Technical Electrodynamics 0010324281010324777 Field of study Profile of study Vear /Semester Electrical Engineering (Drak) Vear /Semester Electrop pathypacially - Subject offered in: polisin Course (computency, electron) Cycle of study: - First-cycle studies No. of reads No. of hours Classes: - Laboratory: 13 Status of the course in the study program (Bais, major, other) (brak) (university-wide, from another field) No. of credits Education areas and fields of science and at technical sciences 3 100% ECTS distribution (number and %) Electrical Engineering u. Protocycleachowski Broin Subject / lecturer: Responsible for subject / lecturer: Prof. dr hab in2, Andrza) Demenko emait: andra: objeciechowski Broin Subject / lecturer: Prof. dr hab in2, Andrza) Electrical Engineering u. Protowo 3a, 60-965 Poznan U. Plotrowo 3a, 60-965 Poznan U. Plotrowo 3a, 60-965 Poznan 1 Knowledge Elementary knowledge of electrical engineering u. Plotrowo 3a, 60-965 Poznan U. Plotrowo 3a, 60-965 Poznan 2 Skills The skill of effective self-education in a field related to the chosen major of stu		f the module/subject		ESCRIPTION FORM	Code
Electrical Engineering (general academic, practical) (brak) 4 / 8 Electrical Engineering Subject offered in: polish Course (compulsory, elective obligatory Cycle of study: First-cycle studies Form of study (full-time, part-time) No. of nours Laboratory: 13 Project/seminars: No. of oredits Status of the course in the study program (Baac, major, other) (brak) (university-wide, from another field) (brak) No. of oredits Education areas and fields of solence and at technical sciences Status of the course in the study program (Baac, major, other) (brak) (brak) ECTS distribution (number and 5%) Education areas and fields of solence and at ECTS distribution (number and 5%) ECTS distribution (number and 5%) Education areas and fields of solence and at ECTS distribution (number and 5%) ECTS distribution (number and 5%) To risk. Rata M. Wojciechowski email: radirzej demenko 8% put poznan.pl tel. 48 061 647 58 03 9100% Electrical Engineering u. Piotrowo 3a, 60-865 Poznań Electrical Engineering u. Piotrowo 3a, 60-865 Poznań 1 Knowledge Elementary knowledge of electrical engineering, electromagnetic field theory, electrical machines and numerical methods. 2 Skills The skill of effictive self-educa			namics		
Elective path/specialty - Subject offered in: polish Course (computancy, elective obligatory) Cycle of study: First-cycle studies Form of study (full-time,part-time) No. of hours Lecture: 8 Classes: - 3 Lecture: 8 Classes: - Laboratory: 13 Project/seminars: - 3 Status of the course in the study program (Basic, major, other) (university-wide, from another field) No. of cradits Education areas and fields of science and art ECTS distribution (number and %) ECTS distribution (number and %) technical sciences 3 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Dr.iz. Rafal M. Wojciechowski email: radit wojciechowski email: radit wojciechowski email: radit wojciechowski email: radit wojciechowski email: radit wojciechowski email: radit wojciechowski Prof. d' rhab in2. Andrzej Demenko 1 Knowledge Electrical Engineering u.l. Piotrowo 3a, 60-965 Poznań U.l. Piotrowo 3a, 60-965 Poznań 2 Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right docisions to solve simple problems related to the theory of the electromagnetic field, the abilit		,		(general academic, practica	I)
- polish obligatory Cycle of study: Form of study (full-time,part-time) Form of study (full-time,part-time) Part-time No. of hours Ecture: 8 Classes: - Laboratory: 13 Project/seminars: - No. of credits Status of the course in the study program (Basic, major, other) (university-wide, from another field) (brak) ECTS distribution (number and %) Education areas and fields of science and art Image: Compart in the study program (Basic, major, other) Image: Compart in the study for the course: 3 100% Education areas and fields of science and art Image: Compart in the study			Ig	· · · ·	
First-cycle studies part-time No: of credits No: of credits Lecture: 8 Classes: - Laboratory: 13 Project/seminars: - 3 Status of the course in the study program (Basic, major, other) (university-wide, from another field) (brak) ECTS distribution (number and %) Education areas and fields of science and art (brak) (brak) ECTS distribution (number and %) Education areas and fields of science and art (brak) (brak) ECTS distribution (number and %) Education areas and fields of science and art (brak) (brak) ECTS distribution (number and %) Education areas and fields of science and art Proj. dr hab in2. Andrzej Demenko email: andrzej demenko @put.poznan.pl ECTFS distribution (number and %) technical Engineering U.Piotrowo 3a, 60-965 Poznań Prof. dr hab in2. Andrzej Demenko @put.poznan.pl EL4 80 61 647 58 03 U.Piotrowo 3a, 60-965 Poznań U.Piotrowo 3a, 60-965 Poznań Prof. dr hab in2. Andrzej Demenko @put.exoran.pl EL4 80 61 647 58 03 1 Knowledge Elementary knowledge of electrical engineering @put.exoran.pl Electrical Engineering @put.exoran.pl 1.Profecuisites in terms of Knowledge, skills and social completic	Elective	path/specialty	-		
No. of brours No. of credits Lecture: 8 Classes: Laboratory: 13 Project/seminars: No. of credits Status of the course in the study program (Basic, major, other) (brak) (university-wide, from another field) Status Education areas and fields of science and at (brak) (brak) ECTS distribution (number and %) Education areas and fields of science and at ECTS distribution (number and %) 3 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Prof. dr hab in2. Andrzej Demenko email: rad1.wojciechowski@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering ul. Plotrowo 3a, 60-965 Poznań Prof. dr hab in2. Andrzej Demenko email: andrzej demenko@put.poznan.pl tel. 48 061 647 58 03 Prerequisites in terms of knowledge, skills and social competencies: Profectical Engineering ul. Plotrowo 3a, 60-965 Poznań Elementary knowledge of electrical engineering, electromagnetic field theory, electrical machines and numerical methods. 2 Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies Study outcomes and reference to the educational results for a field of study Nowledge Inestrutent showled	Cycle of	f study:		Form of study (full-time,part-time)
Lecture: 8 Classes: - Laboratory: 13 Project/seminars: - 3 Status of the course in the study program (Basic, major, other) (university-wide, from another field) (brak) Education areas and fields of science and att (brak) (brak) ECTS distribution (number and %) technical sciences 3 100% 3 100% Responsible for subject / lecturer: Drin2: Rafa M. Wojciechowski Prof. dr hab in2: Andrzej Demenko email: andrzej demenko@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering Letrorwo 3a, 60-965 Poznań Drin2: Rafa M. Wojciechowski Prof. dr hab in2: Andrzej Demenko email: andrzej demenko@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering Letrorwo 3a, 60-965 Poznań Nowledge of electrical engineering, electromagnetic field theory, electrical machines and numerical methods. Te skill to fifed theosis to solve simple problems related to the chosen major of studies, the skill to field, the ability to use Windows OS. Social Sudden		First-cyc	cle studies	part	-time
Status of the course in the study program (Basic, major, other) (university-wide, from another field) Education areas and fields of science and att (brak) Education areas and fields of science and att ECTS distribution (number and %) technical sciences 3 To ize Rafa M. Wojciechowski Prof. of hab in2. Andrzej Demenko email: rafal wojcieichowski@put.poznan.pl email: andrzej.demenko@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering U. Piotrowo 3a, 60-965 Poznań U. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field the ability to use Windows OS. 3 Social Competencies Study outcomes and reference to the educational results for a field of study Knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Nowledge: 1. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++; K_W12+] Study outcomes and reference to the educational results for a field of study Knowledge: <t< td=""><td>No. of h</td><td>iours</td><td></td><td></td><td></td></t<>	No. of h	iours			
(brak) (brak) Education areas and fields of science and att ECTS distribution (number and %) technical sciences 3 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Dr in2. Rafal M. Wojciechowski Prof. dr hab in2. Andrzej Demenko email: rafal.wojcielechowski@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering Ll. Plotrowo 3a, 60-965 Poznań U. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 1 Knowledge Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electronagnetic field, the ability to use Windows OS. 3 Social competencies Student is aware of the widening his competence, demonstrate a willingness to work in a team whe ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The skill of efference to the educational results for a field of study Medvedge 1 Study outcomes and reference to the educational results for a field of study Medvedge of interime element methods and software for the numerical calculation of electromagnetic fransducers - [K_W02+++; K_W06++++	Lectur	re: 8 Classe	s: - Laboratory: 13	Project/seminars:	- 3
Education areas and fields of science and at ECTS distribution (number and %) technical sciences 3 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Dr in2, Rafal M, Wojciechowski Prof. dr hab in2, Andrzej Demenko email: rafal.wojcieciechowski@put.poznan.pl email: andrzej.demenko@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań ul. Piotrowo 3a, 60-965 Poznań 1 Knowledge 2 Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electroal genetic of the ability to use Windows OS. 3 Social Student is aware of the widening his competence, demonstrate a willingness to work in a team competencies Assumptions and objectives of the course: The skill of effective self-educational results of electroal laboratory. Assumptions and objectives of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of inue element method in electrodynamics - [K_W02++; K_W06+++] 2. Studen thas a basic knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W12+] Student will be able to use known methods and models for field analysis and synthesis of simple systems	Status o	-		(university-wide, from another	
and %) and %) technical sciences 3 100% Responsible for subject / lecturer: Responsible for subject / lecturer: Drinz. Rafal M. Wojciechowski Prof. dr hab inż. Andrzej Demenko emait: rafat/wojcieichowski@put,poznan.pl emait: andrzej,demenko@put,poznan.pl tel. 48 061 647 58 03 Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań UL. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 2 Skills 3 Social competencies 3 Sudent is aware of the widening his competence, demonstrate a willingness to work in a team the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The skuled of finite element method in electromagnetic. 1. Studen thas a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Studen thas a basic knowledge of technical electrodynamics - [K_W02++; K_W06++++] 2. Student was twolkege of nu	E 1 - 1'		\ /		, ,
Responsible for subject / lecturer: Responsible for subject / lecturer: Dr inž: Rafal M. Wojciechowski email: rafal.wojcieicchowski@put.poznan.pl Prof. dr hab inž. Andrzej Demenko email: andrzej.demenko@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: Elementary knowledge of electrical engineering, electromagnetic field theory, electrical machines and numerical methods. 2 Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies Student is aware of the widening his competence, demonstrate a willingness to work in a tear the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electrodynamics - [K_W02++; K_W06+++] 2. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10+++; K_U11+++] 2. Student will be able to use known methods and models for field	Educati	on areas and fields of sci	ience and art		
Dr inz. Rafał M. Wojciechowski email: rafal.wojciechowski@put.poznan.pl tel. 48 061 647 58 03 Prof. dr hab inz. Andrzej Demenko email: andrzej.demenko@put.poznan.pl tel. 48 061 647 58 03 Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań tel. 48 061 647 58 03 Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 2 Skills 3 Social competencies: 3 Social competencies: 3 Social competencies: 7 The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies: Student is aware of the widening his competence, demonstrate a willingness to work in a team the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has a basic knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: 1. The student will be able to use known meth	techr	nical sciences			3 100%
email: rafal.wojcielechowski@put.poznan.pl email: andrzej.demenko@put.poznan.pl tel. 48 061 647 58 03 tel. 48 061 647 58 03 Electrical Engineering U. Piotrowo 3a, 60-965 Poznań ul. Piotrowo 3a, 60-965 Poznań U. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Elementary knowledge of electrical engineering, electromagnetic field theory, electrical machines and numerical methods. 2 Skills 3 Social competencies: The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. The student has a basic knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers . [K_W02+++; K_W06+++; K_W12+] Skills: 1. A the student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U0	Resp	onsible for subj	ect / lecturer:	Responsible for subje	ect / lecturer:
email: rafal.wojcielechowski@put.poznan.pl email: andrzej.demenko@put.poznan.pl tel. 48 061 647 58 03 tel. 48 061 647 58 03 Electrical Engineering U. Piotrowo 3a, 60-965 Poznań ul. Piotrowo 3a, 60-965 Poznań U. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Elementary knowledge of electrical engineering, electromagnetic field theory, electrical machines and numerical methods. 2 Skills 3 Social competencies: The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. The student has a basic knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers . [K_W02+++; K_W06+++; K_W12+] Skills: 1. A the student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U0	Dr i	nż. Rafał M. Wojciech	owski	Prof. dr hab inż. Andrzej D	Demenko
Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań Electrical Engineering ul. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 2 Skills 3 Conjecture 3 Social competencies 3 Social competencies 4 Knowledge of the course: 7 The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies Student is aware of the widening his competence, demonstrate a willingness to work in a team the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: Electrical engineering engineericon engineericon enginetic field engineering engineering engineerin		,			
ul. Piotrowo 3a, 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 2 Skills 3 Social competencies 3 Social competencies Student sia ware of the electroganetic field theory, electrical devices as well as howledge of field the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The student should obtain knowledge of technical electrodynamics - [K_W02++; K_W06++++] 2. Student has a basic knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06++++] 2. Student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U08++] 2. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U08++] 3. Student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U08++]					
Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge 2 Skills 2 Skills 3 Social competencies 3 Social competencies 5 Student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. 5 Student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of the chical electrodynamics - [K_W02++; K_W06+++] 2. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. 1. The student will be able to use			oznań		0700ú
Image: Note of the sector of the se				· · · · · · · · · · · · · · · · · · ·	
1 Knowledge machines and numerical methods. 2 Skills The skill of effective self-education in a field related to the chosen major of studies, the skill to make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies Student is aware of the widening his competence, demonstrate a willingness to work in a team the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has a basic knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Stills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. 1. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. 1. The student is aware of	Prere	equisites in term	is of knowledge, skills and	d social competencies	:
2 Skills make a right decisions to solve simple problems related to the theory of the electromagnetic field, the ability to use Windows OS. 3 Social competencies Student is aware of the widening his competence, demonstrate a willingness to work in a team the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W12+] Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	1	Knowledge			tic field theory, electrical
S competencies the ability to comply with the rules in force on the lecture and laboratory. Assumptions and objectives of the course: The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	2	Skills	make a right decisions to solve s	simple problems related to the	
Assumptions and objectives of the course: The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	3				
The student should obtain knowledge of the description and analysis of electromagnetic phenomena in electrical devices as well as knowledge of finite element method in electromagnetism. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	Assu	-	iectives of the course:		
Knowledge: 1. Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] 2. Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	The stu	udent should obtain ki	nowledge of the description and ar		nomena in electrical devices as
 Student has a basic knowledge of technical electrodynamics - [K_W02++; K_W06+++] Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++] 		Study outco	mes and reference to the	educational results fo	r a field of study
 2. Student has structured knowledge of numerical methods and software for the numerical calculation of electromagnetic transducers - [K_W02+++; K_W06+++; K_W12+] Skills: The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++] 	Knov	vledge:			
transducers - [K_W02+++; K_W06+++; K_W12+] Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	1. Stuc	lent has a basic know	ledge of technical electrodynamics	s - [K_W02++; K_W06+++]	
Skills: 1. The student will be able to use known methods and models for field analysis and synthesis of simple systems with the electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]				d software for the numerical ca	alculation of electromagnetic
electromagnetic field - [K_U10++; K_U11+++] 2. The student will be able to prepare a report on the numerical calculations of electromechanical transducers and systems with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]	Skills	5:			
with the electromagnetic field using professional software - [K_U08++] Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]				for field analysis and synthesis	s of simple systems with the
Social competencies: 1. The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K03++]					nical transducers and systems
work - [K_K03++]				-	
2. The student is able to identify the problem and choose the correct way to solve the subject of electrodynamics - [K_K06++		student is aware of th	ne value of his work, respect the pr	inciples of teamwork, takes re	sponsibility for collaborative
	Socia 1. The				

Lecture:

-assessment of knowledge and skills by the completion of a written test (solving problem), -continuous evaluation for each course (rewarding activity and quality of the expression).

Laboratory:

- end test and favoring the knowledge necessary to complete tasks during laboratory,

- continuous evaluation for each course rewarding gain skills,
- assessment of skills related to the practical implementation of lecture knowledge to solve laboratory tasks,
- evaluation of the reports from performed exercise.

Extra points for the activity in the classroom, and in particular for:

-discussion and proposition of additional aspects of the subjects,

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

-ability to work within a team, which performs the task detailed at the laboratory,

-quality and diligence of the developed reports.

Course description

The field approach in the description of electromagnetic phenomena. Differential, integral and circuit forms of electromagnetic field equations. Boundary conditions. Two dimensional (2D) fields. Methods of electromagnetic field analysis, field and potential formulations. Integral and finite difference methods of 2D electro and magnetostatic field analysis. Finite element method. Network models of systems with magnetic and electric field. Inducted currents. Electromagnetic shields. Field method of electromagnetic torques and forces calculation. Electromagnetic levitation. Equations of 2D transient field. Numerical methods of solving diffusion equation. Implicit and explicit schemes, Crank-Nicholson method. Professional software for electromagnetic field analysis in electrical devices.

Basic bibliography:

1. Feynman L. S., Feynmana wykłady z fizyki. Elektrodynamika, fizyka ośrodków ciągłych, t. 2.2, PWN Warszawa 2012

2. Brzezowska J., Gajewski A., Wprowadzenie do elektrodynamiki klasycznej, WPK, Kraków, 2010

3. Demenko A., Obwodowe modele układów z polem elektromagnetycznym, WPP, Poznań, 2004

4. Bastos J., Sadowski J., Electromagnetic Modeling by Finite Element Methods, Marsel Dekker Inc., 2003

5. Nowak L., Modele polowe przetworników elektromechanicznych w stanach nieustalonych, WPP, Poznań, 1999

6. Bossavit A., Computational electromagnetism, variational formulations, complementarity, edge element method, Academic Press Limited, London, 1998

7. Demenko A., Symulacja dynamicznych stanów pracy maszyn elektrycznych w ujęciu polowym, WPP, Poznań, 1997

8. Turowski J., Elektrodynamika techniczna, Wyd.II, WNT, Warszawa, 1993

Additional bibliography:

1. Jian-Ming J., Theory and Computation of Electromagnetic Fields, John Wiley&Sons, 2010

2. Sikora J., Numeryczne metody rozwiązywania zagadnień brzegowych, WUPL., Lublin 2009

3. Dolezel I., Karban P., Solin P., Integral methods in low-frequency electromagnetics, Wiley&Son, New Jersey, 2009

4. Binns K., Lawrenson P., Trowbridge C., The analytical and numerical solution of electric and magnetic fields, John Wiley&Sons, 1992

Result of average student's workload

Activity	Time (working hours)
1. Lectures	8
2. Laboratories	13
3. Participate in the consultations on the lecture	5
4. Participate in the consultations on the laboratories	12
5. Preparation for laboratory	8
6. Homework preparation	22
Student's workload	

Source of workload	hours	ECTS
Total workload	68	3
Contact hours	38	1
Practical activities	43	1