				Bi	alystok	Univers	ity of Tech					
Field of study		Aut	omatic	Contro	ol and R	Robotics	6	Degree level and programme type	full-time Master's	s degree		
Specjalization / diploma path			industr	ial proc	cess cor	ntrol		Study profile	general acad	emic		
			lata					Course code	MYAR2S12	001		
Course name			inter	rim wor	k projec	<i>а</i>		Course type	elective			
Forms and number of hours	L	С	LC	Р	SW	FW	S	Semester	2			
of tuition	0	0	0	30	0	0	0	No. of ECTS credits	2			
Entry requirements							-					
Course objectives	Acquis system		substant	ive and	practical	l principle	es of desigr	n, operation and use c	f industrial automa	tic contro		
Course content	Identifi of moc operati	cation o lels of a ion of pr	f the obj iutomatio rocess c	ect, con c contro ontrol s	troller ar I system ystems.	nd acces is. Progr Ability to	sories. Stu amming of use desig	systems with the us dy of the stability, stat real-time control sys n aiding programs (El unication, machines,	ic and dynamic per tems. Rules for the PLAN, LabView). T	formance use an hemes o		
Teaching methods	Project	t classes	S;									
Assessment method		oject: ev ring the		of proje	ect comp	oletion, c	urrent prog	ress in project comple	etion, discussion ar	nd activit		
Symbol of learning outcome		<u> </u>			Learnir	ng outcome	6		Reference to the outcomes for the fie			
LO1	knows and can use advanced methods of designing elements and analog a digital automatic control and robotics systems											
LO2	knows and understands concepts and principles in the field of intellectual industrial, copyright and patent protection						al, AR2_W0 9					
LO3	is able to model and design control objects and industrial and service processes						AR2_W0 AR2_U0 2 1	AR2_U 2				
LO4								technical solutions ar s of science				
Symbol of learning outcome						•	ning outcome		the outcome is a	Type of tuition during which the outcome is assessed		
L01	•				completion the class		ent progress	s in project completio	n, P			
LO2	discus	sion and	l activity	during t	he class	es;		s in project completio	P			
LO3					completion the class		ent progress	s in project completio	n, P			
LO4				during t	he class	es;	ent progress	s in project completio	P			
	Droiod	tattanda	2000	Student w	orkload (in	hours)			No. of hou	rs		
		t attenda	r project	rlaccor					30			
						tion of pr	esentation	s)	12			
Calculation		<u> </u>	r projects	<u> </u>			Sociations	5/	1			
						ns related	d to the mo	dule subject	5			
				510001				TOTA				
				Quanti	tative indica	itors			Hours	ECTS		
		Student	workload -	activities t	hat require	direct teach	er participation		35	1,4		
						cal activities			50	2		
	1. Kacz 2. Kos				•			odstawy teorii sterowa				

	 Białostockiej. Białystok, 2005. 4. Siemieniako F., Gosiewski Z., Automatyka. Modelowanie i analiza układ Politechniki Białostockiej. Białystok, 2006. 5. Gosiewski Z., Siemieniako F., Automatyka. Synteza układów. T. 2. W Białostockiej. Białystok, 2006. 	
Supplementary references	 Ogata K., Modern control engineering, 4th ed., Pearson Education International, Mikulczyński T., Automatyzacja procesów produkcyjnych: metody modelowani programowania sterowników PLC, PWN, Wydawnictwo 2, Warszawa, 2017. Honczarenko J., Elastyczna automatyzacja wytwarzania. WNT Warszawa 2000. Flasiński M., Wstęp do sztucznej inteligencji. Wydawnictwo Naukowe PWN, Wa Giergiel M. J., Hendzel Z., Żylski W., Modelowanie i sterowanie mobil Wydawnictwo Naukowe PWN, Warszawa 2013. 	a procesów dyskretnych i rszawa 2018.
Organisational unit conducting the course	······································	Date of issuing the programme
Author of the programme	prof. dr hab. inż. Zdzisław Gosiewski	2019-09-23

Field of study				Bia	lysto <mark>k U</mark>	Iniversit	y of Tech					
0		Auto	omatic (Contro	and R	obotics		Degree level programme t		full-time I	Master's	degree
Specjalization / diploma path			industri	al proc	ess con	trol		Study profi	le	gener	al acadeı	mic
• •								Course coo	de	MYA	R2S1200)2
Course name		Ne	tworked	autom	ation sy	stems		Course typ	e		elective	-
Forms and	L	С	LC	Р	SW	FW	S	Semester	r		2	
number of hours of tuition	30	0	15	15	0	0	0	No. of ECTS c	redits		5	
Entry			1				-	1	I			
requirements Course objectives	as TCF actuato for net	P / IP, IR ors and o vork per	RT, RT and decentra ripherals	nd PRO lized co . Gainin	FIsafe. (ntrollers g knowle	Commun . Teachir edge and	ication of ig design skills in ir	nation system PLC modules, principles, dra idustrial netwo tecture of TC	, distribut wing ele ork syste	ted measu ectrical and ms and di	urement s d signal d agnostics	systems liagrams s.
Course content	modes. the PR networl system of draw FC / FE PROFI structur the dat RT / IF process Asynch Safety decent	Design OFIsafe k redun using F ving elec functio NET IO re of the a excha RT mode s data. I ronous system ralized s	ning PRC e networ dant sys PLCs. Cy ctrical an ons and so networ e industri inge cycl e configu Performi commun . Redui security	PFIsafe k. Secu stems. (cclic and d signa support k. Fam ial netwo e and ir uration. ng phys nication ndant r	network rity cate Commur acyclic I diagrar of DB da iliarizatic ork and formatic Building sical and of perip network	security egories of nication f commun ns for ne ata blocks on with health an on refresh various I applicat pheral do project	systems. f devices functions ication. Di twork per s required the princi nd safety n cycle and network t ion layer evices. Pl	etwork. Support The rules for controlled by in the PROF agnostics of r ipherals. Labor to perform co ples of opera guidelines. Co d parameteriz opologies. Pro diagnostics. F ROFINET IO n the PROF	setting u the ind INET IO networks pratory: F mmunica ating PL ponfigurati ation of r ogrammi Project: C network	p and ope lustrial ne o network and perip Programm ation tasks C periphe ion of PC network du ng of cyc Decentraliz design f	erating de in the S herals. Pring of OB s in the Ei eral device evices. To lical exch zed drive for an ex	evices in esigning SIMATIC rinciples blocks thernet ces, the ons. Se CP / IP nange o control cemplary
Teaching			r selecte	d syster	-			onous commu	inication		r and sla	
•		ative_nro			n interru	pts.	e. Synchro	onous commu	inication		r and sla	
methods			blem lec		n interru	pts.		onous commu	inication		r and sla	
•	Leo Lat Pro	cture: ex poratory	oblem lec kam c evaluat aluation	ture; La	n interru boratory troducto	pts. / classes ory tests,	e. Synchro ; Project c reports, di	onous commu	activity c	of maste	classes	ve units
Methods Assessment method Symbol of	Leo Lat Pro	cture: ex poratory pject: ev	oblem lec kam c evaluat aluation	ture; La	n interru boratory troducto ct compl	pts. / classes ory tests,	e. Synchro ; Project c reports, di	onous commu lasses; iscussion and	activity c	of maste	classes ission and	d activity
methods Assessment method Symbol of	Lec Lat Pro dur knows protoco	cture: ex poratory pject: eva ing the the prine	oblem lec cam : evaluat aluation classes ciple of c	ion of in of proje	n interru boratory troducto ct compl Learning n of Ethe	pts. v classes pry tests, etion, cu outcomes ernet, TC	e. Synchro ; Project c reports, di rrent prog	onous commu lasses; iscussion and	activity c complet	of maste	classes ssion and ence to the least for the field	d activity
Methods Assessment method Symbol of learning outcome	Leo Lat Pro dur knows protoco knows	cture: ex poratory pject: eva ing the ing the prine bls function	oblem lec cam : evaluat aluation classes	ion of in of proje	n interru boratory troducto ct compl Learning n of Ethe	pts. v classes pry tests, etion, cu outcomes ernet, TC	e. Synchro ; Project c reports, di rrent prog .P / IP, IR	onous commu lasses; iscussion and ress in project T, RT and PR	activity c complet	of maste during the tion, discu Refere outcome: AR2_W05 AR2_W03 AR2_U06	classes ission and ence to the least s for the field AR2_W05	d activity
Methods Assessment method Symbol of learning outcome LO1	Leo Lat Pro dur knows protoco knows commu	cture: exporatory oject: eva ing the prino the prino ols function	oblem lec cam : evaluat aluation classes ciple of c ons for n system	ion of in of proje	n interru boratory troducto ct compl Learning n of Ethe	pts. v classes pry tests, etion, cu outcomes ernet, TC data	e. Synchro ; Project c reports, di rrent prog .P / IP, IR	iscussion and ress in project T, RT and PR	activity c t complet OFIsafe	of maste	classes ission and ence to the least s for the field AR2_W05	d activity
Methods Assessment method Symbol of learning outcome LO1 LO2	Leo Lat Pro dur knows protoco knows commu knows can co	the principal characteristics of the principal characteristics of the principal characteristics of the principal characteristics of the principal characteristics of	blem lec am aluation classes ciple of c ons for system	ion of in of proje operation decer nods for nd tes	n interru boratory troducto ct compl Learning n of Ethe ntralized industria	pts. v classes ory tests, etion, cu outcomes ernet, TC data al networ	e. Synchro ; Project c reports, di rrent prog P / IP, IR exchange ks and pe	iscussion and ress in project T, RT and PR	activity c complet OFIsafe	of maste	classes ission and ence to the least s for the field AR2_W05	d activity
Methods Assessment method Symbol of learning outcome LO1 LO2 LO3	Leo Lak Pro dur knows protoco knows commu knows commu knows commu knows commu knows	the print the print function diagnos onfigure NET IO to prock	blem lec am cam aluation classes ciple of c ons for system tics meth , run a and syst ogram fu	ion of in of projector operation decer nods for ind test iem redu inctions	n interru boratory troducto ct compl Learning n of Ethe ntralized industria t comm undant for rea	pts. v classes ory tests, etion, cu outcomes ernet, TC data al networ ounication al-time data	e. Synchro ; Project c reports, di rrent prog P / IP, IR exchange ks and pe connec ata excha	anous commu lasses; iscussion and ress in project T, RT and PR in the ir ripherals tions in PRC ange in an ir	activity c complet OFIsafe ndustrial DFIsafe, ndustrial	of maste during the tion, discu Refere outcome: AR2_W05 AR2_W03 AR2_W03 AR2_U06 AR2_U03 AR2_U03	classes ission and ince to the least s for the field AR2_W05 AR2_W05	d activity
methods Assessment method Symbol of learning outcome LO1 LO2 LO3 LO4	Leo Lat Pro dur knows protoco knows commu knows commu knows can co PROFI is able networl can us and ap	the principles the principles function diagnos onfigure NET IO to prock e select plication	blem lec cam : evaluat aluation classes ciple of c ons for n system tics meth , run a and syst ogram fu ted meth n layer	ion of in of proje- operation decer nods for nod tes iem redu inctions	n interru boratory troducto ct compl Learning n of Ethe industria t comm undant for rea	pts. v classes ory tests, letion, cu outcomes ernet, TC data al networ nunicatior al-time da stics of i	e. Synchro ; Project c reports, di rrent prog P / IP, IR exchange ks and pe connec ata excha	onous commu lasses; iscussion and ress in project T, RT and PR e in the ir ripherals tions in PRC ange in an ir networks for	activity of technologies of the completed of the complete	of maste	classes ission and ence to the lease s for the field AR2_W05 AR2_W05 AR2_U05	d activity
methods Assessment method Symbol of learning outcome LO1 LO2 LO3 LO3 LO4 LO5	Leo Lak Pro dur knows protoco knows commu knows commu knows can co PROFI is able networl can us and ap is read mainte	the principles the principles function diagnos onfigure NET IO to pro- c e select plication y to crit	blem lec cam aluation classes ciple of c ons for system tics meth , run a and syst ogram fu ogram fu ted meth n layer tically ev f networ	eture; La ion of in of proje operation decer nods for ind tes iem redu inctions nods for nods for	n interru boratory troducto ct compl Learning n of Ethe industria t comm undant for rea	pts. v classes pry tests, etion, cu outcomes ernet, TC data al networ unicatior unicatior dats of i	e. Synchro ; Project c reports, di rrent prog P / IP, IR exchange ks and pe connec ata excha ndustrial e and ski	anous commu lasses; iscussion and ress in project T, RT and PR in the ir ripherals tions in PRC ange in an ir	activity c complet OFIsafe ndustrial DFIsafe, ndustrial physical ign and	of maste during the tion, discu Refere outcome AR2_W03 AR2_W03 AR2_W03 AR2_U06 AR2_U03 AR2_U03 AR2_U03 AR2_U03 AR2_U03	classes ission and ence to the lease s for the field AR2_W05 AR2_W05 AR2_U05	d activity arming of study AR2_U03

LO1	Lecture: exam;	W				
LO2	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	W L P				
LO3	Lecture: exam;	W				
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	LP				
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	L P				
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	L P				
LO7	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	W L P				
	Student workload (in hours)	No. of hours				
	Lecture attendance	30				
	Laboratory classes attendance	15				
	Project attendance	15				
	Preparation for the lecture exam; participation in the exam	16				
	Preparation for laboratory classes	12				
Calculation	Preparation for laboratory classes completion	3				
	Preparation for project classes	18				
	Working on projects (including preparation of presentations)	6				
	Preparation for projects completion	5				
	Participation in teacher-student sessions related to the module subject	5				
	TOTAL	125	5070			
	Quantitative indicators Student workload - activities that require direct teacher participation	Hours	ECTS			
		67	2,7			
	Student workload - practical activities	79	3,2			
Basic references	 Mystkowski A., Sieci przemysłowe PROFIBUS DP i PROFINET IO, Oficyna Białostockiej, 2012. Pigan R., Metter M., Automating with PROFINET: Industrial communication ba 2nd Edition, 2015. 	-				
	 Stehernet, 2nd ed., Siemens, 2006. Popp M., Weber K., The rapid way to PROFINET, PNO, 2004. Michta E., Modele komunikacyjne sieciowego systemu pomiarowo-si Politechniki Zielonogórskiej, Zielona Góra, 2000. 	terującego, Wyda	wnictwo			
Supplementary references	 Comer D. E., Sieci komputerowe i intersieci: aplikacje internetowe, Ed. 4, WN PROFINET specyfikacje: IEC 61784-1; IEC 61784-2; IEC 61784-5; IEC 67 IEC61784. PN EN 61131-3:2004 Sterowniki programowalne: języki programowania. www.profibus.com, www.profibus.org.pl (PNO). 					
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the prog	ramme			
Author of the programme	dr hab. inż. Arkadiusz Mystkowski	2019-09-23				

				Bia	lystok l	Jniversit	y of Techr			
Field of study		Auto	omatic	Contro	I and R	obotics		Degree level and programme type	full-time	Master's degree
Specjalization / diploma path			industri	al proc	ess con	trol		Study profile	gener	al academic
Course name		-	Tooting	of a ont	ralavat			Course code	MYA	R2S12003
			Testing		-			Course type	e	elective
Forms and number of hours		C	LC	P	SW	FW	S	Semester		2
of tuition Entry	15	0	30	0	0	0	0	No. of ECTS credits		4
requirements								ne controllers	<u> </u>	
Course objectives	control s micropro programi	ystems cessor ming s contro	s. Gainir r contro signals t ol syster	ng know Ilers. A o contro ns. Gai	ledge al cquiring ol actua ning kn	bout func knowle tors. Tra	tions, struc dge and nsfer of kr	of analog-digital ar cture and methods of skills in calibrating nowledge in the field Id of application of	f programm measure d of testing	ning (configuring) ment paths and g continuous and
Course content	control s controller including compute control a channels Examina	ystem ystem. rs - in liquid r mod and mo s. Tes tion of	s. Meas HART nplemen I level, eling an easurem ting cor f the adj	uremen protocol ted fund pressure d simula ent mo ntinuous ustmen	t signal , wireles ctions, p e, rotatio ation of dules - contro t proces	processi s measu orogram l onal spec work, ex commur l system s of pne	ng. The ro ring systen layers, con ed, flow ra camples of nication, lin ns. Selectio	rol and measureme ole of A/D and D/A ns, modem and option figuration. Control of the Testing the sing implementation in nitations, parameter on of controller se and electrohydraulic s re.	converters cal systems of basic ph gle-circuit c practice. La s. Calibrati attings in t	in the automatic s. Microprocessor hysical quantities, control systems - aboratory: ADAM on of measuring test applications.
Teaching methods	Informati	Informative-problem lecture; Laboratory classes;								
Assessment method		ure: on pratory:		ion of in	itroducto	ory tests,	reports, dis	scussion and activity	during the	classes
Symbol of learning outcome					Learning	g outcomes				ence to the learning s for the field of study
LO1	D/A conv	/erters	in auto	mation s	systems,	selects		, the role of A/D an echniques in modula s	d AR2_W04	AR2_U03 AR2_K01
LO2								cessor controllers	AR2_W04	AR2_U03
LO3						0 0	•	ontrol systems	AR2_U04	
LO4		the ty	pe and	setting	gs of th	ne contro	oller and	uses and program	S AR2_U03	AR2_U04
LO5		ents v	vith cor					s, tests the corre		AR2_U05
LO6	calibrates			nannels	in auton	nation sys	stems		AR2_W06	AR2_U05
Symbol of learning outcome			M	ethods of	assessin	g the learni	ng outcomes			tuition during which tcome is assessed
L01	discussio	on and	activity	during t	he class	es;		ctory tests, report	VV	L
LO2	discussio	on and	activity	during t	he class	es;		ctory tests, report	٧V	L
LO3	during th	e class	ses;					scussion and activit	-	L
LO4	during th	e class	ses;				•	scussion and activit		L
	Laborato	nv: 01	aluation	of intr	oductor	tests i	renorts die	scussion and activit	hv l	

LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L					
	Student workload (in hours)	No. of hours					
	Lecture attendance	15					
	Laboratory classes attendance	30					
	Preparation for lecture test(s)	24					
Calculation	Preparation for laboratory classes	20					
	Preparation for laboratory classes completion	6					
	Participation in teacher-student sessions related to the module subject	5					
	TOTAL	100					
	Quantitative indicators	Hours	ECTS				
	Student workload - activities that require direct teacher participation	50	2				
	Student workload - practical activities	61	2,4				
Basic references	 Kulesza Z., Ćwiczenia laboratoryjne z urządzeń automatyki. Regulatory konf Politechniki Białostockiej, Białystok 2006. Turkowski M., Przemysłowe sensory i przetworniki pomiarowe. Oficyna Warszawskiej, Warszawa 2002. Suchocki K., Sensory i przetworniki pomiarowe: laboratorium. Wydaw. Politec 2016. Nawrocki W., Komputerowe systemy pomiarowe. WKiŁ, Warszawa, 2006. Nawrocki W., Rozproszone systemy pomiarowe. WKiŁ, Warszawa 2006. 	Wydawnicza Pol	itechniki				
Supplementary references	 Kwaśniewski J., Programowalne sterowniki przemysłowe w systemach sterowania. Wydawnictwa AGH, Kraków, 1999. Piotrowski J. (red.), Pomiary: czujniki i metody pomiarowe wybranych wielkości fizycznych i składu chemicznego. WNT, Warszawa, 2009. Jędrzejkiewicz Z., Teoria sterowania układów jednowymiarowych. Uczelniane Wydawnictwa Naukowo- 						
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the prog	gramme				
Author of the programme	dr inż. Adam Kotowski	2019-09-23					

				Bial	vstok U		endix No 1 t	o the Directive No 915/ Dogy	2019 of the	Rector of BUT	
Field of study		Auto	omatic			obotics		Degree level and programme type		ne Master's egree	
Specjalization / diploma path			industr	ial proc	ess con	itrol		Study profile	genera	I academic	
		D ! . ! .						Course code	MYA	R2S12004	
Course name		Decisio	n suppo	ort in teo	cnnicai	diagnost	ICS	Course type	el	ective	
Forms and	L	С	LC	Р	SW	FW	S	Semester		2	
number of hours of tuition	15	0	0	15	0	0	0	No. of ECTS credits		2	
Entry						Signal an	d image pro				
requirements Course objectives	Demon	stration	of relat	tionships	ary to c betwe	arry out en the c	correct pra	actical activities in th ision (information) a on of activities in the	and system	n performance.	
Course content	Newton Control system. Lapuno Relation significa transien The imp	ian and potentia Phase v functi nships b ant char nt. Deter	Bergso al - relat portrait on with etween nge in s mination e of "risk	nian tim ionships t in the the state ignal, p n of indi trin the	ne. Cont betwee process nergy s of ope aramete vidual re decision	trol susce on multi-cu s of eval state of ration, teo r, system eliability c	eptibility of riteria (optir uating the the systen chnical con- n potential. characteristi	destruction (dysregu the system - object nal) control and tech state of system reg n. Diagnostic susce dition and reliability o Types of damage - ics based on parame Project: Genesis, prog	and contro nical/reliab gulation. R ptibility of f the objec catastroph tric and tra	oller correction. ility state of the elations of the the machine. t. Damage as a nic, parametric, ansient failures.	
Teaching methods	Informa	tive-prol	blem lec	ture; Pro	oject cla	sses;					
Assessment method	Lec Pro	ture: on	e test aluation	of proj			current pro	ogress in project co	mpletion,	discussion and	
Symbol of learning outcome		, ,	U		Learnin	g outcomes			Reference to the learning outcomes for the field of study		
LO1							ing in the mation and	life cycle of devices robotics	-		
LO2		decision ntation a				•	decision s	ituations, uncertaint	y AR2_W01	AR2_W02	
LO3	is able t	to lead a	discuss	sion on t	he imple	ementatio	n of the pro	oject task	AR2_U05	AR2_U08	
LO4	is read diagnos	,	ulfill soc	cial obli	gations	resulting	from the	needs of technica			
Symbol of learning outcome			N	lethods of	fassessin	g the learni	ng outcomes		the outc	uition during which ome is assessed	
L01	Lecture	: one tes	st;						W		
LO2		: one tes	,						W		
LO3		evaluat					t progress	in project completion	,	Ρ	
LO4	Project:		tion of p activity	roject co during th	ompletic ne classe	on, curren es;	t progress	in project completion	-	P	
		attenda		Student wo	ini) deolain	iours)				lo. of hours 15	
		attenda								15	
		ation for		oct(c)						3	
		ation for								4	
Calculation					vonoral	ion of are	contations)			6	
						ion of pre	sentations)				
		ation for				a nal-1 - 1	1. 1k	ula aulate et		2	
	Particip	ation in	teacher-	student	session	s related	to the mode			5	
								TOTA		50	

	Quantitative indicators	Hours	ECTS							
	Student workload - activities that require direct teacher participation	35	1,4							
	Student workload - practical activities	32	1,3							
	1. Cempel C., Teoria i inżynieria systemów. Wydawnictwo WITE, Radom 2006.									
	2. Lindstedt P., Sudakowski T., Grądzki R., Eksploatacyjna niezawodność maszyny i jej teoretyczne podstawy. Wydawnictwo ITWL, Warszawa 2016.									
Basic references	3. Lindstedt P., Praktyczne regulacja maszyn i jej teoretyczne podstawy. Wydawnictwo ITWL, Warszawa 2012.									
	4. Lindstedt P., Praktyczna diagnostyka maszyn i jej teoretyczne podstawy. Wydawnictwo Naukowe ASKON, Warszawa 2002.									
Supplementary references	1. Bubnicki Z., Podstawy informatycznych systemów zarządzania. Wydawnictwo W	/PWr, Wrocław 199	93.							
Organisational unit conducting the course	Katedra Automatyki i Robotyki Date of issuing the programme									
Author of the programme	dr inż. Rafał Grądzki	2019-09-23								

				Ria	alvstok I		y of Techr	to the Directive No 91.		
Field of study		Auto	omatic			obotics		Degree level and	full-time Master's degree	
Specjalization /					ess con			programme type Study profile	general academic	
diploma path			muusu		633 601			Course code	MYAR2S12005	
Course name		Autor	nation a	nd rob	otizatior	ı system	s	Course type	elective	
Forms and	L	С	LC	Р	SW	FW	S	Semester	2	
number of hours of tuition	45	0	0	30	0	0	0	No. of ECTS credits	6	
Entry requirements							-			
Course objectives	automa Teachir comput operatio technic	ition of ng proce ter-aidee on of re al soluti	service edures fo d engine obotic sy on.	, produ or desig ering d /stems.	ction an ning rob esign en The use	d indust otization vironmer e of CAI	rial proces and autom its. Introdu) and mul	sses as well as bu nation systems and c inction to the use of timedia techniques	lected robotization systems, uilding automation systems. creating documentation using robots and the structure and to design and visualize the	
Course content	automa introduc unempl Internet system automa system in the i transpo industry of auto product docume product	tion, au cing aut loyment t of Thir s, meas tion. Au s. Produ mmedia ort, asse y, servic omation tion / entation ts, scen rs: driv	utomation comation The p ngs. The surement utomation uction ar ate vicini embly, pa ces, med and rol industria of the narios ar res; stru	n syste of serv rocess use of t system n tool - nd servit ty of th ainting, icine ar botics. al proce designe id visior uctural	m, auto ice, proc of produ internet ns, envire program ce proce e robot. welding, nd rehabi Industry esses a ed autor ns of ind forms;	mation a luction, ir uction / i technolog onmental mable lo sses. Ro Control o dosing, litation. E 4.0. Pro nd auto nation sy lustrial an interfacia	nd automa ndustrial pr ndustrial pr gies in the monitoring gic control botic syste of a roboti testing and Developme oject: Desi mation sy vstem. Con nd service ng. Non-t	atic control. Advant rocesses and buildin processes automatic automation of home g processes and risk lers (PLC). Pneuma m, its components a c system. Examples d inspection, agricult nt trends and the lat gn of robotic syste ystems of building nsideration of the r robotization. Desig	esses, automatic processes, tages and disadvantages of ag automation. Technological on and building automation. es, cities, enterprises, energy commitoring. Comprehensive atic and hydraulic automation and configurations. Transport s of the use of robots: close ture and forestry, processing test achievements in the field ems, automation of service, ps. Principles of preparing robot's use; robot selection; ning grippers and other end of robotization: economic-	
Teaching methods					roject cla			ł		
Assessment method	Leo Pro	cture: tw	o tests aluation		-		rrent progr	ess in project compl	letion, discussion and activity	
Symbol of learning outcome					Learning	g outcomes			Reference to the learning outcomes for the field of study	
LO1	knows	the con	cepts rel	ated to	automati	on and ro	obotization		AR2_W03	
LO2	-	tion of					• •	robotization system es, and automation	of	
LO3	product	tion and techni	d indust	rial pro	cesses	and auto	omation of	utomation of servic f buildings, analyze new achievements	es in	
LO4	-		ed syste or engin			on and a	utomation	using computer-aide		
LO5	identifie	es non-t	echnical	aspect	s of robo	tization a	nd automa	ation systems	AR2_U07	
Symbol of			Μ	lethods of	fassessin	g the learning	ng outcomes		Type of tuition during which the outcome is assessed	
learning outcome	Methods of assessing the learning outcomes Type of dation during which the outcome is assessed Lecture: two tests; W									

LO2	Lecture: two tests;	W				
LO3	Lecture: two tests;	W				
LO4	Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	Р				
LO5	Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	Р				
	Student workload (in hours)	No. of hours				
	Lecture attendance	45				
	Project attendance	30				
	Preparation for lecture test(s)	22				
Calculation	Preparation for project classes	28				
Calculation	Working on projects (including preparation of presentations)	12				
	Preparation for projects completion	8				
	Participation in teacher-student sessions related to the module subject	5				
	TOTAL	150				
	Quantitative indicators	Hours	ECTS			
	Student workload - activities that require direct teacher participation	80	3,2			
	Student workload - practical activities	83	3,3			
Basic references	 Naukowe PWN, Warszawa, 2017. Świder J. (red.), Sterowanie i automatyzacja procesów technologicznych uł Układy pneumatyczne i elektropneumatyczne ze sterowaniem logicznym (PLC). Śląskiej, Gliwice 2015. Kost G., Łebkowski P., Węsierski Ł., Automatyzacja i robotyzacja proces Polskie Wydawnictwo Ekonomiczne. Warszawa, 2013. Gawrysiak M. Wykłady: Robotyzacja 2004. (dostepne w postacji plików pdf). 	Wydawnictwo Pol	itechniki			
5. Gawrysiak M., Wykłady: Robotyzacja 2004, (dostępne w postaci plików pdf). 1. Zdanowicz R., Robotyzacja dyskretnych procesów produkcyjnych, Wydawnictwo Politechniki Śląskiej, 2013. 2. Matyszewska E. (red.), Automatyzacja przemysłu spożywczego Casebook. Wydawnictwo Naukowe PWN. Warszawa, 2016. 3. Kaczmarek W., Panasiuk J., Robotyzacja procesów produkcyjnych, PWN, 2017. 4. Serwisy internetowe: iAutomatyka.pl, eplan.pl, astor.com.pl, automatykab2b.pl, aps.pl., inne czasopisma, branżowe, bazy danych intechopen.com, bazy patentów Google Patents, bazy publikacji Google Scholar, zdalne bazy czasopism naukowych PB						
Organisational unit conducting the course		Date of issuing the prog	Iramme			
Author of the programme	dr inż. Roman Trochimczuk	2019-09-23				

				Bia	alystok l		ty of Tech	to the Directive No 915/ 10logy	2019 0j ine 1	lector of	<i>b</i> 01
Field of study		Auto	omatic		and R		•	Degree level and	full-time M	aster's	degree
Specjalization / diploma path			industr	ial proc	ess con	trol		Study profile	genera	l acade	mic
			Neuline					Course code	MYAF	R2S1200	06
Course name		_	Nonline	ar cont	rol syste	ems	-	Course type	el	ective	
Forms and number of hours	L	С	LC	Р	SW	FW	S	Semester		2	
of tuition	30	0	0	30	0	0	0	No. of ECTS credits		6	
Entry requirements							-				
Course objectives		ing non			•	•		control systems. Ac following systems,			
Course content	control Lapund system Stabilit	system ov's stee is. Adap y testing	ns. Dire ering fun otive sys g of sele	ct and oction. L stem fol	indirect a Salle's lowing t onlinear (Lapuno theorer he linea control s	v method. n. Uncertai r reference ystems. Pr	stems in the state s Modifications of the inty in the object mode model. Selected ac actical implementatio pontrol parameters on t	e direct La del - resista laptive algo n of selecto	apunov ant and a prithms. ed adap	method. adaptive Project: tive and
Teaching					roject cla						
methods Assessment method	Le Pro	cture: ex oject: ev	kam aluation				ırrent progr	ress in project comple	tion, discus	sion and	d activity
Symbol of		during the classes Learning outcomes								ice to the le	
learning outcome	knowo	and is	abla ta	una ha	-		docoribo or	ad analyza of a non		for the field	l of study
LO1		control s		use ba		epis io i	describe al	nd analyze of a non-	/	/11/2_001	
LO2	unders	tands th	ie conce	•	•		linear contr apunov me	ol system and knows thod)			
LO3	knows them	the sou	irces of	uncerta	inty in t	he objec	t model ar	nd is able to analyze	AR2_U05		AR2_U02
LO4		•	alyze ar th profes			essary ir	formation	from various sources		AR2_K07	
Symbol of learning outcome							ing outcomes			ion during ne is asse	
LO1			-				completion	, current progress in ses;	VV	Ρ	
LO2		e: exam;							W		
LO3	discuss	sion and	l activity	during t	he class	es;		in project completion,		Ρ	
LO4			tion, dise	cussion	and activ	vity durin	completion	, current progress in ses;	VV	Ρ	
	l ecture			Student wo	orkload (in h	ours)			N	lo. of hours	
		e attenda								<u> 30 </u> 30	
		t attenda			m [.] nartio	ination ir	n the exam			29	
			project			φαιιστη Π				<u></u> 34	
Calculation						tion of pr	esentation	s)		12	
			projects (in					- /		10	
						ns related	d to the mo	dule subject		5	
								TOTAL		150	
	•				tive indicato				Hou		ECTS
		Student v					r participation		67		2,7
			Stude	ent workloa	ad - practica	I activities			91		3,6

Basic references	 Kabziński J., Projektowanie nieliniowych układów sterowania. PWN, Warszawa 2018. Gessing R., Skrzywan-Kosek A., Latarnik M., Zbiór zadań z teorii sterowania układami nieliniowymi, Wydawnictwo Politechniki Śląskiej 2006. 							
· · · · · · · · · /								
references	2. Górecki H., Optymalizacja i sterowanie systemów dynamicznych, AGH 2006.							
the course	anisational conducting Katedra Automatyki i Robotyki Date							
Author of the programme	dr hab. Ewa Pawłuszewicz, prof. PB	r hab. Ewa Pawłuszewicz, prof. PB 2019-09-23						

				Bia	lystok l	Jniversit	y of Tech				
Field of study		Auto	matic	Contro	I and R	obotics		Degree level and programme type	full-time M	laster's	degree
Specjalization / diploma path			industri	al proc	ess con	trol		Study profile	genera	l acade	mic
								Course code	MYA	R2S120	07
Course name		Contr	rol of m	anufact	uring pi	ocesses	5	Course type		ective	
Forms and	L	С	LC	Р	SW	FW	S	Semester		2	
number of hours of tuition	15	0	15	30	0	0	0	No. of ECTS credits		5	
Entry		-	_			-				•	
Course objectives	Bus, P Acquai Acquai	rofinet, <u>nting wit</u> nting wit	Profibus th the math th the p	i using anipulat ossibiliti	PLC cor or motio es of co	ntrollers. n program ntrolling	Familiariz nming bas production	processes based ation with the prog ed on the vision sy processes based	ramming of i stem. on the Interne	industria et, Ether	I robots
Course content				•				ize with the progr ed on the vision system	•	ndustria	l robots
Teaching		-					; Project c				
methods		cture: on				2.2.30000	,				
Assessment method	Lat Pro	ooratory	: evalua aluation			•	•	scussion and activi ress in project comp	• •		d activit
Symbol of					Learning	outcomes			Reference to		
learning outcome LO1					onfigurati	on neces		he implementation inication interfaces		ne field of st AR2_W04	uuy
LO2							n industria		AR2_W02	AR2_W04	AR2_W0
LO3		nfigure a ilable ele				_Cs in the	e TIA Port	al environment base	ed AR2_U01	AR2_U03	AR2_U09
LO4				-			grams imp uction line	lemented on the PL		AR2_U04	
LO5	can ma	anage th	e work o	of the tea	am to so	lve a con	nplex tech	nical problem	AR2_U10		
Symbol of learning outcome				ethods of	assessing	the learnir	ng outcomes			ion during ne is asse	
L01		e: one te	,						W		
LO2		e: one te	,						W		
LO3	during in proje	the clas	ses; Pro	oject: ev liscussio	aluation	of projectivity du	ct complet		ss	LP	
LO4	during	the clas	ses; Pro	oject: ev	aluation	of proje		scussion and activi ion, current progre asses;		L P	
LO5	during	the clas	ses; Pro	oject: ev	aluation	of proje		scussion and activition, current progre asses;		LΡ	
			5		rkload (in ho				Ν	lo. of hours	
		e attenda								15	
		tory clas		endance						15	
		attenda		1 1/)						30	
Calculation		ation for								13	
		ation for				.1.6				11	
		<u>ation for</u> ation for			ses com	oletion				3 16	
	LICODOR	ation tor	nroiont	000000		16					

	Preparation for projects completion	5					
	Participation in teacher-student sessions related to the module subject	5					
	TOTAL	125					
	Quantitative indicators						
	Student workload - activities that require direct teacher participation						
	Student workload - practical activities	97	3,9				
Basic references	 Mystkowski A., Sieci przemysłowe PROFIBUS DP i PROFINET IO, Oficyn Białostockiej, Białystok 2012. Solnik W., Zajda Z., Sieci przemysłowe, Profibus-DP, Profinet, AS-I, EG Wydawnictwo BTC, 2018. Kwiecień R., Komputerowe systemy w automatyce przemysłowej, Wydawnictw 4. Kaczmarek W., Programowanie robotów przemysłowych. Wydawnictwo PWN 	D, Przykłady zast wo Helion, 2013. , 2017.	osowań.				
Supplementary references	 Podręczniki szkoleniowe firmy FESTO do poszczególnych stacji roboczych elastycznej linii produkcyjnej. Materiały szkoleniowe firmy SIEMENS z programowania sterowników PLC 2013. 						
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the progr	amme				
Author of the programme	dr inż. Andrzej Koszewnik	2019-09-23					

L01 Incluses the principles of designing automatic control and robotics systems and is a local to use them 4 1 L02 knows theories, methods and engineering tools to manage robotic systems and is a use them AR2_W0 AR2_W0 3 L03 can use wired and wireless telecommunications systems AR2_U03 L04 can design subassemblies and complete mobile robots AR2_U03 L05 can evaluate designed robotic systems and discuss simulation results or experiment AR2_U05 Symbol of learning outcome Methods of assessing the learning outcomes Type of tuition duite outcome is L01 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L02 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L03 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L03 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L03 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L04 Project attendance <td< th=""><th></th><th></th><th></th><th></th><th>Di</th><th>alvetak</th><th></th><th></th><th>to the Directive No 9</th><th>915/20</th><th>19 of the Red</th><th>ctor of B</th><th>UT</th></td<>					Di	alvetak			to the Directive No 9	915/20	19 of the Red	ctor of B	UT
Seccipitation : dpione path computer systems Study profile general acar Study profile Course name L Course type East Course type East Course type elective Porms and number of hours L C L C P SW Senseter 2 Course type Entry requirements Senseter 2 Course type elective Course of hours of table Acquiring the substantive and practical principles of design, operation and use of computeriz systems. Synthesis of linear and non-linear control systems. Study of the stability, static and dynamic operation of information systems. Repecially in the field of mobile robotics. The ability to use programs that support design (Adams, RobWork). Topics of projects: design of subassemblies and operation of information of project completion, current progress in project completion, discussion a during the classes Teaching method Project classes; Release the during the classes Release the notice mobile robotic. Systems and is during the classes Release the notice set the during the classes Release the notice mobile robotic. Systems and is during the classes Release the notice set the during the classes Release the notice set the during the classes Release the notice set the during the classes L01 knows the principles of designing automatic control and robotic systems and able to use	Field of study		Aut	omatic					Degree level and	f	ull-time Ma	aster's	dearee
Opposition Course name Interim work project Course type MYAR2S22 Course name L C L P SW FW S Sementer 2 of tuition 0 0 0 30 0 0 0 No. of ECTS credits 2 Entry requirements Acquiring the substantive and practical principles of design, operation and use of computeriz systems. Symbols of linear and non-linear control systems using computer techniques. Identification of 1 controller and elements of robotic information systems. Study of the stability, static and dynamic models of atuonatic control systems. Rob/Work). Topics of projects: design of subasemblies and mobile robotics. autonomy and cooperation of robots, base stations and their telemetry links. Teaching method Project classes; Researce the during the classes Reference the outcomes is the robotics systems and is Reference the during the classes Reference the outcomes is the robotics systems and is Reference the during the classes Reference the robotics systems and is Reference the robotics systems and is Reference the robotic systems and discussion and during the classes Reference the robotics systems and reference the robotic systems and discuss simulation results or reperiment Reference the reperiment Reference the robotics Reference the reperiment Reference the reperiment Reference the reperiment								-					•
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Forma and momber of builds L C LC P SW FW S Semester 2 orbuilds 0 0 0 30 0 0 No. of ECTS credits 2 Entry requirements -	Course name			Inter	im wor	k projec	t						/ 1
number of hours of tuition 0 0 0 0 0 0 No. of ECTS credits 2 Entry requirements -	Forms and	1	С		Р	SW	FW	S			CIC		
Territy requirements - Course objectives Acquiring the substantive and practical principles of design, operation and use of computeriz systems. Course objectives Synthesis of linear and non-linear control systems using computer techniques. Identification of controller and elements of robotic information systems. Study of the stability, static and dynamic models of automatic control systems, Programming of real-time control systems. Rules for the operation of information systems, especially in the field of mobile robotics. The ability to use programs that support design (Adams, RobWork). Topics of project: design of subassemblies and mobile robots, autonomy and cooperation of robots, base stations and their telemetry links. Treaching methods Project classes; Assessment method Project: evaluation of project completion, current progress in project completion, discussion a during the classes L01 knows the principles of designing automatic control and robotics systems and is able to use them AR2_W0 L02 knows theories, methods and engineering tools to manage robotic systems and able to use them AR2_W0 L03 can use wired and wireless telecommunications systems AR2_W0 L04 can design subassemblies and complete mobile robots AR2_W0 L05 can valuate designed robotic systems and discuss simulation results of experiment Project: evaluation of project completion, current progress in project completion, discussion and activity during the					-				No. of ECTS credit	s			
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objectives systems. Course content Synthesis of linear and non-linear control systems using computer techniques. Identification of 1 controller and elements of robotic information systems. Study of the stability, static and dynamic models of automatic control systems. Programming of real-time control systems. Rules for the operation of information systems, especially in the field of mobile robotics. The ability to use programs that support design (Adams, RobWork). Topics of projects: design of subassemblies and mobile robots, autonomy and cooperation of robots, base stations and their telemetry links. Teaching methods Project classes; Assessment method Project: evaluation of project completion, current progress in project completion, discussion a during the classes Symbiol of learning outcome Learning outcomes L01 knows the principles of designing automatic control and robotics systems and is able to use them L02 knows theories, methods and engineering tools to manage robotic systems and can use wired and wireless telecommunications systems AR2_U01 L03 can valuate designed robotic systems and discuss simulation results or experiment AR2_U01 Symbol of learning outcome Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; L03 Project: evaluation of project com		Acquiri	na tha	aubatani	tive en	d proatia	ol princi	- plag of da	aign aparation of		of comp	itorizod	robotio
Course content Controller and elements of robotic information systems. Study of the stability, static and dynamic models of automatic control systems. Programming of real-time control systems. Rules for the operation of information systems, especially in the field of mobile robotics. The ability to use mobile robots, autonomy and cooperation of robots, base stations and their telemetry links. Teaching methods Project classes; Project classes; Assessment method Project: evaluation of project completion, current progress in project completion, discussion a during the classes Symbol of learning outcomes Reference to the during the classes; L01 knows the principles of designing automatic control and robotics systems and is alter to use them AR2_W0 L02 knows theories, methods and engineering tools to manage robotic systems and can use wired and wireless telecommunications systems AR2_U01 L03 can use wired and wireless telecommunications systems AR2_U01 L04 can design subassemblies and complete mobile robots AR2_U01 L05 can evaluate designed robotic systems and discuss simulation results or discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; L03 Projec		system	S.			•	•		•				
methods Project classes, Assessment method Project: evaluation of project completion, current progress in project completion, discussion a during the classes Symbol of learning outcome Learning outcomes Reference to the outcomes for the f LO1 knows the principles of designing automatic control and robotics systems and is able to use them Reference to the outcomes for the f LO2 knows the principles of designing automatic control and robotics systems and can use them AR2_W0 A		controll models operation program	ler and of auto on of ir ms that	elements omatic conformatic support (s of rob control s on syste design (ootic info systems. ems, esp (Adams,	rmation Program pecially i RobWor	systems. S mming of n the field k). Topics	Study of the stabili real-time control s I of mobile robotic of projects: design	ty, sta system cs. Th of sut	tic and dyr s. Rules fo e ability to bassemblie	namic q or the u use co	uality of use and omputer
Assessment method Project: evaluation of project completion, current progress in project completion, discussion a during the classes Reference to the outcomes for the f automes for the f LO1 knows the principles of designing automatic control and robotics systems and is able to use them AR2_W0 4 AR2_W0 4 AR2_W0 4 AR2_W0 4 AR2_W0 4 AR2_W0 4 AR2_W0 4 AR2_W0 4 AR2_W0 5 AR2_U0 5 AR2_U01 5 AR2_U01 5 AR2_U01 3		Project	classes	s;									
learning outcome outcomes outcomes outcomes for the f LO1 knows the principles of designing automatic control and robotics systems and is able to use them AR2_U0 4 AR2_U0 3 AR2_U	Assessment				of proje	ect comp	oletion, c	urrent proo	gress in project co	mpletio	on, discuss	ion and	activity
L01 knows the principles of designing automatic control and robotics systems and is able to use them AR2_W0 AR2_W1 AR2_W0 AR2_W1 AR2_W0						Learnir	ng outcome	5					
LO2 Individual technics, interfores and engineering tools to manage robotic systems and for an use them 5 3 LO3 can use them AR2_U03 AR2_U03 AR2_U03 LO4 can design subassemblies and complete mobile robots AR2_U01 AR2_U3 LO5 can evaluate designed robotic systems and discuss simulation results or experiment AR2_U05 Symbol of learning outcome Methods of assessing the learning outcomes Type of tuition di the outcome is LO1 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P LO2 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P LO3 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P LO3 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P LO4 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P LO4 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; No. of			•	•	f desigr	ning auto	omatic co	ontrol and	robotics systems a	and is	AR2_W0	AR2_U0	AR2_U0 3
L03Can use wired and wireless telecontinunications systemsL04can design subassemblies and complete mobile robotsAR2_UIL05can evaluate designed robotic systems and discuss simulation results or experimentAR2_UISymbol of learning outcomeMethods of assessing the learning outcomesType of tuition di the outcome isL01Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL02Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL03Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL03Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL04Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL04Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL05Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL05Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL04Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL05Project: evaluation of project	LO2			s, metho	ds and	enginee	ring tool	s to mana	ge robotic system	s and		AR2_U0 3	AR2_U0 4
L04 can design subassemblies and complete mobile robots AR2_001 3 L05 can evaluate designed robotic systems and discuss simulation results or experiment AR2_005 Symbol of learning outcome Methods of assessing the learning outcomes Type of tuition duit the outcome is L01 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L02 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L03 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L03 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L04 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L04 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L05 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P L05 Project attendance 30 Preparation for project classes 2 Work	LO3	can use	e wired	and wire	less tel	ecommu	nications	systems			AR2_U03		
L05experimentType of tuition of the outcome systems and anotation results on the experimentSymbol of learning outcomeMethods of assessing the learning outcomesType of tuition di the outcome isL01Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL02Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL03Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL03Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL04Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL04Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PL05Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;No. of hoL05Project attendance30Project attendance30Preparation for project classes2Working on projects (including preparation of presentations)12Preparation for projects completion1Participation in teacher-student sessions related to the module subject5	LO4	can de	sign sub	bassemb	lies and	l comple	te mobile	e robots			AR2_001	AR2_U0 3	
learning outcomeInterfolds of assessing the learning outcomesthe outcome isLO1Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO2Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO3Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO3Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO4Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO4Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project attendance30Project attendance30Preparation for projects (including preparation of presentations)12Preparation for projects completion1Preparation for projects completion1Preparation for projects completion1Participation in teacher-student sessions related to the module subject5	LO5			designe	ed robo	otic syst	ems an	d discuss	simulation resul	ts or			
LO1discussion and activity during the classes;PLO2Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO3Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO4Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO4Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Vorking on project classes2Student workload (in hours)30Preparation for project classes2Vorking on projects (including preparation of presentations)12Preparation for projects completion1Participation in teacher-student sessions related to the module subject5							-	•					
LO2discussion and activity during the classes;PLO3Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO4Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO4Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;PLO5Project attendanceNo. of hoStudent workload (in hours)No. of hoNo. of ho30Preparation for project classes2Working on projects (including preparation of presentations)12Preparation for projects completion1Participation in teacher-student sessions related to the module subject5	LO1	discuss	sion and	activity	during	the class	es;		. , .			Ρ	
L03 discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; Project attendance Project attendance Calculation Project attendance 30 30 Preparation for project classes 2 Working on projects (including preparation of presentations) 12 12 Preparation for projects completion 1 1 Participation in teacher-student sessions related to the module subject 5	LO2	discuss	sion and	activity	during	the class	es;					Ρ	
L04 discussion and activity during the classes; P L05 Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; P Student workload (in hours) No. of ho Project attendance 30 Preparation for project classes 2 Working on projects (including preparation of presentations) 12 Preparation for projects completion 1 Participation in teacher-student sessions related to the module subject 5	LO3	discuss	sion and	activity	during	the class	es;	. •				Ρ	
LOS discussion and activity during the classes; Project attendance Student workload (in hours) No. of ho Project attendance 30 Preparation for project classes 2 Working on projects (including preparation of presentations) 12 Preparation for projects completion 1 Participation in teacher-student sessions related to the module subject 5	LO4	discuss	sion and	activity	during	the class	es;					Ρ	
CalculationProject attendance30Preparation for project classes2Working on projects (including preparation of presentations)12Preparation for projects completion1Participation in teacher-student sessions related to the module subject5	LO5				during	the class	es;	ent progres	s in project compl	etion,	-	P	
CalculationPreparation for project classes2Working on projects (including preparation of presentations)12Preparation for projects completion1Participation in teacher-student sessions related to the module subject5		Project	attenda	ance	Student v	vorkload (in	nours)				No		
CalculationWorking on projects (including preparation of presentations)12Preparation for projects completion1Participation in teacher-student sessions related to the module subject5					classes								
Calculation Preparation for projects completion 1 Participation in teacher-student sessions related to the module subject 5	0						tion of pr	esentation	IS)				
Participation in teacher-student sessions related to the module subject 5	Calculation						P		/			1	
							ns related	d to the mo	odule subject			5	
TOTAL 50										OTAL			
Quantitative indicators Hours Student workload - activities that require direct teacher participation 35													ECTS 1,4

	Student workload - practical activities	50	2
	1. Kost G., Łebkowski P., Węsierski Ł. N., Automatyzacja i robotyzacja procesó Wydawnictwo Ekonomiczne, Warszawa 2013.	w produkcyjnych.	Polskie
Desirenteren	2. Kasprzak W., Rozpoznawanie obrazów i sygnałów mowy. Oficyna Warszawskiej, Warszawa 2009.	Wydawnicza Pol	itechniki
Basic references	3. Flasiński M., Wstęp do sztucznej inteligencji. Wydawnictwo Naukowe PWN, Wa		1
	4. Giergiel M. J., Hendzel Z., Żylski W., Modelowanie i sterowanie mobil Wydawnictwo Naukowe PWN, Warszawa 2013.	inych rodotów ko	błowycn.
	5. Kaczorek T., Dzieliński A., Dąbrowski W., Łopatka R., Podstawy teorii sterowani	a. WNT, Warszaw	a 2005.
	1. Murphy R. R., Disaster robotics, MIT Press, Cambridge London 2014.		
	2. Li Z., Ge S. S., Fundamentals in modeling and control of mobile manipulators.	CRC Taylor and	Francis,
	2013.	• • • • •	
Supplementary references	3. Laugier C. Chatila R. (eds.), Autonomous navigation in dynamic environment Heidelberg 2010.	s. Springer Verlag	g, Berlin
1010101000	4. Gausemeier J., Ramig F. J., Shaffer W. (eds.), Design methodology for inte	elligent technical s	systems.
	Springer Verlag, Berlin Heidelberg 2014.5. Mazur A., Model-based control for nonholonomic mobile manipulators. Oficyna	Wydawniaza Bol	itoobniki
	Wrocławskiej, Wrocław 2009.	a wydawilicza foi	
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the proc	gramme
Author of the programme	prof. dr hab. inż. Zdzisław Gosiewski	2019-09-23	

				Bia	lystok U		endix No 1 y of Techr	nology	5/2019 of the Rector of BUT
Field of study		Auto	omatic (Contro	and R	obotics		Degree level and programme type	full-time Master's degree
Specjalization / diploma path			com	puter s	ystems			Study profile	general academic
				-	•			Course code	MYAR2S22002
Course name		E	thernet	industr	iai netw	orks		Course type	elective
Forms and number of hours	L	С	LC	Р	SW	FW	S	Semester	2
of tuition	30	0	15	15	0	0	0	No. of ECTS credits	5
Entry requirements							-		
Course objectives	level in network Perform diagnos	ndustrial k configi ming an stics of i	network uration b d testing industrial	s of the ased or netwo networ	Etherne the SIN rk confi ks. Softv	et, PROF MATIC sy gurations vare for I	INET IO a vstem. Pro s with per T services	nd EtherCAT types. gramming functions f ipheral devices. Edu in industrial network	
Course content	protoco network PROFI exchan network PC sta Configu PROFI IO network physica designi Network router st level u design.	bl. Comi k param NET IO nge in P ks and c ation con uring the uring the NET IO work. P al layer I ing IT fu k design services using Ste	munication peters. C peters. C PROFINE devices. nnection PROFINE PROFINE PROFINE PROFINE PROFINE Not the F and So por and por the F	on profi ommuni ks. Ana T IO an Progran with th NET IO ces para , networ hing of I protoco ring top ftnet sof the http	le and ication in lysis of and Ethen ming of ne PROI network ameters rk topolo cyclic e obl. ARP t: Config pology. (ftware. Fo p protoc	PROFIN PROFI PROFIN rCAT ne f IT proto FINET IC , setting and the pgy, conf xchange protocol, guration Configura Programr col. Mana	ET IO pro NET IO ne IET IO ne tworks. Cy ocols. Redu O system. the data e PROFINE iguration o of proces listening p and testin ation, progr ning of PR aging statio	betwork: RT, IRT, nor twork at the protocol vclic and acyclic cor undant systems. Lab Assigning IP addre xchange cycle and the T IO CBA configurat f a quick restart of the so data. Performing backet frames in the g of IT services offer ramming and testing ROFINET IO diagnoss on data from the ht	network operation. TCP / IP Physical layer, cabling and n-RT mode. Data frames for ol level. Programming data nmunication. Diagnostics of oratory: Configuration of the esses and naming stations. the information refresh cycle, ion. IRT configuration of the ne station in the PROFINET network diagnostics at the PROFINET IO network and ered by CP-343 Advanced. of industrial SCALANCE S tics services at the protocol tp level. EtherCAT network using frame previews using
Teaching	Informa	ative-pro	blem lec	ture; La	boratory	classes	; Project cl	asses;	
methods Assessment method	Leo Lai Pro	cture: ex boratory	kam r: evaluat raluation	ion of in	troducto	ory tests,	reports, di	scussion and activity	etion, discussion and activity
Symbol of learning outcome					Learning	outcomes			Reference to the learning outcomes for the field of study
LO1	records	s, recog		nd is ab	le to pr			protocols, EtherCA unication and contro	r AR2_W03
LO2	knows	methods	s of indu	strial ne	twork dia	agnostics	3		AR2_W03 AR2_U01 AR2_U03
LO3							rial networ		AR2_W02 AR2_W05
LO4	can pro IT	ogram fu	unctions	for data	exchan	ge in ind	ustrial netv	vorks and IT services	
LO5			of indust						AR2_U03
LO6			cally eva of Etherr				us sources	useful for the design	
Symbol of learning outcome			M	ethods of	assessing	the learnin	ng outcomes		Type of tuition during which the outcome is assessed
L01		e: exam;							W

LO2	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	W L P	
LO3	Lecture: exam;	W	
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	L P	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;		
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;		
LO7	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;		
	Student workload (in hours)	No. of hours	
	Lecture attendance	30	
	Laboratory classes attendance	15	
	Project attendance	15	
	Preparation for the lecture exam; participation in the exam	16	
	Preparation for laboratory classes	12	
Calculation	Preparation for laboratory classes completion	3	
	Preparation for project classes	18	
	Working on projects (including preparation of presentations)	6	
	Preparation for projects completion	5	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	125	
	Quantitative indicators	Hours	ECTS
	Student workload - activities that require direct teacher participation	67	2,7
	Student workload - practical activities	79	3,2
	 Mystkowski A., Sieci przemysłowe PROFIBUS DP i PROFINET IO, Oficyna Białostockiej, 2012. Pigan R., Metter M., Automating with PROFINET: Industrial communication ba 		
Basic references	2nd Edition, 2015. 3. Ethernet, 2nd ed., Siemens, 2006.		
	4. Popp M., Weber K., The rapid way to PROFINET, PNO, 2004.		
	5. Michta E., Modele komunikacyjne sieciowego systemu pomiarowo-s	teruiaceno Wyda	wnictwo
	Politechniki Zielonogórskiej, Zielona Góra, 2000.		WINCLWO
	1. Comer D. E., Sieci komputerowe i intersieci: aplikacje internetowe, Ed. 4, WN	T Warszawa 2000	
Supplementary references	2. PROFINET specyfikacje: IEC 61784-1; IEC 61784-2; IEC 61784-5; IEC 6 IEC61784.		
1010101000	3. PN EN 61131-3:2004 Sterowniki programowalne: języki programowania.		
	4. www.profibus.com, www.profibus.org.pl (PNO).		
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the prog	ramme
Author of the programme	dr hab. inż. Arkadiusz Mystkowski	2019-09-23	

				Bial	<u>ystok U</u>	niversity	<u>/ of Tech</u>		
Field of study		Auto	omatic (Control	and Ro	obotics		Degree level and programme type	full-time Master's degree
Specjalization / diploma path			com	puter s	ystems			Study profile	general academic
Course name	۸r	tificial r	oural n	otworks	and ev	pert syst	tome	Course code	MYAR2S22003
								Course type	elective
Forms and number of hours	L	С	LC	Р	SW	FW	S	Semester	2
of tuition	30	0	0	0	30	0	0	No. of ECTS credits	5
Entry requirements							-		
Course objectives	applica archited expert	tions in cture. U system	technica nderstar using PC	I proble iding ba Shell c	ms. Acq sic prob lass soft	uaintanc lems of ware.	e with se expert sy	lected methods of op stems synthesis, pra-	I neural networks and their timization of neural network ctical implementation of the
Course content	network optimiz optimiz and dia creating artificia and ide Optimiz and ne	ks, SVN ation of agnostic g expert l neural entification zation of uro-fuzz	A netwo the arch gorithms problem systems network on of dy f the neu cy netwo	rks, de iitecture (includ ns. Cond s. Exam s in tas namic s ural net rks. Acq	ep neur of a fee ing gene cept and ples of e ks: appr systems. work arc uaintanc	al netwo forward i etic algor l architeo expert sy oximatio The use hitecture	orks, neu neural ne ithms). A cture of e stems. Hy n of inpu e of netw using pr e enviror	ro-fuzzy networks. I twork. Teaching neuro opplication of neural re- expert systems. Know ybrid methods. Specia t-output mappings, pa orks in the problems uning methods. Desig	neural networks: feedback Problems of selection and al networks using advanced networks in process control ledge acquisition. Tools for alistic workshop: The use of attern recognition, modeling of control and diagnostics. gning SVM neural networks pert systems. Designing and
Teaching methods						ion work			
Assessment method	Leo	cture: ex	am					l progress. discussion	and activity at workshop
Symbol of	I			- I	Learning				Reference to the learning
LO1		g and a			structure	s of neu		orks, methods of their automatic control and	
LO2			ods of o	ptimizat	ion of ne	ural netv	vork archi	tecture	AR2_W03 AR2_W07
LO3	cites ar	nd prese	ents mair	n issues	related t	o synthe	sis of exp	ert systems	AR2_W03 AR2_W07
LO4	selecte	d techni	cal prob	lem and	analyze	its opera	ation and	a neural network in a performance	
LO5		sign and ven prot		an artific	cial neura	al netwoi	rk with th	e optimal architecture	
LO6			expert system		evaluate	its opera	tion and p	propose, if necessary	
Symbol of learning outcome			Me	ethods of a	assessing	the learnin	g outcomes	8	Type of tuition during which the outcome is assessed
L01	Lecture	e: exam;							W
LO2		e: exam;							W
LO3	Lecture	e: exam;							W
LO4	and act	tivity at v	vorkshop);		•		progress, discussion	PS
LO5	Special and act	listic wo	orkshop: workshop	evaluat o;		-		progress, discussion	гъ
LO6			workshop	o;		-	ndividual	progress, discussion	Ps
			S	tudent wor	kload (in ho	urs)			No. of hours

	Lecture attendance	30	
	Workshop attendance	30	
Calculation	Preparation for the lecture exam; participation in the exam	14	
Calculation	Preparation of reports from excercises made at the specialistic workshop	46	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	125	
	Quantitative indicators	Hours	ECTS
	Student workload - activities that require direct teacher participation	67	2,7
	Student workload - practical activities	81	3,2
Basic references	 Duch W. i in. (red.), Biocybernetyka i inżynieria biomedyczna 2000, Tc Akademicka Oficyna Wydawnicza Exit, Warszawa 2000. Grzech A. i in., Inżynieria wiedzy i systemy ekspertowe. Akademicka O Warszawa, 2009. Osowski S., Sieci neuronowe do przetwarzania informacji, Oficyna Warszawskiej. Warszawa 2013. Rutkowski L., Metody i techniki sztucznej inteligencji. Wydawnictwo Naukowe 5. Kosiński R. A., Sztuczne sieci neuronowe: dynamika nieliniowa i chaos. Wyd 2014. 	ficyna Wydawnicz Wydawnicza Poli PWN, Warszawa, 2	a EXIT, itechniki 2009.
Supplementary references	 Białko M., Sztuczna inteligencja i elementy hybrydowych systemów eks Uczelniane Politechniki Koszalińskiej, Koszalin 2005. Markowska-Kaczmar U., Ekstrakcja reguł z sieci neuronowych: podej Wydawnicza Politechniki Wrocławskiej, Wrocław 2006. Fujarewicz K., Zastosowanie wybranych metod sieci neuronowych w ste Wydawnictwa Politechniki Śląskiej, Gliwice 2010. Osowski S., Metody i narzędzia eksploracji danych. Wydawnictwo BTC, Legio 5. Tuffery S., Data mining and statistics for decision making. John Wiley and Sor 	ście ewolucyjne. erowaniu i bioinfor nowo 2013.	Oficyna
Organisational unit conducting the course	Katedra Automatyki i Elektroniki	Date of issuing the progr	amme
Author of the programme	dr hab. inż. Mirosław Świercz, prof. PB	2019-09-23	

				Bial	ystok U		endix No 1 t of Techno	o the Directive No 915/ Dogy	2019 of the	Rector of BUT
Field of study		Aut	omatic			obotics		Degree level and programme type		e Master's egree
Specjalization / diploma path			con	nputer s	systems			Study profile	genera	l academic
			0		a f na h ai	1-		Course code	MYA	R2S22004
Course name			Coop	eration	of robo	(S		Course type	el	ective
Forms and	L	С	LC	Р	SW	FW	S	Semester		2
number of hours of tuition	15	0	0	30	0	0	0	No. of ECTS credits		4
Entry				•			-	· · ·		
requirements Course objectives	related	to con	trol of s	warms	and forr	nations o	of mobile r	bots and mobile robo obots, communicatio ement cooperation be	n and dat	a exchange in
Course content	familiar and da robots. robotic work c coopera	ization v ta excha Project cell. Imp ell and ating rol	vith meth ange be : Modeli blementa providin poots. De	nods of o tween ro ng of a ation of t g the ir signing	control o obots op robotic he ROS nterface control la	f swarms erating ir cell arme system p necessar aws, algo	and formation a group. d with at lockage colory to carry prithms for	tion of principles of tions of mobile robots Methods of planning east two robots and ntaining the position r out the project task cooperation, planning Simulink environmer	, issues of the route sensors. (nodel, cont (in the si), generation	communication for cooperating Calibration of a figuration of the mulation using
Teaching methods	Informa	ative-pro	blem lec	ture; Pro	oject cla	sses;				
Assessment method	Leo Pro	cture: or oject: ev	ie test	of pro			current pro	ogress in project co	mpletion,	discussion and
Symbol of					Learning	g outcomes				ce to the learning
LO1	knows	the meth	nods of v	vork cell	calibrati	on			AR2_W07	for the field of study
LO2	knows	the basi	c metho	ds of co	operatior	n of mobil	e robots ar	nd industrial robots	AR2_W03	
LO3	optimiz	ation of	systems	consist	ing of ma	any coope	erating robo			AR2_W07
LO4		a excha	•	•	•		•	s, choose parameters n consisting of many		
Symbol of learning outcome						-	ng outcomes		the outc	uition during which ome is assessed
LO1							completion the classe	n, current progress in s;	י W	Р
LO2							completion the classe	n, current progress ir s;	۳ W	Р
LO3	Lecture	e: one te	est; Proj	ect: eva	luation o	of project		n, current progress ir	۳ W	Р
LO4	Lecture	e: one te	est; Proj tion, disc	ect: eva cussion a	luation of and activ	of project ity during		n, current progress ir	VV	Р
	11	-H- '		Student wo	orkload (in h	ours)			N	o. of hours
	-	e attenda								15
		attenda		loct(c)						<u>30</u> 14
Calculation	· · ·		lecture f							14 18
Calculdtion		au011101	project	103343						
	WVArkin	a on pro	iacte (in	cluding	ronarati	on of pro	sontations)			12
			jects (in projects			on of pre	sentations)			<u>12</u> 6

1	TOTAL	100	
	Quantitative indicators	Hours	ECTS
	50	2	
	Student workload - practical activities	71	2,8
Basic references	 Lentin J., Mastering ROS for robotics programming. Packt Publishing Ltd, UK, 20 O'Kane J. M., A gentle introduction to ROS. University of South Karolina, Colum Martinez A., Fernandez E., Learning ROS for robotics programming. Packt Public Ren W., Beard R. W., Distributed consensus in multi-vehicle cooperation applications. Springer-Verlag London, 2008. 	bia 2013. ishing Ltd, UK, 201	
Supplementary references	1. Shamma J., Cooperative control of distributed multi-agent systems. John Wiley8 2. Siciliano B., Khatib O., Handbook of robotics, 2nd edition. Springer-Verlag Berlin		
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the progr	amme
Author of the programme	dr inż. Adam Wolniakowski	2019-09-23	

	I			Bial	ystok u	niversity	of Techn	ology			
Field of study		Auto	omatic	Contro	l and R	obotics		Degree leve programme			ne Master's egree
Specjalization / diploma path			com	nputer s	ystems			Study pro	file	genera	l academic
Course name		Ir	ntelliger	t tochn	ical eve	tome		Course co	ode	MYA	R2S22005
				1	-	1	-	Course ty	-	el	ective
Forms and number of hours		C	LC	P	SW	FW	S	Semest			2
of tuition Entry	15 0 0 30 0 0 0 No. of ECTS credits								credits		4
requirements							-				
Course objectives	robotic: the issu	s. Interno ues of ma	et of thii achines	ngs, use and rob	e of integ ots adap	grated co pting to th	mputer sy e environn	stems to creatent, intelliger	ate digital nt sensors	factories, and mate	automation and introduction to erials. oplications. The
Course content	large d system efficien Integra measu devices knowle intellige	atabase s to cre cy. Intro tion of ring instr s. Know dge reso ent mate	s. Exam eate dig duction the mad ruments /ledge-ba ources. F	ples of ital fact to self-le chine co . Industr ased sy Practical	impleme cories. E controller ial exar ystems. exampl	entations. Experiment machines with art nples of Systems es of sys	Digital fa ntal metho and robot ificial intel intelligent s that ac tems. Intro	ctory concept ods of increates. Examples ligence algor measuring sy quire knowled oduction to inf	t. The use asing proo of industri ithms. Sr ystems. M edge auto telligent m	e of integ ductivity a ial self-lea nart sens leasuring omatically aterials.	ctive search of rated computer and production arning systems. sors. Intelligent self-calibrating from various Classification of nergy recovery
	introdu fuzzy c	ction of t controller	echnical); develo	opment I devices opment	of an int s to prog of a sel	telligent o gramming f-learning	; developn	em for the pr nent of knowle system; Integ	oduction li edge-base	ed control	e of the project: (rule modeling, of the machine
Teaching methods	fuzzy c with art	ction of t controller	echnica); develo elligence	opment l devices opment e algorith	of an int s to prog of a sel nms; alg	telligent o gramming f-learning orithm te	; developn I machine	em for the pr nent of knowle system; Integ	oduction li edge-base	ed control	(rule modeling,
Teaching methods Assessment method	introduction fuzzy of with art Information Leo Pro	ction of t controller cificial int ative-prol cture: on	technical ; develo <u>elligence</u> blem lec e test raluation	opment I devices opment <u>e algorith</u> ture; Pro	of an in s to prog of a sel nms; alg pject clas	telligent c gramming f-learning orithm te sses;	; developn j machine sts on real	tem for the pro- nent of knowle system; Intego objects.	oduction li edge-base gration of	ed control the PLC	(rule modeling, of the machine
methods Assessment method Symbol of	introduction fuzzy of with art Information Leo Pro	ction of t controller ificial int ative-prol cture: on oject: ev	technical ; develo <u>elligence</u> blem lec e test raluation	opment I devices opment <u>e algorith</u> ture; Pro	of an in s to prog of a sel nms; alg oject clas lect con	telligent c gramming f-learning orithm te sses;	; developn j machine sts on real	tem for the pro- nent of knowle system; Intego objects.	oduction li edge-base gration of	npletion, Referen	(rule modeling, of the machine discussion and ce to the learning
methods Assessment method Symbol of learning outcome	introdu fuzzy c with art Informa Leo Pro act	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri	echnical); develo elligence blem lec e test raluation ing the c	opment I devices opment e algorith ture; Pro of proj lasses	of an initiation of a set of a	telligent c gramming f-learning orithm te sses; npletion, g outcomes	; developn j machine sts on real current pr	em for the pro- nent of knowle system; Integ objects.	oduction li edge-base gration of	npletion, our control	(rule modeling, of the machine discussion and
methods Assessment method Symbol of	introdu fuzzy c with art Informa Pro act knows knows discuss	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und s the app	echnical elligence blem lec e test raluation ng the c erstands derstand	opment I devices opment e algorith ture; Pro of proj lasses s basic c s the pr areas o	of an initiation of a set of a	telligent c gramming f-learning orithm te sses; npletion, g outcomes related to of the Ir ent syste	; developn j machine sts on real current pr o intelligen nternet of ems based	em for the pro- nent of knowle system; Integobjects. rogress in pro- t technical sy Things; can on the conce	oduction li edge-base gration of oject com stems point and	ed control the PLC	(rule modeling, of the machine discussion and ce to the learning for the field of study
methods Assessment method Symbol of learning outcome LO1	introdu fuzzy c with art Informa Pro act knows knows discuss Interne knows knows	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und t of Thing and und	echnical elligence blem lec e test raluation ing the c erstands derstand oblication gs; know derstand resentat	opment I devices opment e algorith ture; Pro of proj lasses s basic c s the pr areas o <u>vs the to</u> s the si ion, heu	of an initiation of a series to progot a series of a s	telligent o gramming f-learning orithm ter sses; npletion, g outcomes related to of the Ir ent syste igital fact of mach	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert	em for the pro- nent of knowle system; Integobjects. rogress in pro- t technical sy Things; can on the conce	oduction li edge-base gration of oject com stems point and ept of the ethods of	ed control the PLC	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_U01 AR2_W05
methods Assessment method Symbol of learning outcome LO1 LO2	introdu fuzzy c with art Informa Lec Pro act knows discuss Interne knows knowle learning	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und t of Thin and und dge rep g and da	echnical elligence blem lec e test raluation ing the c erstands derstand oblication gs; know derstand resentat ta minin	opment I devices opment algorith ture; Pro of proj lasses s basic c s the pr areas o <u>vs the to</u> s the st ion, heu g	of an initial of a set of a se	telligent c gramming f-learning orithm ter sses; npletion, g outcomes related to of the Ir ent syste igital fact of mach ontrol alg	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert	em for the prinent of knowle system; Integ objects. rogress in print t technical sy Things; can on the conce systems, me he need for	oduction li edge-base gration of oject com stems point and ept of the ethods of	ed control the PLC	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_U01
methods Assessment method Symbol of learning outcome LO1 LO2 LO2	introdu fuzzy c with art Informa Pro act knows knows discuss Interne knows knowle learning knows	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und tof Thin and und dge rep g and da the princ	echnical elligence blem lec e test raluation ing the c erstands derstand plication gs; know derstand resentat ita minin ciple of o	opment I devices opment algorith ture; Pro of proj lasses a basic c s the pr areas o vs the to s the si ion, heu g peration	of an initial of an initial of a set of	telligent c gramming f-learning orithm ter sses; npletion, g outcomes related to of the Ir ent syste igital fact of mach ontrol alg	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert gorithms, t	em for the prinent of knowle system; Integ objects. rogress in print t technical sy Things; can on the conce systems, me he need for	oduction li edge-base gration of oject com stems point and ept of the ethods of machine	ed control the PLC	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_U01 AR2_W05
methods Assessment method Symbol of learning outcome LO1 LO2 LO2 LO3 LO3	introdu fuzzy c with art Informa Pro act knows knows discuss Interne knows knowle learning knows can pro	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und tof Thin and und dge rep g and da the princ ocess an	echnical elligence blem lec e test raluation ing the c erstands derstand plication gs; know derstand resentat ta minin ciple of o d analyz	opment I devices opment e algorith ture; Pro of proj lasses basic c s the pr areas o vs the to s the st ion, heu g peration	of an initial of a set of a se	telligent of gramming f-learning orithm ter sses; npletion, g outcomes related to of the Ir ent syste igital fact of mach ontrol alo pes of inte	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert gorithms, t elligent sen cision mak	em for the prinent of knowle system; Integ objects. rogress in print t technical sy Things; can on the conce systems, me he need for sors	oduction li edge-base gration of oject com stems point and ept of the ethods of machine	ed control the PLC	(rule modeling, of the machine discussion and ice to the learning for the field of study AR2_W07 AR2_U01 AR2_W05 AR2_W07
methods Assessment method Symbol of learning outcome LO1 LO2 LO2 LO3 LO4 LO4 LO5	introdu fuzzy c with art Informa Lee Pro act knows discuss Interne knows knowle learning knows can pro can inte	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und and und dge rep g and da the princ ocess an egrate th assify int	echnical elligence blem lec e test raluation ing the c erstands derstand plication gs; know derstand resentat ita minin ciple of o d analyz	opment I devices opment algorith ture; Pro of proj lasses a basic c s the pr areas o vs the to s the si ion, heu g peration re large o	of an initiation of a series to progot a series of a s	telligent o gramming f-learning orithm ter sses; npletion, g outcomes related to of the Ir ent syste igital fact of mach ontrol alo pes of inte es for deo ith an arti	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert gorithms, t elligent sen cision mak ficial intelli	em for the prinent of knowle system; Integ objects. ogress in pr t technical sy Things; can on the conce systems, me the need for sors	oduction li edge-base gration of oject com stems point and ept of the ethods of machine	ed control the PLC pletion, or areferen outcomes AR2_W05 AR2_W03 AR2_W04 AR2_W04 AR2_U03 AR2_U04 AR2_U02	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_W07 AR2_W05 AR2_W05 AR2_W07 AR2_U06 AR2_U09 AR2_U06
methods Assessment method Symbol of learning outcome LO1 LO2 LO2 LO3 LO4 LO5 LO6	introduc fuzzy c with art Informa Lec Pro act knows knows discuss Interne knows knowle learning knows can pro can inter	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und and und dge rep g and da the princ ocess an egrate th assify int	technical elligence blem lec e test raluation ing the c erstands derstand oblication gs; know derstand resentat ita minin ciple of o d analyz elligent	opment I devices opment e algorith ture; Pro of proj lasses basic c s the pr areas o <u>vs the to</u> s the st ion, heu g peration te large o iller mac material	of an initial of a set of a se	telligent of gramming f-learning orithm ter sses; npletion, goutcomes related to of the Ir ent syste igital fact of mach ontrol alo bes of inte es for deo ith an arti n their b	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert gorithms, t elligent sen cision mak ficial intelli	em for the prinent of knowle system; Integ objects. rogress in print t technical sy Things; can on the conce systems, me the need for sors ing processes gence algorith n an energy	oduction li edge-base gration of oject com stems point and ept of the ethods of machine	ed control the PLC pletion, or area area area area area area area are	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_U01 AR2_W05 AR2_W05 AR2_W05 AR2_U06 AR2_U09
methods Assessment method Symbol of learning outcome LO1 LO2 LO2 LO3 LO4 LO5 LO5 LO6 LO7 Symbol of	introdu fuzzy c with art Informa Lec Pro act knows discuss Interne knows knowle learning knows can pro can inte system	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und and und dge rep g and da the princ ocess an egrate th assify int	technical elligence blem lec e test raluation ing the c erstands derstand oblication gs; know derstand resentat ta minin ciple of o d analyz e contro elligent	opment I devices opment e algorith ture; Pro of proj lasses basic c s the pr areas o <u>vs the to</u> s the st ion, heu g peration te large o iller mac material	of an initial of a set of a se	telligent of gramming f-learning orithm ter sses; npletion, goutcomes related to of the Ir ent syste igital fact of mach ontrol alo bes of inte es for deo ith an arti n their b	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert gorithms, t elligent sen cision mak ficial intelli asis, desig	em for the prinent of knowle system; Integ objects. rogress in print t technical sy Things; can on the conce systems, me the need for sors ing processes gence algorith n an energy	oduction li edge-base gration of oject com stems point and ept of the ethods of machine	ed control the PLC pletion, o Referen outcomes AR2_W05 AR2_W05 AR2_W03 AR2_W04 AR2_W04 AR2_W04 AR2_U03 AR2_U04 AR2_U02 Type of tu the outc W	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_W07 AR2_W05 AR2_W05 AR2_W07 AR2_U06 AR2_U09 AR2_U06 uition during which
methods Assessment method Symbol of learning outcome LO1 LO2 LO2 LO3 LO4 LO4 LO5 LO6 LO6 LO7 Symbol of learning outcome	introdu fuzzy c with art Informa Lee Pro act knows discuss Interne knows knowle learning knows can pro can inte can cla system Lecture Lecture	ction of t controller ificial int ative-prol cture: on oject: ev ivity duri and und and und and und and und and und g the app t of Thin and und dge rep g and da the princ ocess an egrate th	technical elligence blem lec e test valuation ing the c erstands derstand oblication gs; know derstand resentat ta minin ciple of o d analyz relligent M st; st;	opment I devices opment e algorith ture; Pro of proj lasses basic c s the pr areas o <u>vs the to</u> s the st ion, heu g peration te large o iller mac material	of an initial of a set of a se	telligent of gramming f-learning orithm ter sses; npletion, goutcomes related to of the Ir ent syste igital fact of mach ontrol alo bes of inte es for deo ith an arti n their b	; developn j machine sts on real current pr o intelligen nternet of ems based ory design ine expert gorithms, t elligent sen cision mak ficial intelli asis, desig	em for the prinent of knowle system; Integ objects. rogress in print t technical sy Things; can on the conce systems, me the need for sors ing processes gence algorith n an energy	oduction li edge-base gration of oject com stems point and ept of the ethods of machine	ed control the PLC pletion, or area area area area area area area are	(rule modeling, of the machine discussion and ce to the learning for the field of study AR2_W07 AR2_W07 AR2_W05 AR2_W05 AR2_W07 AR2_U06 AR2_U09 AR2_U06 uition during which

LO5	Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	Р	
LO6	Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	Р	
L07	Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	Р	
	Student workload (in hours)	No. of hours	
	Lecture attendance	15	
	Project attendance	30	
	Preparation for lecture test(s)	14	
O alex lation	Preparation for project classes	18	
Calculation	Working on projects (including preparation of presentations)	12	
	Preparation for projects completion	6	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	100	
	Quantitative indicators	Hours	ECTS
	Student workload - activities that require direct teacher participation	50	2
	Student workload - practical activities	71	2,8
	1. Rutkowski L., Metody i techniki sztucznej inteligencji. Inteligencja obliczeniowa. I	PWN Warszawa 20	005.
Basic references	2. Osowski S., Sieci neuronowe do przetwarzania informacji. Oficyna W	/ydawnicza Polite	chniki
Dasic references	Warszawskiej 2013.		
	3. Conway D, White M. J., Uczenie maszynowe dla programistów. Gliwice, Helion,	2015.	
	1. Russell S. J., Norvig P., Artificial intelligence - a modern approach (2nd Ed.), Pre	entice-Hall, 2001.	
	2. Krawiec K., Stefanowski J., Uczenie maszynowe i sieci neuronowe, Oficyna \	Nydawnicza Polite	chniki
Supplementary	Poznańskiej, 2004.		
references	3. Cichosz P., Systemy uczące się. Wydawnictwa Naukowo-Techniczne, Warszaw	a, 2000.	
	 Ciupke K., Laboratorium metod sztucznej inteligencji z zastosowaniem je Politechniki Śląskiej, 2016. 	ęzyka R, Wydawi	nictwo
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the prog	ramme
Author of the programme	dr inż. Sławomir Romaniuk	2019-09-23	

				Bia	alystok l	Jniversit	y of Tech					
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Master's degre			
Specjalization / diploma path			con	nputer	systems			Study profile	genei	al academic		
			• .		-	Course code	MYA	MYAR2S22006				
Course name			Auto	mation	system	Course type	elective					
Forms and	L	С	LC	Р	SW	FW	S	Semester		2		
number of hours of tuition	30	0	0	15	0	0	0	No. of ECTS credits		4		
Entry			1				_					
course course objectives	Familiarizing with the concepts of automation (robotization). Presentation and analysis of selected system for automation (robotization) of production / industrial processes and automation systems for buildings Learning procedures of designing systems for automation of production / industrial processes, automatio systems for buildings and with creating documentation using computer-aided environments for engineerin design.											
Course content	automa of serv introdu and au homes and ris Pneum of auto automa	ation, au rice, pro ction. Tr itomatio , cities, k monit atic and mation. ation sy	utomation oduction, echnolog n of bui enterprisoring. Co I hydraul Project: stems fi	n syster indust gical un ldings. ses, en ompreh lic autor Desigr or build	m, autom rial proc employm Internet ergy sys ensive a mation sy ning syste lings. Pr	nation an esses ar nent. The of Thing tems, me utomation vstems. E ems for a inciples	d automat nd automa process o s. The us easuremen n. Automa Developme automation	es, automated proc ic control. Advantag ation of buildings. I of automation of pro se of internet techn nt systems, environ ition tool - programment trends and the lat n of service, production ing documentation ing design.	jes of introd Disadvantag duction / inc ologies in t mental mon nable logic test achieve tion, industri	lucing automation es of automation dustrial processes he automation o itoring processes controllers (PLC) ements in the field al processes and		
Teaching methods	Informative-problem lecture; Project classes;											
Assessment method	Pro	•		of proje	ect comp	letion, cu	rrent prog	ress in project comp	letion, discu	ission and activity		
Symbol of									ence to the learning			
LO1	knows the concepts related to automation (robotization) and lists the benefits resulting from the introduction of automation (robotization) of service, production, industrial processes and automation of buildings						its AR2_W03	es for the field of study				
LO2	provides stages and describes the essence of automation of service, production, industrial processes and automation of buildings											
LO3	lists an and in	nd analyzes exemplary systems for the automation of service, production AR industrial processes, automation of buildings and knows the latest opment trends in the field of automation					est					
LO4	compu	ter-aide	d enviror	nments	for engin	eering de	esign	e documentation usi		AR2_U02 AR2_U03		
LO5		ganize d proce		k of a	project	team dea	aling with	the automation of				
Symbol of learning outcome	1 - 1			lethods o	f assessing	g the learni	ng outcomes	3	the ou	tuition during which tcome is assessed		
L01		e: two te							W			
L02		e: two te	-						W			
LO3		e: two te	,		a manufa 4		1 mmc	in protect accords (W			
LO4			uion of p	•	completio	n, curren	ι progress	in project completion	Dr1,	Р		
LOT	 discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes; 									I.		
LO5	Project	: evalua	tion of p	roject c	ompletio	n, curren	t progress	in project completion	on,	P		

	Lecture attendance	30								
Calculation	Project attendance	15								
	Preparation for lecture test(s)	17								
	Preparation for project classes	21								
	Working on projects (including preparation of presentations)	6								
	Preparation for projects completion	6								
	Participation in teacher-student sessions related to the module subject	5								
	TOTAL	100								
	Quantitative indicators Student workload - activities that require direct teacher participation	Hours	ECTS							
	50	2								
	Student workload - practical activities	53	2,1							
	1. Marciniak M., Elementy automatyzacji we współczesnych procesach wytwarzania. Oficyna Wydawnicza									
	Politechniki Warszawskiej, Warszawa, 2007.									
	2. Mikulczyński T., Automatyzacja procesów produkcyjnych: metody modelowania procesów dyskretnych i									
	programowania sterowników PLC. PWN, Wydawnictwo 2, Warszawa, 2017.									
	3. Mikulczyński T., Samsonowicz Z., Więcławek R., Automatyzacja procesów produkcyjnych. Wydawnictwo									
Basic references	Naukowe PWN, Warszawa, 2017.									
	4. Świder J. (red.), Sterowanie i automatyzacja procesów technologicznych układów mechatronicznych.									
	Układy pneumatyczne i elektropneumatyczne ze sterowaniem logicznym (PLC). Wydawnictwo Politechniki									
	Śląskiej, Gliwice 2015.									
	5. Kost G., Łebkowski P., Węsierski Ł., Automatyzacja i robotyzacja procesów produkcyjnych. PWE									
	Polskie Wydawnictwo Ekonomiczne. Warszawa, 2013.									
	1. Czasopisma, m.in. Pomiary, Automatyka i Robotyka (PAR); Automatyka; Napędy i sterowanie,									
Supplementary references	internetowe bazy danych Google Scholar, Google Patents, zdalne bazy czasopism naukowych PB,									
	www.intechopen.com									
	2. Matyszewska E. (red.), Automatyzacja przemysłu spożywczego Casebook. Wydawnictwo Naukowe									
	PWN. Warszawa, 2016.									
	3. Serwisy internetowe: iAutomatyka.pl, eplan.pl, astor.com.pl, automatykab2b.pl, aps.pl.									
Organisational	Katadan Automatuki Dabatuki	Data of includes the sures								
unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the prog	Jiailiile							
Author of the	dr inż. Roman Trochimczuk	2019-09-23								
programme										

				Bialy	vstok Ur		of Techno	to the Directive No 915, logy		
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Master's degree	
Specjalization / diploma path			com	nputer s	ystems	Study profile	general academic			
			Autor		ovetem	Course code	MYAR2S22007 elective			
Course name			Autor	nomous	system	Course type				
Forms and number of hours	L	С	LC	Р	SW	FW	S	Semester	Semester	
of tuition	30	0	30	15	0	0	0	No. of ECTS credits		6
Entry requirements							-			
Course objectives	Familiarization with known solutions of autonomous systems. Explanation of terms: adaptation, redundancy, reconfiguration and synergy. Presentation of sensors used to analyze the state of the environment and the internal state of the system. Discussion of the issues of designing autonomous mobile robots: avoiding obstacles, reconfiguration in case of damage, autonomy of takeoff and landing in case of flying robots, autonomous navigation, trajectory planning.									
Course content	Characteristics of various sources of obtaining image information. Presentation and discussion of methods for motion measurement and estimation. Active motion analysis in the environment as well as techniques and methods of building the environment map (SLAM). Concepts of planning algorithms and generating the trajectory of movement of autonomous mobile objects. Application and integration of multi-stage control algorithms. Autonomous mobile robots - design, modeling, control and analysis of on-board equipment in terms of tasks and implementation of autonomous motion. Reactive navigation. Location of a mobile robot. The use of sensory information to build algorithms for detecting and bypassing obstacles. Designing a diagnostic system to reconfigure the control system in the event of a drive failure. Laboratory: Designing and programming control laws, navigation functions, reactive navigation functions and control algorithms in safe mode and testing them on flying platforms. Project: Modeling of autonomous mobile platforms and simulation of mobile motion of an autonomous robot, designing of advanced functions and simulations and simulation of mobile motion of an autonomous robot, designing of advanced functions and simulations and simulation of mobile motion of an autonomous robot.									
Teaching	algorithms increasing the autonomy level of a mobile robot. Informative-problem lecture; Laboratory classes; Project classes;									
methods Assessment method	Leo Lat Pro	ture: two poratory:	o tests evaluat aluation	ion of int of proje	roductor	ry tests, ro	eports, disc	cussion and activity d ogress in project co	mpletion, o	discussion and
Symbol of learning outcome	Learning outcomes						ce to the learning for the field of study			
LO1	process		analysis	s in real				methods of image a trajectory of motion	AR2_W01	AR2_W02
LO2						nentation use then		n and optimization o		AR2_W06
LO3		s, eleme						n, including multi-drive ad the necessary leve	I	AR2_U04
LO4			•			nomous s ying robo	•	d model the dynamics		
LO5	can des in the a	sign muli pplicatio	ticriterial	control and robots	algorithr	ns ensuri	ng autonor	my and simulate then		
LO6	autono	mous sy	stems te	chnolog	y and de	emonstrat		ports in the field o ative in the search fo stems	r	AR2_K02
Symbol of learning outcome							g outcomes		the outc	iition during which ome is assessed
LO1					•			ctory tests, reports evaluation of projec	VV	L P

		1		
	completion, current progress in project completion, discussion and activity during the classes;			
LO2	Lecture: two tests; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	W F	0	
LO3	Lecture: two tests; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	W F	0	
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	L F	þ	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes; Project: evaluation of project completion, current progress in project completion, discussion and activity during the classes;	L F	0	
LO6	Lecture: two tests;	W		
	Student workload (in hours)	No. of hour	S	
	Lecture attendance	30		
	Laboratory classes attendance	30		
	Project attendance	15		
	Preparation for lecture test(s)	17		
	Preparation for laboratory classes	14		
Calculation	Preparation for laboratory classes completion	6		
	Preparation for project classes	21		
	Working on projects (including preparation of presentations)	6		
	Preparation for projects completion	6		
		5		
	Participation in teacher-student sessions related to the module subject	-		
	Quantitative indicators	150 Hours	ECTS	
	Student workload - activities that require direct teacher participation	80	3,2	
	Student workload - practical activities	103	4,1	
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Supplementary references	 Bovik A., Handbook of image and video processing. Academic Press; 1st edit Academic Press; 2 edition (June 21, 2005). R. Szeliski, Computer vision: algorithms and applications. Springer 2010. Gupta S.,Autonomous robots and agents. Springer, 2007. Fahimi Farbod, Autonomous robots modeling, path planning, and control. Spring 5. Azad Pedram, Visual perception for manipulation and imitation in humanoid robots 	tion (June 14, 20 ger, 2009.	100), lub	
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the pr		
Author of the programme	dr inż. Leszek Ambroziak	2019-09-23		