

Bialystok University of Technology									
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree
Specialization / diploma path	common subject							Study profile	general academic
Course name	Diploma seminar							Course code	MYARS07001
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7
	0	0	0	0	0	0	30	No. of ECTS credits	3
Entry requirements	-								
Course objectives	Acquainting with the principles of the implementation and preparation of the diploma thesis. Acquiring the ability to exchange information (scientific discussion) in the field of automation and robotics. Presentation of own knowledge and views and the ability to publicly defend them. Understanding the rules of conduct during the diploma exam.								
Course content	The rules of writing compact texts, including the presentation of the requirements for the diploma work. Discussing the scope and methodology of preparing the diploma thesis. Discussing the structure of diploma theses. Developing the ability to use various sources of information (discussion, books, articles, sources: websites, workplaces). Acquaintance with the concepts: copyright, intellectual property, plagiarism. Preparation of a patent or utility model proposal (writing rules). Presentation of the diploma thesis in its entirety or its fragments.								
Teaching methods	Seminar classes;								
Assessment method	Seminar: evaluation of presentation of the thesis, discussion and activity during the seminar								
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study
LO1	can refer to the current state of knowledge and shows the latest existing development trends in the field of automatic control and robotics and is ready to solve existing engineering problems								AR1_U05 AR1_K02
LO2	knows and understands issues related to the problem of intellectual property and patent law								AR1_W10
LO3	can obtain information from various sources, analyze it, apply to solving a specific engineering problem								AR1_U02 AR1_U05
LO4	is able to prepare and present a short presentation, using contemporary multimedia techniques, devoted to the results of the engineering task								AR1_U09
LO5	is ready to follow the rules of professional ethics and its application in a professional manner when writing his own engineering diploma thesis								AR1_K05
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed
LO1	Seminar: evaluation of presentation of the thesis, discussion and activity during the seminar;								S
LO2	Seminar: evaluation of presentation of the thesis, discussion and activity during the seminar;								S
LO3	Seminar: evaluation of presentation of the thesis, discussion and activity during the seminar;								S
LO4	Seminar: evaluation of presentation of the thesis, discussion and activity during the seminar;								S
LO5	Seminar: evaluation of presentation of the thesis, discussion and activity during the seminar;								S
Student workload (in hours)									No. of hours
Calculation	Seminar attendance								30
	Preparation for the seminar								28
	Preparation for seminar completion								12
	Participation in teacher-student sessions related to the module subject								5
	TOTAL								75

Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		35	1,4
Student workload - practical activities		75	3
Basic references	1. Pułło A., Prace magisterskie i licencjackie. Wskazówki dla studentów. PWN, Warszawa, 2000. 2. Boć J., Jak pisać pracę magisterską. Wydawnictwo Kolonia Ltd, Wrocław, 2003.		
Supplementary references	1. Opoka E., Uwagi opisanie i redagowaniu prac dyplomowych na studiach technicznych. Wydawnictwo Politechnika Śląska, Gliwice, 2001.		
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the programme	
Author of the programme	prof. dr hab. inż. Zdzisław Gosiewski	2019-09-23	

Białystok University of Technology									
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree
Specialization / diploma path	common subject							Study profile	general academic
Course name	Diploma thesis							Course code	MYARS07002
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7
	0	0	0	0	0	0	0	No. of ECTS credits	16
Entry requirements	-								
Course objectives	Acquainting with the methodology of solving research problems in the field of automatic control and robotics. Acquiring the skills of proper selection and use of literature sources and the use of information gathered in scientific databases. Acquiring the ability to analyze the source material in the aspect of solving the problem set in the diploma thesis. Acquiring the ability to formulate the purpose and scope of work and the choice of methodology and tools to solve the problem. Acquiring the ability to determine the proper structure of the diploma thesis as a report on the implementation of the research task. Teaching theoretical principles or experimental verification of the hypothesis formulated in the diploma thesis. Developing the ability to draw conclusions and analyze and evaluate the results achieved.								
Course content	Analysis of literature materials in the scope of the subject of the thesis. Formulating research problems and hypotheses based on the assessment of the current state of knowledge in the area of diploma thesis. Acceptance of assumptions, theses and objectives of the thesis, calculation and design tools. Determining the structure of the thesis and the schedule of its implementation. The use of interdisciplinary knowledge to conduct analysis, calculations, equipment selection, design work, etc. Verification of the obtained design solution by means of methods and tools of theoretical and experimental analysis. Summary and formulating conclusions. The use of computer support in the simulation and visualization of the obtained results. Preparation of work documentation (text, tables, diagrams, drawings) in accordance with the guidelines for writing theses.								
Teaching methods									
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study	
LO1	can acquire information from various sources, analyze them, apply to solve a specific engineering problem							AR1_U02	AR1_U05
LO2	can plan individual work, prepare and implement a work schedule that ensures deadlines							AR1_W11	AR1_U11
LO3	has detailed knowledge of the current state of knowledge including the latest development trends in the field of automatic control and robotics							AR1_W02	AR1_W04 AR1_W05
LO4	can prepare the text including a discussion of the results of the engineering task being carried out and is ready to critically evaluate it							AR1_U02	AR1_K01
LO5	can use well-chosen programming environments and tools of computer-aided design for modeling and simulation of systems							AR1_W05	AR1_U03
LO6	can perceive non-technical aspects and effects of automatic control and robotics engineer activities, including their impact on the environment and is ready to accept the related responsibility for decisions							AR1_U05	AR1_K02
Symbol of learning outcome	Methods of assessing the learning outcomes							Type of tuition during which the outcome is assessed	
	Student workload (in hours)							No. of hours	
Calculation	Editing of diploma thesis							100	
	Realization of the project/research related to diploma thesis							150	
	Collecting and studying literature related to diploma thesis							125	

	Participation in teacher-student sessions related to the module subject	25	
	TOTAL	400	
	Quantitative indicators	Hours	ECTS
	Student workload - activities that require direct teacher participation	25	1
	Student workload - practical activities	375	15
Basic references	1. Boć J., Jak pisać pracę magisterską, Kolonia, Wrocław, 2001. 2. Kolman R., Zdobywanie wiedzy. Poradnik podnoszenia kwalifikacji (magisteria, doktoraty, habilitacje), Oficyna Wydawnicza Branta, Bydgoszcz-Gdański, 2003. 3. Literatura specjalistyczna - stosownie do tematu pracy.		
Supplementary references	1. Lindsay D., Dobre rady dla piszących teksty naukowe, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 1995.		
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the programme	
Author of the programme	prof. dr hab. inż. Zdzisław Gosiewski	2019-09-23	

Białystok University of Technology										
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	common subject							Study profile	general academic	
Course name	Vocational training							Course code	MYARS07003	
								Course type	obligatory	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7	
	0	0	0	0	0	0	0	No. of ECTS credits	4	
Entry requirements	-									
Course objectives	Vocational training is an important element of preparing for future work. The aim of the vocational training is to build your own workshop during direct work in a group of colleagues or in a team by verifying the theoretical knowledge gained during the studies. It gives you the opportunity to gain personal professional experience and to develop practical skills based on the theoretical foundation.									
Course content	Getting to know the scope of duties and the rights of the trainee. Characteristics of the place of vocational training. Getting to know the organizational issues and production processes and their characteristics at the place of the training. Knowledge and characteristics of technical devices used in technological processes. Participation in the implementation of current professional tasks carried out in the place of the training.									
Teaching methods										
Assessment method	Evaluation of the week job card or required documents									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
LO1	knows the basic principles of safety and health at work in automatic control and robotics								AR1_W10	
LO2	knows issues in the field of quality management								AR1_W09	
LO3	knows and understands the principles of interpersonal and social communication and can apply them								AR1_W09 AR1_U09	
LO4	can work individually and in a team								AR1_U11	
LO5	is ready to critically evaluate his/her knowledge and continuous improvement of professional qualifications								AR1_K01	
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed	
LO1	Evaluation of the week job card or required documents									
LO2	Evaluation of the week job card or required documents									
LO3	Evaluation of the week job card or required documents									
LO4	Evaluation of the week job card or required documents									
Student workload (in hours)								No. of hours		
Calculation	Practical classes supervised by the training supervisor								100	
	TOTAL								100	
Quantitative indicators								Hours	ECTS	
Student workload - activities that require direct teacher participation								100	4	
Student workload - practical activities								100	4	
Basic references	1. Olejnik A., Nauka i praktyka - staże zawodowe w przedsiębiorstwach. Oficyna Wydawnicza Politechniki Opolskiej, Opole, 2011.									
Supplementary references	1. Oleksyn T., Zarządzanie kompetencjami: teoria i praktyka. Oficyna a Wolters Kluwer business, Warszawa, 2010.									
Organisational unit conducting the course	Katedra Automatyki i Robotyki								Date of issuing the programme	
Author of the programme	dr inż. Adam Kotowski								2019-09-23	

Białystok University of Technology										
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	common subject							Study profile	general academic	
Course name	Intellectual property protection							Course code	MYARS07004	
								Course type	obligatory	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7	
	15	0	0	0	0	0	0	No. of ECTS credits	1	
Entry requirements	-									
Course objectives	Acquainting with the basic regulations regarding the protection of intellectual property, including industrial property (patents, utility models, etc.), copyright and related rights, as well as non-infringement of other exclusive rights.									
Course content	Intellectual property. Sources of intellectual property rights. Copyright and related rights. Subject of copyright. Copyright entity. Copyright property rights. Author's personal rights. Copyright protection. Workforce. Industrial property. Invention and innovation. Objects of industrial property rights (invention, utility model). Protection of trademarks, industrial designs, topography of integrated circuits, geographical indications. Obtaining a patent. Structure of patent claims. Proceedings before the Patent Office. Conditions of international protection. Contracts used in the course of intellectual property rights. Intellectual property in the university's activity. The Act on Combating Unfair Competition.									
Teaching methods	Informative-problem lecture;									
Assessment method	Lecture: one test									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
LO1	understands the basic concepts of intellectual property protection								AR1_W10	
LO2	knows and understands the differences between industrial property rights and copyright law								AR1_W10	
LO3	recognizes and classifies objects of industrial property law, the copyright								AR1_W10	
LO4	understands the non-technical aspects and effects of engineering activities								AR1_U05	
LO5	analyzes and evaluates engineering activities and the possibility of its commercial use								AR1_K04	
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed	
LO1	Lecture: one test;								W	
LO2	Lecture: one test;								W	
LO3	Lecture: one test;								W	
LO4	Lecture: one test;								W	
LO5	Lecture: one test;								W	
Student workload (in hours)								No. of hours		
Calculation	Lecture attendance								15	
	Preparation for lecture test(s)								5	
	Participation in teacher-student sessions related to the module subject								5	
	TOTAL								25	
Quantitative indicators								Hours	ECTS	
Student workload - activities that require direct teacher participation								20	0,8	
Student workload - practical activities								0	0	
Basic references	1. Adamczak A. (red.), du Vall M., Ochrona własności intelektualnej, Uniwersytecki Ośrodek Transferu Technologii Uniwersytetu Warszawskiego, 2010. 2. Ożegalska-Trybalska J., Uchańska J., Kostański P., Traple E. (red. naukowy), Podrecki P., du Vall M., du Vall P., Prawo patentowe. Wolters Kluwer, 2017.									

	3. Nowak–Gruca A., Własność intelektualna w przedsiębiorstwie, Gdańsk: ODDK Sp. o.o. Sp.k, 2018. 4. Pyrża A., Poradnik wynalazcy, Urząd Patentowy RP, 2017.	
Supplementary references	1. Michniewicz G., Ochrona własności intelektualnej, C.H.BECK, 2016. 2. Salomonowicz M., Prawna regulacja komercjalizacji własności intelektualnej publicznych szkół wyższych, Warszawa: Wolters Kluwer, 2016. 3. Ustawa z dnia 4 lutego 1994 r. o prawie autorskim i prawach pokrewnych (Dz. U. 2017. 880 z późn. zm.). 4. Ustawa z dnia 30 czerwca 2000 r. Prawo własności przemysłowej, (Dz.U.2001 nr 49 poz. 508 z późn. zm.). 5. Ustawa z dnia 16 kwietnia 1993 r. o zwalczaniu nieuczciwej konkurencji, (Dz.U. 1993 nr 47 poz. 211 z późnn. zm.).	
Organisational unit conducting the course	Katedra Mechaniki i Informatyki Stosowanej	Date of issuing the programme
Author of the programme	dr Izabela Senderacka	2019-09-23

Bialystok University of Technology									
Field of study	Automatic Control and Robotics						Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	common subject						Study profile	general academic	
Course name	Fundamentals of business process management						Course code	MYARS07005	
							Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7
	15	0	0	0	0	0	0	No. of ECTS credits	1
Entry requirements	-								
Course objectives	Acquainting with legal procedures related to running a business as well as business planning. Preparing to efficiently move in the area of opening and running a business, familiarizing with the conditions of its development and types of entrepreneurship. Identification of the needs of developing individual entrepreneurship in the process of enterprise creation. Developing entrepreneurial activity planning skills (searching for ideas), teaching practical use of knowledge about the process of starting own business, preparing the business plan of the company. Developing the skills of searching, analyzing and evaluating available information related to starting and running own business.								
Course content	Entrepreneurship around the world at the turn of the 20th and 21st centuries. Changes in the sphere of technology, groundbreaking organizational solutions, changes in consumer preferences, the effects of globalization and international competition. Own business as a career option after graduation. Features and skills of the leaders of new ventures. From the idea to running a business. How to identify a good business idea. Sources of inspiration. Phases of the implementation of a business venture. Business plan - definition and basic elements. Technique for developing a business plan. Elements of the BMC model. Sources of financing innovative projects. Financing new business - general trends. Bank credit. Banks and a new business. Loan funds and credit guarantee funds. Funds for the development of an innovative company from the EU structural funds. Venture capital. Business angels. Legal form for a new venture. Financial and accounting system. Founding team, staff, organizational culture of the company. Activities related to entering a new company on the market. Legal basis for setting up own business (Central Registration and Information on Business, National Court Register, ePUAP Electronic Platform for Public Administration Services).								
Teaching methods	Informative-problem lecture;								
Assessment method	Lecture: one test								
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study	
L01	knows and understands the principles of starting a business							AR1_W09	
L02	knows the sources of financing business							AR1_W09	
L03	knows the forms of running a business							AR1_W09	
L04	knows the elements of the business model, the business plan							AR1_W09	
L05	can identify the sources of business ideas							AR1_U05	
L06	can analyze the elements of the environment and determine their impact on the functioning of the enterprise							AR1_U05	
L07	is ready to identify the characteristics of effective entrepreneurs							AR1_K04	
Symbol of learning outcome	Methods of assessing the learning outcomes							Type of tuition during which the outcome is assessed	
L01	Lecture: one test;							W	
L02	Lecture: one test;							W	
L03	Lecture: one test;							W	
L04	Lecture: one test;							W	

L05	Lecture: one test;	W	
L06	Lecture: one test;	W	
L07	Lecture: one test;	W	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Preparation for lecture test(s)	5	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	25	
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		20	0,8
Student workload - practical activities		0	0
Basic references	1. Czemieli-Grzybowska W., Zarządzanie przedsiębiorstwem. Szanse i zagrożenia otwierania działalności gospodarczej, Wydawnictwo Difin, Warszawa 2011. 2. Burns P., Entrepreneurship and small business: start-up growth and maturity, Palgrave Macmillan 2010. 3. Hisrich R. D., International entrepreneurship, Sage 2013. 4. Górski I. (ed.), General accounting theory: evolution and design for efficiency, Koźmiński Entrepreneurship and Management, Wydawnictwo Akademickie i Profesjonalne, Warszawa 2008. 5. Cieślak J., Przedsiębiorczość dla ambitnych. Jak uruchomić własny biznes, Wydawnictwa Akademickie i profesjonalne, Warszawa 2008.		
Supplementary references	1. Skrzypek J.T., Biznesplan. Model najlepszych praktyk, Wydawnictwo Poltext, Warszawa 2009. 2. Osterwalder A., Pigneur Y. "Tworzenie modeli biznesowych", One Press, 2012. 3. Ries E., Metoda Lean Startup, One press, 2011. 4. Osterwalder A., Pigneur Y. "Tworzenie modeli biznesowych", One Press, 2012.		
Organisational unit conducting the course	Katedra Mechaniki i Informatyki Stosowanej	Date of issuing the programme	
Author of the programme	dr Izabela Senderacka	2019-09-23	

Bialystok University of Technology										
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	common subject							Study profile	general academic	
Course name	Tax law							Course code	MYARS07006	
								Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7	
	15	0	0	0	0	0	0	No. of ECTS credits	1	
Entry requirements	-									
Course objectives	Acquainting with the rules of the Polish tax system. Particular attention will be paid to the personal income tax, corporate income tax, value added tax and excise duty. The aim of the course is also to familiarize with the forms of business taxation. Students during the lecture learn about the structures and principles of downloading the abovementioned taxes. The subject prepares listeners to move efficiently in the area of basic taxes in the Polish tax system.									
Course content	Legal basis for imposing tax obligations in Poland. The concept of tax, types of taxes. Income tax on natural persons - subjective and subjective scope of taxation, source of income, methods of determining tax deductible costs, tax base, tax scale, procedure and terms of payment. Simplified forms of taxation of income and income of natural persons - lump sum from registered income. Corporate income tax - structure and collection rules. Forms of business taxation. Tax on goods and services. Excise tax. Criminal responsibility related to non-payment of taxes.									
Teaching methods	Informative-problem lecture;									
Assessment method	Lecture: one test									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
LO1	has a structured knowledge about the Polish tax system								AR1_W09	
LO2	has knowledge about the formation of tax liabilities, can determine the type of taxes to which a certain subject is subject and the moment the tax liability arises								AR1_W09	
LO3	has knowledge of institutions of substantive tax law								AR1_W09	
LO4	can use basic legal acts in the field of law tax								AR1_U10	
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed	
LO1	Lecture: one test;								W	
LO2	Lecture: one test;								W	
LO3	Lecture: one test;								W	
LO4	Lecture: one test;								W	
Student workload (in hours)								No. of hours		
Calculation	Lecture attendance								15	
	Preparation for lecture test(s)								5	
	Participation in teacher-student sessions related to the module subject								5	
	TOTAL								25	
Quantitative indicators								Hours	ECTS	
Student workload - activities that require direct teacher participation								20	0,8	
Student workload - practical activities								0	0	
Basic references	1. Ustawa z dnia 26.07.1991 r. o podatku dochodowym od osób fizycznych (t.j. Dz.U. 2018r., poz. 200 z późn.zm.) 2. Ustawa z dnia 15.02.1992 r. o podatku dochodowym od osób prawnych (t.j. Dz.U. 2017 r., poz. 2343 z późn. zm.) 3. Ustawa z dnia 11 marca 2004 r. o podatku od towarów i usług (t.j. Dz.U. 2017 r., poz. 1221 z późn. zm.) 4. Ustawa z dnia 6 grudnia 2008 r. o podatku akcyzowym (t.j. Dz.U. 2017 r., poz. 43 z późn. zm.)									

	5. Dowgier R., Prawo podatkowe. Minirepetytorium, Wolters Kluwer, Warszawa 2017.	
Supplementary references	1. Oktaba R., Prawo podatkowe, Wydawnictwo C.H. Beck, Warszawa 2017. 2. Mastalski R., Prawo podatkowe, Wydawnictwo C.H. Beck, Warszawa 2018.	
Organisational unit conducting the course	Zakład Ekonomii Menedżerskiej	Date of issuing the programme
Author of the programme	dr Mirosława Laszuk	2019-09-23

Bialystok University of Technology									
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree
Specialization / diploma path	common subject							Study profile	general academic
Course name	Quality management							Course code	MYARS07007
								Course type	elective
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7
	15	0	0	0	0	0	0	No. of ECTS credits	1
Entry requirements	-								
Course objectives	Indicating the basic concepts of quality and quality management in the contemporary organization. Discussion of selected methods for testing the quality of products and processes. An approximation of the essence of systemic quality management. Understanding the structure and elements of the quality management system in the organization. Acquainting with the requirements of the ISO 9001: 2015 standard. Teaching how to prepare ISO 9001: 2015 documentation. Acquiring the ability to use selected tools and methods of quality management.								
Course content	Quality - basic definitions and shaping factors. Standardization, conformity assessment and legal regulations in the field of quality in the EU and in Poland. Quality management systems according to ISO 9000 series (structure of the ISO 9001: 2015 standard, basic certification requirements, the essence of the process approach, analysis of the organization's context and risk in processes, quality system documentation, quality system improvement tools). Auditing the quality system. Quality management systems in selected industries. The essence of integration of management systems. Comprehensive quality management (TQM). Methods and tools for improving the quality system.								
Teaching methods	Informative-problem lecture;								
Assessment method	Lecture: one test								
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study
LO1	knows the issues of management and economics, including quality management and basic aspects related to the functioning of quality improvement processes in the enterprise								AR1_W09
LO2	knows and understands the principles of interpersonal and social communication in the field of solving quality problems in the enterprise								AR1_W09
LO3	can obtain information related to quality management in the company from literature, databases and other sources and integrate them								AR1_U02
LO4	can assess the usefulness of selected methods and tools for quality management, used to solve simple tasks related to quality problems in the enterprise								AR1_U05
LO5	can observe and interpret surrounding phenomena regarding the quality of products and processes and use the theories to analyze selected problems								AR1_U05
LO6	is ready to think and act in an entrepreneurial way								AR1_K04
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed
LO1	Lecture: one test;								W
LO2	Lecture: one test;								W
LO3	Lecture: one test;								W
LO4	Lecture: one test;								W
LO5	Lecture: one test;								W
LO6	Lecture: one test;								W
Student workload (in hours)									No. of hours
Calculation	Lecture attendance								15
	Preparation for lecture test(s)								5
	Participation in teacher-student sessions related to the module subject								5

		TOTAL	25
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		20	0,8
Student workload - practical activities		0	0
Basic references	1. Hamrol A., Zarządzanie jakością z przykładami, PWN, Warszawa 2017. 2. Hamrol A., Zarządzanie i inżynieria jakości, PWN, Warszawa 2017. 3. PN-EN ISO 9001:2015 – Systemy zarządzania jakością – Wymagania, Wydawnictwo PKN, Warszawa 2016. 4. Pacana A., Stadnicka D., Nowoczesne systemy zarządzania jakością zgodne z ISO 9001:2015, OW Politechniki Rzeszowskiej, Rzeszów 2017.		
Supplementary references	1. Łańcucki J. (red.), Podstawy Kompleksowego Zarządzania Jakością TQM, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań, 2008. 2. Problemy Jakości, miesięcznik.		
Organisational unit conducting the course	Katedra Ekonomii i Nauk Społecznych	Date of issuing the programme	
Author of the programme	dr Urszula Kobylińska	2019-09-23	

Białystok University of Technology										
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	common subject							Study profile	general academic	
Course name	Management of production							Course code	MYARS07008	
								Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7	
	15	0	0	0	0	0	0	No. of ECTS credits	1	
Entry requirements	-									
Course objectives	Providing and mastering the basic knowledge about the organization of production in the enterprise. Acquainting with the problems of modern planning techniques of production processes and presenting general trends prevailing in the production activity. Familiarization with the possibilities of computer integration of manufacturing processes.									
Course content	The role of the production process in the company's operations. Classification of production processes. Types of production, factors influencing the choice of production type. Unit, serial and mass production. Forms and varieties of production organization. Nest, linear, stream and non-smoking forms of production. Mechanization and automation of production, the concept of flexibility. Production planning: scheduling and programming. The norms for controlling the flow of production, among others: the size of production deficiencies, the size of the series, the size of production batches, the exceedence of standards, the stand-by capacity (labor consumption) unit of products. Inventory management, inventory control systems. Material needs planning systems. The "right on time" production strategy is JIT. Lean Manufacturing. Using the philosophy of KAIZEN. JIT methods, techniques and tools: SMED, 5S rule, 4M rule, principle of autonomy (Jidoka), TQM, TPM, TBM, pull rule, KANBAN system. Basic information on integrated computer-aided manufacturing (CIM).									
Teaching methods	Informative-problem lecture;									
Assessment method	Lecture: one test									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
LO1	defines the production process, classifies and describes the types of production								AR1_W09	
LO2	correctly identifies production control standards and discusses topics related to production planning								AR1_W09	
LO3	knows and analyzes the basic problems of production organization								AR1_W09	
LO4	knows and understands the importance of new concepts of strategies, techniques, methods and tools related to the organization of production and is ready to entrepreneurial thinking								AR1_W09 AR1_K04	
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed	
LO1	Lecture: one test;								W	
LO2	Lecture: one test;								W	
LO3	Lecture: one test;								W	
LO4	Lecture: one test;								W	
Student workload (in hours)								No. of hours		
Calculation	Lecture attendance								15	
	Preparation for lecture test(s)								5	
	Participation in teacher-student sessions related to the module subject								5	
	TOTAL								25	
Quantitative indicators								Hours	ECTS	
Student workload - activities that require direct teacher participation								20	0,8	
Student workload - practical activities								0	0	
Basic references	1. Duda J., Zarządzanie rozwojem wyrobów w ujęciu systemowym, Wydawnictwo Politechniki Krakowskiej, Kraków 2016.									

	2. Lewandowski J., Skołud B., Plinta D., Organizacja systemów produkcyjnych, Polskie Wydawnictwo Ekonomiczne, Warszawa 2014. 3. Liwowski B., Kozłowski R., Podstawowe zagadnienia zarządzania produkcją, Oficyna Wolters Kluwer, Warszawa 2011. 4. Pająk E., Zarządzanie produkcją: produkt, technologia, organizacja, PWN, Warszawa 2010.	
Supplementary references	1. Banaszak Z., Kłos S., Mleczko J., Zintegrowane systemy zarządzania, Polskie Wydawnictwo Ekonomiczne, Warszawa 2016. 2. Chary S.N., Production and operations management, Tata McGraw-Hill Education, New Delhi 2009. 3. Liker J.K., Droga Toyoty: 14 zasad zarządzania wiodącej firmy produkcyjnej świata, Wydawnictwo MT Biznes, Warszawa 2005. 4. Szatkowski K., Nowoczesne zarządzanie produkcją: ujęcie procesowe, Wydawnictwo Naukowe PWN, Warszawa 2014.	
Organisational unit conducting the course	Katedra Zarządzania Produkcją	Date of issuing the programme
Author of the programme	dr hab. inż. Wiesław Urban, prof. PB	2019-09-23

Bialystok University of Technology										
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	common subject							Study profile	general academic	
Course name	Theory of solving innovative problems							Course code	MYARS07009	
								Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7	
	15	0	0	0	0	0	0	No. of ECTS credits	1	
Entry requirements	-									
Course objectives	Getting to know the TRIZ methodology set. Acquiring the skills to create new innovative ideas and solve engineering problems.									
Course content	Overcoming barriers in creative problem solving, vector of inertia - how to overcome it?, stimulating imagination and creativity, methods of identifying and visualizing problems, methods of generating new ideas, reviewing creative thinking techniques, the history of TRIZ, technical systems and their functions. Subsystems and supersystems, systemic approach, technical system development laws, striving for perfection - Perfect Final Result, analysis of technical and physical contradictions, analysis of means to overcome contradictions, grounds for removing technical / physical contradictions, 40 inventive tricks, algorithm for solving inventive tasks of ARIZ.									
Teaching methods	Informative-problem lecture;									
Assessment method	Lecture: one test									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
LO1	is ready to think and act in an entrepreneurial way								AR1_K04	
LO2	is ready to identify problems and resolve dilemmas that arise when generating new technological solutions								AR1_K02	
LO3	knows and understands technical systems and their functions								AR1_W01	
LO4	can acquire information from various sources and critically refer to them								AR1_U02	
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed	
LO1	Lecture: one test;								W	
LO2	Lecture: one test;								W	
LO3	Lecture: one test;								W	
LO4	Lecture: one test;								W	
Student workload (in hours)								No. of hours		
Calculation	Lecture attendance								15	
	Preparation for lecture test(s)								5	
	Participation in teacher-student sessions related to the module subject								5	
	TOTAL								25	
Quantitative indicators								Hours	ECTS	
Student workload - activities that require direct teacher participation								20	0,8	
Student workload - practical activities								0	0	
Basic references	1. Ikovenko S. Współczesna Teoria Rozwiązywania Innowacyjnych Zadań, Novosimo Warszawa 2017. 2. Cempel C., Inżynieria kreatywności w projektowaniu innowacji. Politechnika Poznańska 2013. 3. Proctor T., Twórcze rozwiązywanie problemów, Podręcznik dla menedżerów, GWP, Gdańsk 2002.									
Supplementary references	1. DeBono E., Myślenie równoległe, Wydawnictwo Prima, Warszawa 1998. 2. Alder H., Inteligencja kreatywna, Wydawnictwo Amber, Warszawa 2003. 3. Kelley T., Littman J., Sztuka innowacji, lekcja kreatywności z doświadczeń czołowej amerykańskiej firmy projektowej, MT Biznes, Warszawa 2009. 4. Michalewicz Z., Fogel D.B., Jak to rozwiązać czyli nowoczesna heurystyka, WNT, Warszawa 2006.									

Organisational unit conducting the course	Katedra Organizacji i Zarządzania	Date of issuing the programme
Author of the programme	dr inż. Jerzy Sienkiewicz	2019-09-23

Bialystok University of Technology										
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree	
Specialization / diploma path	mobile robots							Study profile	general academic	
Course name	Navigation of mobile robots							Course code	MYARS17001	
								Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7	
	15	0	30	0	0	0	0	No. of ECTS credits	4	
Entry requirements	Signal processing systems in robotics									
Course objectives	Acquainting with basic problems in the field of mobile robot navigation. Learning the concepts of air and sea navigation. Learning reference systems used in inertial navigation. Learning methods of expressing spatial orientation of a mobile robot. Acquainting with issues of inertial navigation and methods of relative and absolute location. Presentation of basic measurement systems necessary in the navigation of mobile robots. Eulerian transformations of coordinate systems and quaternion calculus. Preparation and implementation of simulation models of inertial navigation algorithms for mobile robots. Acquainting with the methods of planning the movement path and the trajectory of the mobile robot. Analysis of simulation results.									
Course content	Lecture: Basic concepts in the field of navigation, including air and sea navigation, referring to mobile robots (wheeled, flying and floating). Classification of navigation, its tasks in controlling a mobile robot. Ways of implementing inertial navigation systems. The gravitational field and the magnetic field of the Earth. Loxodroma and orthodrome, use in navigation. Cartographic mappings, navigational parameters, geographical directions, the concept of the bearing. Review of reference frame systems in inertial navigation of a mobile robot. Spatial orientation of the mobile robot and parameters characterizing it - Euler angles, directional cosines, quaternions. Algorithms for solving spatial orientation equations and position equations. Navigation relative to natural and artificial reference points - terrestrial navigation. Inertial navigation, accelerometers, gyroscopes and navigation algorithms of non-cardan navigation systems. Coarse/accurate leveling. Aerodynamic station and its use in flying robots. Radio navigation. Navigation of mobile robots, traffic planning: road maps, visibility graph method, Voronoi diagrams, the method of potential fields, contour method, decomposition methods, artificial field potentials. Laboratory: Modeling of selected navigational algorithms in MATLAB / Simulink environment: modeling of aerodynamic center calculations, solving spatial orientation of a mobile robot using directional cosines and quaternions, modeling quaternion operations, filtration of navigational signals using Kalman filter, solving position equations and modeling of leveling algorithm, path planning using artificial potential fields.									
Teaching methods	Informative-problem lecture; Laboratory classes;									
Assessment method	Lecture: one test Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes									
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study	
LO1	knows and understands basic concepts of navigation and navigation systems and can use them in practice								AR1_W04 AR1_W06	
LO2	knows and describes algorithms and navigational parameters								AR1_W02 AR1_W06 AR1_U01	
LO3	can determine the relationship between navigational parameters								AR1_U01	
LO4	can develop models of inertial navigation algorithms								AR1_U04	
LO5	can analyze results of simulations								AR1_U04	
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed	
LO1	Lecture: one test; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;								W L	
LO2	Lecture: one test; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;								W L	
LO3	Laboratory: evaluation of introductory tests, reports, discussion and activity								L	

	during the classes;		
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Laboratory classes attendance	30	
	Preparation for lecture test(s)	24	
	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	1. Ciesielski P., Sawoniewicz J., Szmigielski A., Elementy robotyki mobilnej, Wydawnictwo PJWSTK, Warszawa, 2004.		
	2. Narkiewicz J., Podstawy układów nawigacyjnych, WKŁ, Warszawa, 2000.		
	3. Narkiewicz J., GPS - Globalny system pozycyjny: budowa, działanie, zastosowanie, WKŁ, Warszawa, 2003.		
	4. Gasparetto A., Boscariol P., Lanzutti, A., Vidoni R., Path Planning and Trajectory Planning Algorithms: A General Overview, Springer, 2015.		
Supplementary references	1. Tchoń K. red., Problemy robotyki, T1 i T2, OWPW, Warszawa, 2008.		
	2. Noureldin A., Karamat T. B., Georgy J., Fundamentals of inertial navigation satellite-based positioning and their integration, Springer, 2012.		
	3. Gosiewski Z., Ortyl A., Algorytmy bezkardanowego systemu orientacji i położenia obiektu o ruchu przestrzennym, Biblioteka Naukowa Instytutu Lotnictwa, Warszawa, 1999.		
Organisational unit conducting the course	Katedra Automatyki i Robotyki	Date of issuing the programme	
Author of the programme	dr inż. Cezary Kownacki	2019-09-23	

Bialystok University of Technology									
Field of study	Automatic Control and Robotics							Degree level and programme type	full-time Bachelor's degree
Specialization / diploma path	automation and computerization of processes							Study profile	general academic
Course name	Automation of electrical drive systems							Course code	MYARS27001
								Course type	elective
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	7
	15	0	30	0	0	0	0	No. of ECTS credits	4
Entry requirements	Electric drive systems, Fundamentals of process control								
Course objectives	Familiarizing with the peripheral models of electric machines. Providing knowledge about typical configurations of automatic drive systems. Familiarizing with the methods of analysis and synthesis of simple drive subsystems. Providing knowledge about modern trends in the technique of automatic drive systems and the possibilities of using modern, specialized microelectronic systems. Practical familiarization with the operation of modern converter drive systems with DC and AC machines.								
Course content	Lecture: Mathematical models of electric machines. Structure and synthesis of drive subsystems. Indicators of control performance in drive systems. Speed and position control systems. Two-zone control systems. Methods of controlling induction motors. Asynchronous machine flux recovery methods. Synchronous machine control methods. Examples of the use of microprocessor technology and specialized microelectronic systems in drive systems. Laboratory: Testing of drive systems with DC and AC motors. Investigation of drive systems controlled at constant magnetic flux of the engine and controlled in two zones. Examination of the drive system controlled by changing the supply voltage and frequency-controlled. Investigation of a scalar and vector controlled or direct torque and flux (DTC) drive system. Testing of the current control system, speed control system and position control system of the automatic electric drive. Research on basic motion measurement systems.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: one test Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								
Symbol of learning outcome	Learning outcomes								Reference to the learning outcomes for the field of study
LO1	knows and understands mathematical models of electrical machines and block structures of typical drive systems								AR1_W02
LO2	knows and understands the process of synthesis of simple subsystems of the drive system								AR1_W06
LO3	knows and understands the process of analyzing properties of simple subsystems of the drive system								AR1_W06
LO4	is able to configure and run the selected converter drive system and determine its basic characteristics								AR1_U04
LO5	can determine and analyze selected signals: current, electromagnetic moment, speed and position in transient and steady states of automatic electric drive								AR1_U03 AR1_U04
LO6	can carry out experiments in accordance with health and safety rules								AR1_U12
Symbol of learning outcome	Methods of assessing the learning outcomes								Type of tuition during which the outcome is assessed
LO1	Lecture: one test;								W
LO2	Lecture: one test;								W
LO3	Lecture: one test;								W
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;								L
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;								L
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;								L
Student workload (in hours)									No. of hours

Calculation	Lecture attendance	15	
	Laboratory classes attendance	30	
	Preparation for lecture test(s)	24	
	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	1. Grzesiak L., Ufnalski B., Kaszewski A., Sterowanie napędów elektrycznych: analiza, modelowanie, projektowanie. Wydawnictwo Naukowe PWN, Warszawa, 2016. 2. Dębowski A., Automatyka: napęd elektryczny. Wydaw. WNT: Wydawnictwo Naukowe PWN, Warszawa, 2017. 3. Bisztyga B., Sieklucki G., Zdrojewski A., Orzechowski T., Sykulski R., Modele i zasady sterowania napędami elektrycznymi, Kraków: Wydawnictwo AGH, 2014. 4. Zawirski K., Deskur J., Kaczmarek T., Automatyka napędu elektrycznego. Wydaw. Politechniki Poznańskiej, 2012.		
Supplementary references	1. Mohan N., Advanced electric drives: analysis, control, and modeling using MATLAB/Simulink, Hoboken: John Wiley a. Sons, 2014. 2. Weidauer J. Electrical drives: principles, planning, applications, solutions. Erlangen: Publicis Publishing, 2014. 3. Seung-Ki S., Control of electric machine drive systems, Hoboken: John Wiley a. Sons, 2011.		
Organisational unit conducting the course	Katedra Energoelektroniki i Napędów Elektrycznych	Date of issuing the programme	
Author of the programme	dr hab. inż. Marian Dubowski, prof. PB	2019-09-23	