery, electrical metrology, electrical circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges of computer science and numerical methods. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems	ul. F	Piotrowo 3A 60-965 Po	oznań	Piostrowo 3A str, 60-965 Pc	znan	
1 Knowledge circuit theory, power controls, power electronics, and operating system support. Fundamentals of construction and design of electrical machines. Knowledges of computer science and numerical methods. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. 2 Skills Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 1. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skulls: 1. 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and criti	Prere	quisites in term	s of knowledge, skills and	d social competencies:		
Fundamentals of construction and design of electrical machines. Knowledges of computer science and numerical methods. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. Skills Fundamentals of construction and operation of electrical machines. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Studen thas an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W04 ++] 3. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U22 ++]	1	Knowledge				
Knowledges of computer science and numerical methods. Knowledges from the construction, analysis and synthesis of electromechanical transducers and measurement methods used in mechatronics. Participation Fundamentals of construction and operation of electrical systems and mechatronics with the use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Studen thas an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able		j-				
and measurement methods used in mechatronics. 2 Skills 3 Social competencies Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++]				0		
2 Skills use of tools. 3 Social competencies Student is aware of the need to broaden their competence, willingness to work together as a team Assumptions and objectives of the course: Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] <			8		ctromechanical transducers	
3 team Assumptions and objectives of the course: Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a	2	Skills		nd operation of electrical system	s and mechatronics with the	
Acquiring modern methods of design, testing and analysis of mechatronics and actuators electromagnetic and electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge: Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++]	3			broaden their competence, willir	gness to work together as a	
electromechanical devices. The acquisition of skills in computing package selected. Study outcomes and reference to the educational results for a field of study Knowledge: Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++]	Assu	mptions and obj	ectives of the course:			
 Knowledge: 1. Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a 					romagnetic and	
 Student has an extended knowledge of advanced numerical methods used to solve complex technical problems in electrical engineering - [K_W02 ++] Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] Student is able prepare and give a presentation on the implementation of the project or research task, and lead a 		Study outco	mes and reference to the	educational results for	a field of study	
 electrical engineering - [K_W02 ++] 2. Student has knowledge of the development trends and the most important new developments in the field of electrical engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a 		-				
 engineering and - to a lesser extent - in electronics, information technology and power energy - [K_W04 ++] 3. Student has knowledge about the formulation of equations describing of simple propulsion systems, application of the principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a 	electric	al engineering - [K_V	V02 ++]			
principles of identification, using the software to analyze the results of computer simulations, and has expertise in designing simple drive systems - [K_W10+] Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a						
Skills: 1. Student can obtain information from literature, databases and other sources, it can integrate the information, make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a	princip	es of identification, us	ing the software to analyze the re-	lescribing of simple propulsion s sults of computer simulations, a	ystems, application of the nd has expertise in designing	
 interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions - [K_U01 +++] 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a 						
 2. Student is able to work independently and in a team, it is able to assess the time-consuming task, it can lead a small team to ensure execution of tasks in a given period - [K_U02 ++] 3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a 	1. Stuc	lent can obtain informa				
3. Student is able prepare and give a presentation on the implementation of the project or research task, and lead a	2. Stuc	lent is able to work inc	lependently and in a team, it is ab			
	3. Stuc	lent is able prepare ar	nd give a presentation on the imple	ementation of the project or rese	arch task, and lead a	

Social competencies:

1. Student is able think and act in a creative and enterprising - [K_K01++]

2. Student understands the need for the formulation and communication of information and opinions on the developments in the field of electrical engineering and other aspects of the electrical engineer, shall endeavor to provide such information in a manner commonly opinions clear - [K_K02+]

Assessment methods of study outcomes

Project lectures

-Evaluation based on the current progress of the projects and thesis.

Get extra points for the activity in the classroom, and in particular for:

- propose to discuss further aspects of the subject;

- the effectiveness of the application of the knowledge gained during solving the given problem.

Course description

Simulation of operation of electrical machines and DC permanent magnet machines in Matlab. Using Maxwell to analyze of magnetic field in the selected systems with magnetic field. Using LabVIEW to create virtual instruments supporting electromagnetic and thermal measurements of electromechanical transducers. Measuring systems for the study of phenomena in transformers. Legislation allowing for the operation of power systems (Polish Standard, EU directives). Methods for measuring force, mechanical stress, torque, moment of inertia, speed and slip in electrical machines.

Update 2017: The project is closely linked to the topic of the thesis, which in turn affects the resolution of new problems every year.

Applied methods of education: project - analysis / discussion of various methods (including nonconventional) problem solving, multimedia demonstration, teamwork.

Basic bibliography:

1. Control of Electrical Drives, Leonhard W., Springer-Verlag, Berlin-Heidelberg-NewYork-Tokyo, 1985

2. AUTOCAD helpdesk

3. Handbook of small electric motors, Yeadon W.H., Yeadon A.W., Mc Graw Hill, 2001

4. LabVIEW Graphical Programming, Jennings Richard, Johnson Gary W., McGraw-Hill Professional Publishing, 2006

- 5. Analysis of Electric Machinery, P. Krauze, McGraw Hill Book Company, New York , 1986
- 6. Numerical Analysis, R. Burden, J.D. Faires, PWS Publishers, Prindle, Weber&Schmidt, 1985
- 7. Metody Numeryczne w Turbo Pascalu, B. Baron, Wyd. Helion, Gliwice, 1995
- 8. Układy napędowe z silnikami synchronicznymi , Kaczmarek T., Zawirski K., Wyd. PP, Poznań, 2000
- 9. Environment LabVIEW w eksperymencie wspomaganym komputerowo, Tłaczała W., WNT, Warszawa, 2002

10. LabVIEW w praktyce, Chruściel M., Wydawnictwo BTC, Legionowo, 2008

11. http://www.ansys.com/products/academic

12. AC micro-machinery, Simst J., Clarendon Press, New York, 1994

13. https://www.infolytica.com/en?category=Motors%20Generators%20Brushless&page=1

14. Silniki krokowe, Wróbel T., WNT, Warszawa, 1993

15. https://www.comsol.com/videos?&sortOrder=&s

Additional bibliography:

1. Barański. M., FE analysis of current displacement phenomena in a squirrel cage motor working at cryogenic temperature, Archives of Electrical Engineering, Volume 63, Issue 2 ,pp.139-147, 2014

2. Barański M., Idziak P., Łyskawiński W., Analiza powównawcza stanów pracy silników indukcyjnego i synchronicznego z magnesami trwałymi i klatka rozruchowa, Poznan University of Technology Academic Journals, Electrical Engineering, Issue 77, pp. 155-163, 2014

3. Barański M.,, Jędryczka C., Knypiński Ł., Stachowiak D., Szeląg W., Analiza wpływu niesymetrii obwodu magnetycznego wirnika na parametry rozruchowe 6-biegunowego silnika magnetoelektrycznego synchronicznego, Zeszyty Problemowe - Maszyny Elektryczne, BOBRME - KOMEL, Nr 4/2015 (108), s. 43-48, 2015

4. Barański M., Field-circuit analysis of LSPMS motor supplied with distorted voltage, Computer Applications in Electrical Engineering, Poznań 2017, Vol. 91, pp. 287-297.

5. Wojciechowski R. M., Jędryczka C., Łukaszewicz P., Kapelski D., Analysis of high speed permanent magnet motor with powder core material, The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, 2012, Vol. 31, No. 5, pp. 1528 ? 1540,

6. Wojciechowski R. M., Jedryczka C., Demenko A., Sykulski J. K., Strategies for two-dimensional and three-dimensional field computation in the design of permanent magnet motors, IET Sci. Meas. Techn. Vol. 9, No. 2, 2015, pp. 224-233.

Result of average student's workload

Time (working Activity hours)

1. Participation in project activities		9			
2. Participation in consultation		10			
3. Participation in the exam		2			
4. Participation in the thesis	15				
Student's workload					
Source of workload	hours	ECTS			
Total workload	39	1			
Contact hours	21	1			
Practical activities	15				