Study programme

Major: Mechatronic Engineering with English as instruction language

Specialty: Mechatronic Design

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General characteristics of the major

Basic information

Faculty name:	Faculty of Mechanical Engineering and Robotics
Major name:	Mechatronic Engineering with English as instruction language
Specialty name:	Mechatronic Design
Level:	Second-cycle (engineer) programme
Profile:	General academic
Form:	Full-time studies
ISCED classification:	0714
Number of ECTS credits necessary to complete studies at a given level:	90
Professional title awarded to graduates:	magister inżynier
Cycle start date:	2023/2024, summer semester
Duration of studies (number of semesters):	3

Field of science to which the major is assigned:

Field engineering and technical sciences

Discipline of science to which the major is assigned:

Discipline	Percentage	ECTS
Mechanical engineering	80%	72
Automation, electronic, electrical engineering and space technologies	13%	12
Technical computing and telecommunications	7%	6

Relationship between the major and the AGH UST development strategy and the AGH UST mission

Study speciality Mechatronic Design of Mechatronic Engineering study field was created in 2011 as a result of enhancement of the university and the faculty’s educational offer. The instruction language is English.
The study is carried out according to Bologna Process basing on two-cycles of higher-education qualifications, use of the European Credit Transfer and Accumulation System (ECTS), and including international student exchange.
Mechatronic Engineering is a modern field of study answering current needs of industry and services. Graduates are prepared to solve engineering problems basing on knowledge.
The faculty continuously improves quality of education through research activity, cooperation with research and development institutions as well as companies in Poland and abroad, supporting students’ placement and activity of student scientific associations focused on mechatronic engineering. Organization of study is constantly perfected, and computerized tools are being introduced to improve efficiency of services for students.

Information on taking into account the socio-economic demand while creating the study programme and indication of the assumed learning outcomes matching the identified demand

Improvement of quality of life is to appreciable extent dependent on development of economic activity that applies advanced technologies. Therefore, curriculum of Mechatronic Engineering study field aims at educating citizens showing active and ethical attitude towards their duties and specialists capable of finding employment in institutions and companies involved in development of advanced technologies concerning design, manufacturing and operation of complex mechatronic systems composed of integrated mechanisms, data processing electronic circuits, control systems and software. Learning

outcomes of the Mechatronic Engineering study comprise computer aided engineering techniques and teamwork skills. As a result of high standards demanded during the study, the graduates become valuable part of society as well as true experts in mechatronic design.

Learning paths - scope in Polish and in English

Diploma paths - scope in Polish and in English

The names of the specialties in Polish and in English

Name [pl]	Name [en]
Mechatronic Design	Mechatronic Design

General information about the study programme

Major: Mechatronic Engineering with English as instruction language
Specialty: Mechatronic Design

General information related to the study program (general learning objectives and employment opportunities, typical jobs and opportunities for graduate continuing education)

Education at Mechatronic Design speciality is oriented on solving problems of various scope and complexity level, individually or in teams in the course of project or lab classes with the use of knowledge based methods.
The students are taught with the aim of gaining:
- knowledge concerning design of integrated systems composed of cooperating mechanical, electronic, control and software components
- skill of application of computer aided engineering tools to design and testing of mechatronic systems with the use of virtual and rapid prototyping techniques
- ability of working in multidisciplinary teams as well as awareness of need for continuous perfecting of professional qualifications.

The speciality's graduates are being employed as designers and integrators of mechatronic systems, maintenance engineers or they become individual entrepreneurs.
Typical employers of the graduates are companies offering engineering services, design units, factories as well as research and development institutions.
The graduates may continue education at the Mechanical Engineering based 3rd cycle or postgraduate study in Poland or abroad.

The program is accredited by the EAC of ABET. As such, it results in the following Student Outcomes:

1. an ability to apply engineering design to produce solutions in area of complex mechatronic systems that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
2. An ability to apply virtual prototyping tools to model and simulate effectively operation of complex mechatronic systems.
3. An ability to carry out rapid prototyping of components of mechatronic systems.
4. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to communicate effectively with a range of audiences.
7. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
8. an ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.

Information on the study programme including the conclusions from the students and graduates careers monitoring

The careers of graduates are constantly monitored by the AGH Career Center. A Unit of Monitoring of Graduates Professional Development operates within the Centre aimed at job market analysis and research activities including monitoring of graduates career paths (first destination surveys). AGH UST graduates are interviewed several times after completing their studies. From these surveys, reports are prepared containing information such as the distribution of graduate employment, the strengths and weaknesses of graduates, and respondents' comments on suggested changes in the programs. These reports are then annually submitted to the authorities of the university and faculties. Based on them, changes in the particular programs and subjects are proposed. These may include the introduction of new subjects or changes to the existing ones.

Information on the study programme taking into account the requirements and recommendations of the

accreditation committees, in particular the Polish Accreditation Committee and industry accreditation committees

Mechatronic Engineering in English is accredited by ABET. The accreditation commission did not recommend changes to the study program, but ordered to increase the emphasis on student outcome monitoring. According to the recommendations, a suitable system was developed and implemented.

Information on including examples of good practice in the study program

The Mechatronic engineering program uses combining courses into large modules, so that students would learn comprehensively and carry out multidisciplinary projects.

Information on cooperation in the preparation of the study programme with external stakeholders, in particular associations, professional and social organizations

Within the Faculty of Mechanical Engineering and Robotics, there is a Social Board, which gathers several dozen representatives of the management staff of enterprises associated with AGH. Board members are annually surveyed for the needs and requirements of graduates of Mechatronics Engineering. The results of these surveys are then analyzed and taken into account in the creation and modification of study programs.
Personal activity of teachers who cooperate with companies in research and development projects or jointly initiate and supervise students' theses as well as placements provide a source of detail information concerning expected skills of the graduates which influence gradually upgrading of curricula and introduction of appropriate software and hardware tools into educational facilities of the faculty.

Duration, rules and form of the apprenticeship

During the 2nd cycle study every student must take part in a 4 weeks individual diploma training at a company or at a university or at a research and development institution. The training is scheduled for the first 4 weeks of the 3rd semester of study according to annual schedule of courses.

Admission criteria, rules and policies

Major: Mechatronic Engineering with English as instruction language
Specialty: Mechatronic Design

Description of competences expected from the candidate applying for admission to studies

Completed the 1st cycle engineering degree (Bachelor) study.
Having Bachelor’s or Master’s degree in Engineering.
The completed study curriculum must contain 60% of basic and study field related courses corresponding to curriculum of the first cycle study in Mechatronic Engineering

Recruitment conditions, including the winners and finalists of the central level high school scientific Olympics, as well as winners of international and national contests

Recruitment is conducted in accordance with the annual Resolution of the Senate of AGH-UST concerning the admission principles and procedures for the 1st and the 2nd cycle studies

The expected limit of admissions to studies along with an indication of the minimum number of admitted candidates required to successfully launch a study cycle

Minimum number of students: 12
Maximum number of students: 30

Learning outcomes

Major : Mechatronic Engineering with English as instruction language
Specialty: Mechatronic Design

Knowledge

KEU symbol	Directional learning outcomes	CEU symbol
IMA2A_W01	knowledge of some domains of the physics necessary for understanding complex physical phenomena occurring in mechatronic systems and devices and their surroundings	P7S_WG_A
IMA2A_W02	extensive and ordered knowledge of IT techniques applied in mechatronics	P7S_WG_A
IMA2A_W03	knowledge of development trends and most important recent achievements in mechatronics and, to a lesser extent, of automatics, robotics, machine construction, electronics and IT sciences	P7S_WG_A
IMA2A_W04	knowledge and understanding of the methodology of designing complex mechatronic equipment and methods and techniques used for thier design, knowledge of computer tools for the design and simulation of mechatronic devices	P7S_WG_A
IMA2A_W05	extensive and theory-based knowledge of mechatronic systems control	P7S_WG_A
IMA2A_W06	extensive and ordered knowledge of the management of mechatronic projects	P7S_WK_A
IMA2A_W07	theory-based detailed knowledge of selected aspects of testing, modelling, designing, production and operation of mechatronic systems and devices, as well as the materials and information processing methods used	P7S_WG_A, P7S_WG_A_Inz
IMA2A_W08	knowledge of the general rules for creation and development of individual entrepreneurship	P7S_WK_A_Inz

Skills

KEU symbol	Directional learning outcomes	CEU symbol
IMA2A_U01	ability to acquire information from literature, databases and other sources, integrate, interpret and critically assess the information obtained, draw conclusions, formulate and justify opinions	P7S_UW_A
IMA2A_U02	ability to work individually or in team, to estimate the time needed to complete a task, ability to manage a small team in a manner ensuring the deadline for the task to be met	P7S_UO_A
IMA2A_U03	ability to develop detailed documentation related to the completion of an experiment, project or research activity; ability to prepare an elaboration discussing the results obtained	P7S_UK_A
IMA2A_U04	ability to prepare and give a presentation on the completion of a project or research task and conduct a discussion regarding the presentation given	P7S_UK_A
IMA2A_U05	Sufficient competence in foreign language to talk about professional topics, read and understand scientific literature, as well as to prepare and give short presentations on the completion of a project or research task	P7S_UK_A
IMA2A_U06	ability to set directions for further learning and self-education	P7S_UU_A
IMA2A_U07	ability to use methods and mathematical models – and modify them as required if necessary – to analyse and design mechatronic components, equipment and systems	P7S_UW_A_Inz_01, P7S_UW_A, P7S_UW_A_Inz_02

KEU symbol	Directional learning outcomes	CEU symbol
IMA2A_U08	ability to assess and compare design solutions or manufacturing processes of complex mechatronic devices and systems in terms of the functional and economic criteria given	P7S_UW_A_Inz_01, P7S_UW_A
IMA2A_U09	ability to formulate a design specification of a complex mechatronic system or device, taking into consideration the legal aspects, such as the protection of intellectual property and other non-technical aspects, such as environmental impact, applying, among others, the standards regulating the operation of mechatronic equipment	P7S_UW_A_Inz_01, P7S_UW_A, P7S_UW_A_Inz_02
IMA2A_U10	ability to design mechatronic systems and devices for various applications, taking into consideration the given functional and economic criteria and, if required, adjusting the existing methods or developing new methods for design and CAD and CAE tools	P7S_UW_A, P7S_UW_A_Inz_02
IMA2A_U11	ability to formulate and – using appropriate analytical, simulation and experimental tools – test hypotheses related to modelling and designing mechatronic equipment and systems or designing their manufacturing processes	P7S_UW_A_Inz_01, P7S_UW_A, P7S_UW_A_Inz_02
IMA2A_U12	ability (while formulating and solving problems related to the modelling and design of mechatronic devices and systems or designing their manufacturing process) to integrate the knowledge of electronics, electrical engineering, IT sciences, automatics, robotics, mechanics, machine construction and operation and other discipline using the system-oriented approach, bearing in mind non-technical (including economic and legal) aspects	P7S_UW_A_Inz_01, P7S_UW_A, P7S_UW_A_Inz_02
IMA2A_U13	ability to propose improvements to the existing design solutions and models of mechatronic components, devices and systems	P7S_UW_A_Inz_01, P7S_UW_A, P7S_UW_A_Inz_02
IMA2A_U14	ability to assess the usefulness of recent achievements in the domain of materials, components, methods for the design and manufacture of mechatronic systems and devices featuring innovative solutions	P7S_UW_A_Inz_01, P7S_UW_A, P7S_UW_A_Inz_02

Social competence

KEU symbol	Directional learning outcomes	CEU symbol
IMA2A_K01	ability to think and act in an enterprising and creative manner	P7S_KO_A
IMA2A_K02	understanding of the need to formulate and communicate to society, via the media, information and opinions regarding the achievements of mechatronics and other aspects of the activity of a mechatronic engineer in a commonly understandable manner, presenting different points of view	P7S_KK_A, P7S_KO_A
IMA2A_K03	awareness of the social role of a graduate of technical studies, especially as regards the need to formulate and communicate to society, via the media, information and opinions regarding the achievements of mechatronics and other aspects of the activity of a mechatronic engineer; striving to convey such information and opinions in a commonly understandable manner	P7S_KR_A

Compliance table of engineering competence (Inz) with directional learning outcomes (KEU)

Major : Mechatronic Engineering with English as instruction language
Speciality: Mechatronic Design

Knowledge

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P7S_WG_A_Inz	knowledge of basic processes taking place in the life cycle of technical devices, facilities and systems	IMA2A_W07
P7S_WK_A_Inz	knowledge of basic principles of creating and developing various forms of individual entrepreneurship	IMA2A_W08

Skills

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P7S_UW_A_Inz_01	ability to plan and carry out experiments, including measurements and computer simulations as well as to interpret the obtained results and draw conclusions out of them. When identifying and formulating the specification of engineering problems and solving them, being able to: - use analytical, simulation and experimental methods; - recognize their systemic and non-technical aspects, including ethical connotations; - conduct a preliminary economic assessment of the proposed solutions and planned engineering activities; - perform a critical analysis of the functioning of existing technical solutions to further evaluate them;	IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14
P7S_UW_A_Inz_02	ability to design solutions in compliance with the given specification as well as being able to: create simple devices, facilities and systems typical for the study major or implement processes using skillfully chosen methods, techniques, tools and materials	IMA2A_U07, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14

Directional outcomes coverage matrix

Major: Mechatronic Engineering with English as instruction language
Specialty: Mechatronic Design

2023/2024/S/IIi/IMiR/IMA/MD

Subject	Code	Semestr	IMA2A_W01	IMA2A_W02	IMA2A_W03	IMA2A_W04	IMA2A_W05	IMA2A_W06	IMA2A_W07	IMA2A_W08	IMA2A_U01	IMA2A_U02	IMA2A_U03	IMA2A_U04	IMA2A_U05	IMA2A_U06	IMA2A_U07	IMA2A_U08	IMA2A_U09	IMA2A_U10	IMA2A_U11	IMA2A_U12	IMA2A_U13	IMA2A_U14	IMA2A_K01	IMA2A_K02	IMA2A_K03
Management engineering	RIMAMDS.IIi1HS.5da9fa5ac8549dbf93b8729412ac132b.23	1						x			x				x												
Ergonomy	RIMAMDS.IIi1HS.df85a2aeebe1e4770933895f6a3071b4.23	1							x		x							x							x		
Company management	RIMAMDS.IIi1HS.3ce645fb3a7f49b8f01fc8523d31b934.23	1						x		x		x															
Mechatronic system indentification	RIMAMDS.IIi1K.ef47afa2811b3758164b8fd249ffa38a.23	1	x						x		x						x				x	x					
Kinematics and dynamics of mechatronic systems	RIMAMDS.IIi1K.ab2f5abcbb6efbad0bd1b27624e54fe5.23	1				x			x			x	x				x										
Mechatronics	RIMAMDS.IIi1K.1112faafc7117d8ab54b1d1aa00f55a9.23	1				x													x							x	
Informatics in mechatronics	RIMAMDS.IIi1K.b6360b2210dc9273a51402ab3f852335.23	1		x															x	x		x					

Subject	Code	Semestr	IMA2A_W01	IMA2A_W02	IMA2A_W03	IMA2A_W04	IMA2A_W05	IMA2A_W06	IMA2A_W07	IMA2A_W08	IMA2A_U01	IMA2A_U02	IMA2A_U03	IMA2A_U04	IMA2A_U05	IMA2A_U06	IMA2A_U07	IMA2A_U08	IMA2A_U09	IMA2A_U10	IMA2A_U11	IMA2A_U12	IMA2A_U13	IMA2A_U14	IMA2A_K01	IMA2A_K02	IMA2A_K03
English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics	RIMAMDS.IIi2JO.ef4557fa02b1ccf0f1bd0a9191bdbc2f.23	2													x												
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES	RIMAMDS.IIi2JO.5ecdcd70c5f967f68d851387d4713913.23	2									x				x												
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES at the Faculty of Computer Science, Electronics and Telecommunications (Computer Science)	RIMAMDS.IIi2JO.ff5757b98a7d5ad732f45e4c01bbb9e5.23	2									x		x		x												
Smart materials and structures	RIMAMDS.IIi2PJO.75c9c864dbfb6274be54a7503b5e1b9e.23	2	x		x	x			x		x	x	x	x			x							x	x	x	
3D printing technology	RIMAMDS.IIi2PJO.a9420442277e20c671a67f6f286b2faa.23	2			x	x			x			x					x	x		x			x	x	x	x	
MEMS fabrication systems	RIMAMDS.IIi2PJO.1181479c360138ff3c9c888a6aaa48c3.23	2	x						x								x										

Subject	Code	Semestr	IMA2A_W01	IMA2A_W02	IMA2A_W03	IMA2A_W04	IMA2A_W05	IMA2A_W06	IMA2A_W07	IMA2A_W08	IMA2A_U01	IMA2A_U02	IMA2A_U03	IMA2A_U04	IMA2A_U05	IMA2A_U06	IMA2A_U07	IMA2A_U08	IMA2A_U09	IMA2A_U10	IMA2A_U11	IMA2A_U12	IMA2A_U13	IMA2A_U14	IMA2A_K01	IMA2A_K02	IMA2A_K03
Mechatronic systems	RIMAMDS.IIi2K.b2212a1046562442ca34e164ab2fc780.23	2			x	x					x	x	x	x	x			x	x	x	x	x	x	x	x		x
Mechatronic design	RIMAMDS.IIi2K.b9b04e35dacca7185105bf5accebae6d.23	2	x	x		x			x								x			x	x		x	x	x			
Individual research project related to mechatronic design	RIMAMDS.IIi2K.fddc8b412e3fbdce845e32a9fe38f98b.23	2	x		x				x		x		x	x	x		x			x		x			x	x	
Electronics in mechatronics	RIMAMDS.IIi2K.21de89247e43b7693594928121ceed9f.23	2				x			x		x	x		x			x		x						x			
Design of composite parts	RIMAMDS.IIi4S.e235cf0f5046b57507f20a29d9225d77.23	3	x			x			x		x		x	x			x	x		x	x		x	x				
Operation and maintenance of mechatronic devices	RIMAMDS.IIi4S.0f9927bdddfabf8e869a5e0e8cdd3e70.23	3	x		x				x																			
Embedded systems	RIMAMDS.IIi4S.228078523cb7f097ecc55879565d142c.23	3		x													x			x	x		x		x			
Diploma Training	RIMAMDS.IIi4K.f00878b72b1aae627be56073cdece963.23	3				x			x			x	x	x											x	x	
Diploma Thesis	RIMAMDS.IIi4K.e53bc1ffec52171870fc55d1cec2fa6a.23	3	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Project management	RIMAMDS.IIi4HS.8a38ca14dfd6a4112fda620666db2f11.23	3						x		x								x	x						x		
MEMS and nanotechnology	RIMAMDS.IIi4K.07b7a2f01a9cf93f1023f15453228f06.23	3	x						x								x										
Diploma Seminar	RIMAMDS.IIi4S.113e607328fe3b1feac36d5c37a13bcd.23	3	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sum (obligatory):			5	3	3	7	1	2	8	1	5	5	5	5	3	1	7	3	6	5	4	5	3	3	7	4	2
Sum (elective):			5	2	4	4	1	3	7	1	7	4	4	3	5	1	6	4	1	4	3	1	4	4	5	3	0
Sum:			10	5	7	11	2	5	15	2	12	9	9	8	8	2	13	7	7	9	7	6	7	7	12	7	2

Characteristics matrix of learning outcomes in relation to modules

Major: Mechatronic Engineering with English as instruction language
Speciality: Mechatronic Design

2023/2024/S/IIi/IMiR/IMA/MD

Subject	Code	Semestr	P7S_WG_A	P7S_WK_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_UW_A	P7S_UO_A	P7S_UK_A	P7S_UU_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_KO_A	P7S_KK_A	P7S_KR_A
Management engineering	RIMAMDS.IIi1HS.5da9fa5ac8549dbf93b8729412ac132b.23	1		x			x		x						
Ergonomy	RIMAMDS.IIi1HS.df85a2aeebe1e4770933895f6a3071b4.23	1	x		x		x				x		x		
Company management	RIMAMDS.IIi1HS.3ce645fb3a7f49b8f01fc8523d31b934.23	1		x		x		x							
Mechatronic system indentification	RIMAMDS.IIi1K.ef47afa2811b3758164b8fd249ffa38a.23	1	x		x		x				x	x			
Kinematics and dynamics of mechatronic systems	RIMAMDS.IIi1K.ab2f5abcbb6efbad0bd1b27624e54fe5.23	1	x		x		x	x	x		x	x			
Mechatronics	RIMAMDS.IIi1K.1112faafc7117d8ab54b1d1aa00f55a9.23	1	x				x				x	x	x	x	
Informatics in mechatronics	RIMAMDS.IIi1K.b6360b2210dc9273a51402ab3f852335.23	1	x				x				x	x			
English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics	RIMAMDS.IIi2JO.ef4557fa02b1ccf0f1bd0a9191bdbc2f.23	2							x						
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES	RIMAMDS.IIi2JO.5ecdcd70c5f967f68d851387d4713913.23	2					x		x						
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES at the Faculty of Computer Science, Electronics and Telecommunications (Computer Science)	RIMAMDS.IIi2JO.ff5757b98a7d5ad732f45e4c01bbb9e5.23	2					x		x						

Subject	Code	Semestr	P7S_WG_A	P7S_WK_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_UW_A	P7S_UO_A	P7S_UK_A	P7S_UU_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_KO_A	P7S_KK_A	P7S_KR_A
Smart materials and structures	RIMAMDS.IIi2PJO.75c9c864dbfb6274be54a7503b5e1b9e.23	2	x		x		x	x	x		x	x	x	x	
3D printing technology	RIMAMDS.IIi2PJO.a9420442277e20c671a67f6f286b2faa.23	2	x		x		x	x			x	x	x	x	
MEMS fabrication systems	RIMAMDS.IIi2PJO.1181479c360138ff3c9c888a6aaa48c3.23	2	x		x		x				x	x			
Mechatronic systems	RIMAMDS.IIi2K.b2212a1046562442ca34e164ab2fc780.23	2	x				x	x	x		x	x	x		x
Mechatronic design	RIMAMDS.IIi2K.b9b04e35dacca7185105bf5accebae6d.23	2	x		x		x				x	x	x		
Individual research project related to mechatronic design	RIMAMDS.IIi2K.fddc8b412e3fbdce845e32a9fe38f98b.23	2	x		x		x		x		x	x	x	x	
Electronics in mechatronics	RIMAMDS.IIi2K.21de89247e43b7693594928121ceed9f.23	2	x		x		x	x	x		x	x	x		
Design of composite parts	RIMAMDS.IIi4S.e235cf0f5046b57507f20a29d9225d77.23	3	x		x		x		x		x	x			
Operation and maintenance of mechatronic devices	RIMAMDS.IIi4S.0f9927bdddfabf8e869a5e0e8cdd3e70.23	3	x		x										
Embedded systems	RIMAMDS.IIi4S.228078523cb7f097ecc55879565d142c.23	3	x				x				x	x	x		
Diploma Training	RIMAMDS.IIi4K.f00878b72b1aae627be56073cdece963.23	3	x		x			x	x				x	x	
Diploma Thesis	RIMAMDS.IIi4K.e53bc1ffec52171870fc55d1cec2fa6a.23	3	x	x	x		x	x	x	x	x	x	x	x	
Project management	RIMAMDS.IIi4HS.8a38ca14dfd6a4112fda620666db2f11.23	3		x		x	x				x	x	x		
MEMS and nanotechnology	RIMAMDS.IIi4K.07b7a2f01a9cf93f1023f15453228f06.23	3	x		x		x				x	x			
Diploma Seminar	RIMAMDS.IIi4S.113e607328fe3b1feac36d5c37a13bcd.23	3	x	x	x		x	x	x	x	x	x	x	x	x
Sum (obligatory):			11	2	8	1	11	5	6	1	11	11	8	4	2
Sum (elective):			8	3	7	1	10	4	7	1	7	6	5	3	0
Sum:			19	5	15	2	21	9	13	2	18	17	13	7	2

Matrix of directional learning outcomes with related forms of classes and the method of testing

Major: Mechatronic Engineering with English as instruction language
Speciality: Mechatronic Design

2023/2024/S/IIi/IMiR/IMA/MD

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Management engineering	Lecture	Test, Project, Scientific paper	IMA2A_W06, IMA2A_U01, IMA2A_U05
Ergonomy	Lecture	Activity during classes, Participation in a discussion, Scientific paper, Involvement in teamwork, Presentation	IMA2A_W07, IMA2A_U01, IMA2A_U08, IMA2A_K01
Company management	Lecture	Activity during classes, Test results	IMA2A_W08, IMA2A_W06, IMA2A_U02
Mechatronic system indentification	Lecture, Laboratory classes, Project classes	Execution of exercises, Execution of a project, Execution of laboratory classes, Project, Examination, Report, Test results, Completion of laboratory classes, Execution of exercises, Execution of a project, Execution of laboratory classes, Project, Examination, Report, Test results, Completion of laboratory classes, Execution of exercises, Execution of a project, Execution of laboratory classes, Project, Examination, Report, Test results, Completion of laboratory classes	IMA2A_W07, IMA2A_W01, IMA2A_U12, IMA2A_U07, IMA2A_U11, IMA2A_U01
Kinematics and dynamics of mechatronic systems	Lecture, Laboratory classes, Project classes	Execution of laboratory classes, Project, Examination, Report, Execution of laboratory classes, Report, Execution of laboratory classes, Project, Report	IMA2A_W04, IMA2A_W07, IMA2A_U02, IMA2A_U03, IMA2A_U07
Mechatronics	Lecture, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Examination, Engineering project, Execution of a project, Execution of laboratory classes, Engineering project, Execution of a project, Execution of laboratory classes, Engineering project	IMA2A_W04, IMA2A_U09, IMA2A_K02
Informatics in mechatronics	Lecture, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Test, Test results, Execution of a project, Execution of laboratory classes, Test, Test results, Execution of a project, Execution of laboratory classes, Test, Test results	IMA2A_W02, IMA2A_U09, IMA2A_U10, IMA2A_U12

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics	Foreign language classes	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Report, Scientific paper, Test results, Essays written during classes, Presentation	IMA2A_U05
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES	Foreign language classes	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Report, Scientific paper, Test results, Essays written during classes, Presentation	IMA2A_U01, IMA2A_U05
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES at the Faculty of Computer Science, Electronics and Telecommunications (Computer Science)	Foreign language classes	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Report, Scientific paper, Test results, Essays written during classes, Presentation	IMA2A_U01, IMA2A_U05, IMA2A_U03
Smart materials and structures	Lecture, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Test, Report, Activity during classes, Participation in a discussion, Execution of a project, Execution of laboratory classes, Test, Report, Involvement in teamwork, Activity during classes, Participation in a discussion, Execution of a project, Execution of laboratory classes, Test, Report, Involvement in teamwork	IMA2A_W01, IMA2A_W03, IMA2A_W04, IMA2A_W07, IMA2A_U07, IMA2A_U14, IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_K01, IMA2A_K02
3D printing technology	Lecture, Laboratory classes	Execution of laboratory classes, Test, Report, Activity during classes, Participation in a discussion, Execution of laboratory classes, Report, Involvement in teamwork	IMA2A_W03, IMA2A_W04, IMA2A_W07, IMA2A_U02, IMA2A_U07, IMA2A_U10, IMA2A_U13, IMA2A_U14, IMA2A_U08, IMA2A_K01, IMA2A_K02
MEMS fabrication systems	Lecture, Laboratory classes	Test results, Completion of laboratory classes, Execution of laboratory classes, Test results, Completion of laboratory classes	IMA2A_W01, IMA2A_W07, IMA2A_U07

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Mechatronic systems	Lecture, Project classes	Participation in a discussion, Execution of a project, Project, Examination, Presentation, Activity during classes, Participation in a discussion, Execution of a project, Project, Examination, Presentation	IMA2A_W03, IMA2A_W04, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U09, IMA2A_U10, IMA2A_U12, IMA2A_U08, IMA2A_U13, IMA2A_U14, IMA2A_U11, IMA2A_U01, IMA2A_U05, IMA2A_K01, IMA2A_K03
Mechatronic design	Lecture, Laboratory classes, Project classes	Activity during classes, Participation in a discussion, Test, Project, Examination, Report, Test, Project, Presentation, Test, Project, Presentation	IMA2A_W02, IMA2A_W04, IMA2A_W07, IMA2A_W01, IMA2A_U07, IMA2A_U10, IMA2A_U11, IMA2A_U13, IMA2A_U14, IMA2A_K01
Individual research project related to mechatronic design	Project classes	Project, Report	IMA2A_W03, IMA2A_W07, IMA2A_W01, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U07, IMA2A_U10, IMA2A_U12, IMA2A_U01, IMA2A_K02, IMA2A_K01
Electronics in mechatronics	Lecture, Laboratory classes	Execution of laboratory classes, Report, Involvement in teamwork, Completion of laboratory classes	IMA2A_W04, IMA2A_W07, IMA2A_U01, IMA2A_U02, IMA2A_U04, IMA2A_U07, IMA2A_U09, IMA2A_K01
Design of composite parts	Lecture, Laboratory classes	Activity during classes, Activity during classes, Execution of laboratory classes, Test, Engineering project	IMA2A_W01, IMA2A_W07, IMA2A_W04, IMA2A_U01, IMA2A_U07, IMA2A_U08, IMA2A_U11, IMA2A_U10, IMA2A_U14, IMA2A_U03, IMA2A_U04, IMA2A_U13
Operation and maintenance of mechatronic devices	Lecture, Laboratory classes, Seminars	Test, Presentation, Test, Presentation, Test, Presentation	IMA2A_W07, IMA2A_W03, IMA2A_W01
Embedded systems	Lecture, Laboratory classes	Execution of laboratory classes, Test results, Execution of laboratory classes, Test results	IMA2A_W02, IMA2A_U07, IMA2A_U10, IMA2A_U11, IMA2A_U13, IMA2A_K01
Diploma Training	Thesis-internship programme	Report on completion of a practical placement, Confirmation of completion of practical placement programme	IMA2A_W04, IMA2A_W07, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_K01, IMA2A_K02

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Diploma Thesis	Diploma Thesis	Diploma thesis preparation	IMA2A_W01, IMA2A_W02, IMA2A_W03, IMA2A_W04, IMA2A_W05, IMA2A_W06, IMA2A_W07, IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U06, IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14, IMA2A_K01, IMA2A_K02
Project management	Lecture, Laboratory classes, Seminars	Activity during classes, Activity during classes, Activity during classes	IMA2A_W06, IMA2A_W08, IMA2A_U09, IMA2A_U08, IMA2A_K01
MEMS and nanotechnology	Lecture, Laboratory classes	Execution of laboratory classes, Test results, Execution of laboratory classes, Test results	IMA2A_W01, IMA2A_W07, IMA2A_U07
Diploma Seminar	Seminars	Review of a thesis, Diploma thesis preparation	IMA2A_W01, IMA2A_W02, IMA2A_W03, IMA2A_W04, IMA2A_W05, IMA2A_W06, IMA2A_W07, IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U06, IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14, IMA2A_K01, IMA2A_K02, IMA2A_K03

Study plans

Major name: Mechatronic Engineering with English as instruction language

Semester 1

Path: Mechatronic Design

Subject	Number of hours	ECTS points	Form of verification	
Humanities and social elective module block		2,0	Assessment	O
The rules for selecting groups/modules: Student selects one module from the block.				
Management engineering	Lecture: 30	2,0	Assessment	W
Ergonomy	Lecture: 28	2,0	Assessment	W
Company management	Lecture: 28	2,0	Assessment	W
Mechatronic system indentification	Lecture: 42 Laboratory classes: 26 Project classes: 28	7,0	Exam	O
Kinematics and dynamics of mechatronic systems	Lecture: 42 Laboratory classes: 26 Project classes: 28	7,0	Exam	O
Mechatronics	Lecture: 28 Laboratory classes: 56 Project classes: 14	8,0	Exam	O
Informatics in mechatronics	Lecture: 28 Laboratory classes: 26 Project classes: 14	6,0	Assessment	O
Sum	**386**	**30,0**		

Semester 2

Path: Mechatronic Design

Subject	Number of hours	ECTS points	Form of verification	
Mechatronic systems	Lecture: 28 Project classes: 52	5,0	Exam	O

Subject	Number of hours	ECTS points	Form of verification	
Block of elective foreign language modules		3,0	Assessment	O
The rules for selecting groups/modules: Student selects one module from the block.				
Uncertainty Analysis in Engineering	Lecture: 15 Laboratory classes: 15 Project classes: 15	5,0	Exam	W
Nanosatellite attitude determination and control	Lecture: 20 Laboratory classes: 18 Project classes: 22	6,0	Exam	O
Smart materials and structures	Lecture: 28 Laboratory classes: 14 Project classes: 14	3,0	Assessment	W
3D printing technology	Lecture: 28 Laboratory classes: 28	3,0	Assessment	W
MEMS fabrication systems	Lecture: 14 Laboratory classes: 28	3,0	Assessment	W
Specialized English course		2,0	Exam	O
The rules for selecting groups/modules: Student selects one module from the block.				
English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics	Foreign language classes: 30	2,0	Exam	W
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES	Foreign language classes: 30	2,0	Exam	W
English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES at the Faculty of Computer Science, Electronics and Telecommunications (Computer Science)	Foreign language classes: 30	2,0	Exam	W
Mechatronic design	Lecture: 56 Laboratory classes: 56 Project classes: 42	8,0	Exam	O
Individual research project related to mechatronic design	Project classes: 0	7,0	Assessment	O
Electronics in mechatronics	Lecture: 28 Laboratory classes: 42	5,0	Exam	O
Sum	**376**	**30,0**		

Semester 3

Path: Mechatronic Design

Subject	Number of hours	ECTS points	Form of verification	
Block of modules elective on a specialization		2,0	Assessment	O
The rules for selecting groups/modules: Student selects one module from the block.				
Design of composite parts	Lecture: 10 Laboratory classes: 20	2,0	Assessment	W
Operation and maintenance of mechatronic devices	Lecture: 10 Laboratory classes: 10 Seminars: 10	2,0	Assessment	W
Embedded systems	Lecture: 10 Laboratory classes: 20	2,0	Assessment	W
Diploma Training	Thesis-internship programme: 0	2,0	Assessment	O
Diploma Thesis	Diploma Thesis: 0	20,0	Assessment	W
Project management	Lecture: 20 Laboratory classes: 10 Seminars: 10	3,0	Assessment	O
MEMS and nanotechnology	Lecture: 10 Laboratory classes: 10	2,0	Assessment	O
Diploma Seminar	Seminars: 15	1,0	Assessment	O
Sum	**105**	**30,0**		

O - Obligatory
W - Elective

ECTS credits calculations

Major: Mechatronic Engineering with English as instruction language
Specialty: Mechatronic Design

The total number of ECTS credits the student needs to obtain in the form of:

classes conducted with the direct participation of academic teachers or other persons conducting classes	61
core science classes relevant to a given major	0
practical classes, developing practical skills, including laboratory, design, practical and workshop classes	39
classes subject to choice by the student (in the amount of not less than 30% of the number of ECTS points necessary to obtain qualifications corresponding to the level of education)	59
classes in the field of humanities or social sciences - in the case of fields of study assigned to disciplines within fields other than humanities or social sciences, respectively	5
foreign language classes	2
apprenticeships	2
classes related to the academic activity conducted at the University in the discipline or disciplines to which the field of study is assigned, in the amount greater than 50% of the number of ECTS points required to complete studies at a given level, taking into account the participation of students in classes preparing to conduct scientific activity or participate in this activity (applies only to studies with a general academic profile)	72
classes shaping practical skills in the amount greater than 50% of the number of ECTS points required to complete studies at a given level (applies only to studies with a practical profile)	

Management engineering

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language	**Didactic cycle** 2023/2024
Speciality Mechatronic Design	**Subject code** RIMAMDS.IIi1HS.5da9fa5ac8549dbf93b8729412ac132b.23
Department Faculty of Mechanical Engineering and Robotics	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatory** Elective
Study form Full-time studies	**Block** Humanities and Social Sciences Modules
Education profile General academic	**Subject related to scientific research** Yes
	Subject shaping practical skills No

Period	**Examination**	**Number of ECTS points**
Semester 1	Assessment **Activities and hours** Lecture: 30	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	basic Problems of Engineering Management (PEM)	IMA2A_W06	Test, Project, Scientific paper
W2	methods applied to solve PEM	IMA2A_W06	Test, Project
W3	basic processes in manufacturing and logistic systems	IMA2A_W06	Test, Project, Scientific paper
W4	basic methods of control applied in manufacturing and logistic systems	IMA2A_W06	Test, Project, Scientific paper
Skills – Student can:			

U1	solve chosen PEM with help of simple algorithms	IMA2A_U01	Test, Project, Scientific paper
U2	build simulation and/or mathematical model of PEM	IMA2A_U01, IMA2A_U05	Test, Project, Scientific paper

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	30
Preparation of project, presentation, essay, report	20
Student workload	**Hours** 50
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, W2, W3, W4, U1, U2	This course provides an accessible introduction to scientific and engineering, quantitative methods for planning and scheduling of production and logistic operations.

Ergonomy

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language	**Didactic cycle** 2023/2024
Speciality Mechatronic Design	**Subject code** RIMAMDS.IIi1HS.df85a2aeebe1e4770933895f6a3071b4.23
Department Faculty of Mechanical Engineering and Robotics	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatory** Elective
Study form Full-time studies	**Block** Humanities and Social Sciences Modules
Education profile General academic	**Subject related to scientific research** No
	Subject shaping practical skills No

Period	**Examination**	**Number of ECTS points**
Semester 1	Assessment **Activities and hours** Lecture: 28	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Student zna i rozumie podstawowe pojęcia związane z ergonomią i BHP.	IMA2A_W07	Activity during classes, Participation in a discussion, Presentation
Skills – Student can:			

U1	Student potrafi — przy formułowaniu i rozwiązywaniu zadań inżynierskich — integrować wiedzę z zakresu dziedzin nauki i dyscyplin naukowych, właściwych dla ergonomii oraz zastosować podejście systemowe, uwzględniające także aspekty pozatechniczne. Student potrafi wykorzystać w zadaniu praktycznym zagadnienia projektowania ergonomicznego	IMA2A_U01, IMA2A_U08	Activity during classes, Participation in a discussion, Scientific paper, Involvement in teamwork
Social competences – Student is ready to:			
K1	Student potrafi pracować w zespole nad powierzonym mu zadaniem.	IMA2A_K01	Activity during classes, Participation in a discussion, Scientific paper
K2	Student potrafi przygotować dokumentację z wykonanego zadania zespołowego.	IMA2A_K01	Activity during classes, Participation in a discussion, Presentation

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Preparation for classes	12
Preparation of project, presentation, essay, report	10
Student workload	**Hours** 50
Workload involving teacher	**Hours** 28

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, U1, K1, K2	Moduł obejmuje podstawy z zakresu ergonomii począwszy od podstawowych definicji, poprzez zagadnienia związane z czynnikami środowiska pracy oraz oddziaływanie ich na człowieka.

Company management

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi1HS.3ce645fb3a7f49b8f01fc8523d31b934.23 **Lecture languages** English **Mandatory** Elective **Block** Humanities and Social Sciences Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 1	Assessment **Activities and hours** Lecture: 28	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Opisuje podstawowe typologie struktur organizacyjnych, zna ich charakterystykę oraz uwarunkowania zastosowań / can describe the basic typologies of organization structures, knows their charakteristic and application areas	IMA2A_W08	Activity during classes, Test results

W2	Definiuje poszczególne modele organizacji, tłumaczy istotę efektu organizacyjnego i zmiany sposobu jego wywoływania w odniesieniu do charakteru zaburzeń otoczenia przedsiębiorstwa / knows to define the several organization models, able to understand and to cativate the synergy effect	IMA2A_W06	Activity during classes, Test results
Skills – Student can:			
U1	Rozpoznaje składowe procesu zarządzania z uwzględnieniem jego funkcji. Określa obszary zarządzania strategicznego i operacyjnego, identyfikuje system planowania przedsiębiorstwa / Knows to identify the components of management process at strategic and operational level	IMA2A_U02	Test results
U2	Potrafi określić zakres czynności wchodzących w skład procesu organizacyjnego / knows to define the activities of organizational process	IMA2A_U02	Test results

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Realization of independently performed tasks	22
Student workload	**Hours** 50
Workload involving teacher	**Hours** 28

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, W2, U1, U2	

Mechatronic system indentification

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi1K.ef47afa2811b3758164b8fd249ffa38a.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 1	Exam **Activities and hours** Lecture: 42 Laboratory classes: 26 Project classes: 28	7

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Knows and understands relations between signal and system description in time- and frequency domain	IMA2A_W07	Execution of exercises, Execution of a project, Report, Test results, Completion of laboratory classes

W2	Knows and understands relations between continuous-time and discrete-time descriptions	IMA2A_W01	Execution of exercises, Execution of laboratory classes, Report, Test results, Completion of laboratory classes
W3	Has basic knowledge of analog and digital filters	IMA2A_W01, IMA2A_W07	Execution of laboratory classes, Project, Report, Test results, Completion of laboratory classes
W4	Has basic knowledge of nonparametric and parametric spectrum estimation methods	IMA2A_W01, IMA2A_W07	Execution of a project, Execution of laboratory classes, Report, Test results, Completion of laboratory classes
W5	Has basic knowledge of system identification with focus on modal analysis	IMA2A_W01, IMA2A_W07	Execution of a project, Execution of laboratory classes, Report, Test results, Completion of laboratory classes
Skills – Student can:			
U1	Can perform experimental modal anamysis	IMA2A_U12	Execution of a project, Execution of laboratory classes, Report, Completion of laboratory classes
U2	Can perform sampling of time-continuous signals and design anti-aliasing filter	IMA2A_U07, IMA2A_U11	Execution of laboratory classes, Project, Report, Completion of laboratory classes
U3	Can modify frequency responce of a dynamic structure using Laplace and z-transform	IMA2A_U01, IMA2A_U07	Execution of laboratory classes, Project, Examination, Report, Test results, Completion of laboratory classes
U4	Can perform analysis of dynamical systems using Matlab	IMA2A_U07	Execution of laboratory classes, Project, Report, Test results, Completion of laboratory classes
U5	Can design an analog filter and convert it to digital form	IMA2A_U07	Execution of laboratory classes, Project, Report, Test results, Completion of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	42
Laboratory classes	26
Project classes	28

Preparation for classes	16
Realization of independently performed tasks	11
Examination or Final test	2
Preparation of project, presentation, essay, report	50
Student workload	**Hours** 175
Workload involving teacher	**Hours** 96

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Project classes	W1, W2, W3, W4, W5, U1, U2, U3, U4, U5	-
Laboratory classes	W1, W2, W3, W4, W5, U1, U2, U3, U4, U5	
Lecture	W1, W2, W3, W4, W5, U2, U3, U5	

Kinematics and dynamics of mechatronic systems

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi1K.ab2f5abcbb6efbad0bd1b27624e54fe5.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 1	Exam **Activities and hours** Lecture: 42 Laboratory classes: 26 Project classes: 28	7

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Knows methods of kinematic analysis and synthesis of actuating and positioning mechanisms of mechatronic systems	IMA2A_W04, IMA2A_W07	Project, Examination
W2	Knows techniques of: motion path and trajectory planning, kinematic modelling, singularity analysis, as well as static and dynamic analysis of positioning mechanisms of mechatronic systems	IMA2A_W04, IMA2A_W07	Execution of laboratory classes, Examination, Report

W3	Knows methods of description of position and orientation, kinematics and dynamics, motion path planning and navigation of mobile mechatronic systems	IMA2A_W04, IMA2A_W07	Execution of laboratory classes, Examination, Report
Skills – Student can:			
U1	Can carry out kinematic analysis of a mechatronic actuating or positioning system	IMA2A_U02, IMA2A_U03, IMA2A_U07	Project
U2	Can formulate dynamic model of a mechatronic positioning system with use of appropriate software tools, and is able to classify components of the formulated dynamic equations of motion	IMA2A_U02, IMA2A_U03, IMA2A_U07	Execution of laboratory classes, Report
U3	Can plan motion path of a mobile mechatronic system	IMA2A_U02, IMA2A_U03, IMA2A_U07	Execution of laboratory classes, Report
U4	Can make use of computer aided engineering tools for simulation of mechanics of a mechatronic positioning system	IMA2A_U02, IMA2A_U03, IMA2A_U07	Execution of laboratory classes, Report

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	42
Laboratory classes	26
Project classes	28
Preparation for classes	25
Realization of independently performed tasks	24
Examination or Final test	1
Contact hours	5
Preparation of project, presentation, essay, report	40
Student workload	**Hours** 191
Workload involving teacher	**Hours** 96

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**

Project classes	U1, U4	The module concerns mechanics of positioning mechatronic devices on example of manipulating and mobile robots
Laboratory classes	U2, U3, U4	
Lecture	W1, W2, W3	

Mechatronics

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi1K.1112faafc7117d8ab54b1d1aa00f55a9.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 1	Exam **Activities and hours** Lecture: 28 Laboratory classes: 56 Project classes: 14	8

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Description and practical use of rules and methods of designing with CAD, CAM and CAE Systems in the given scope of application.	IMA2A_W04	Execution of a project, Examination, Engineering project
Skills – Student can:			
U1	Student learn to use advanced packages for design and simulation of electronic systems and of software systems.	IMA2A_U09	Execution of laboratory classes, Engineering project

U2	Ability to formulate a design specification of a complex mechatronic system or device.	IMA2A_U09	Execution of a project, Engineering project
Social competences – Student is ready to:			
K1	Understanding of the need to formulate and communicate information and opinions regarding the achievements of mechatronics.	IMA2A_K02	Execution of a project, Execution of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Laboratory classes	56
Project classes	14
Preparation for classes	33
Realization of independently performed tasks	33
Examination or Final test	2
Preparation of project, presentation, essay, report	34
Student workload	**Hours** 200
Workload involving teacher	**Hours** 98

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, U1, U2	
Laboratory classes	U1, U2, K1	
Project classes	U1, U2, K1	

Informatics in mechatronics

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi1K.b6360b2210dc9273a51402ab3f852335.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 1	Assessment **Activities and hours** Lecture: 28 Laboratory classes: 26 Project classes: 14	6

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	knows and understands the principles of object-oriented and functional programming in the Scala language	IMA2A_W02	Execution of a project, Execution of laboratory classes, Test, Test results
W2	knows and understands the operation, basics of use and how to configure SBT; knows and understands the structure of a web application built using the Play Framework; knows and understands how to use the Slick framework.	IMA2A_W02	Execution of a project, Execution of laboratory classes, Test, Test results

W3	knows and understands the principles of object-oriented programming in Java (classes, objects, inheritance, interfaces, generic programming and elements of parallel programming); knows and understands elements of functional programming in Java; knows and understands the creation of applications using the Spring Framework	IMA2A_W02	Execution of a project, Execution of laboratory classes, Test, Test results
W4	knows and understands the methods of network and distributed programming in Java: UDP, TCP, RMI, SOAP and RESTful network services.	IMA2A_W02	Execution of a project, Execution of laboratory classes, Test, Test results
Skills – Student can:			
U1	can build a program in Java using classes, objects, interfaces, generic types and threads, can apply selected elements of functional programming in Java	IMA2A_U09, IMA2A_U10, IMA2A_U12	Execution of a project, Execution of laboratory classes
U2	can build Java programs using UDP and TCP protocols, as well as RMI-based distributed programming techniques, SOAP and RESTful network services, can use the Spring Framework to build applications	IMA2A_U12	Execution of a project, Execution of laboratory classes
U3	can build a program in Scala language using SBT to project management, Play skeleton for building a web application and a Slick framework for cooperation with a database system (relational)	IMA2A_U12	Execution of a project, Execution of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Laboratory classes	26
Project classes	14
Preparation for classes	28
Realization of independently performed tasks	28
Examination or Final test	2
Preparation of project, presentation, essay, report	32
Student workload	**Hours** 158
Workload involving teacher	**Hours** 68

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Lecture	W3, W4, W1, W2	The aim of the course is to familiarize students with selected methods and information tools related to Java and Scala languages in application to the development of mechatronic systems software. In addition to the typical object-oriented approach to programming, elements of functional programming are introduced. Applications include parallel programming, network communication using UDP and TCP, RMI, SOAP and REST network services, the basis of the Spring Framework.
Project classes	W1, W2, W3, W4, U1, U2, U3	
Laboratory classes	U1, U2, U3	

Mechatronic systems

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2K.b2212a1046562442ca34e164ab2fc780.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period Semester 2	**Examination** Exam **Activities and hours** Lecture: 28 Project classes: 52	**Number of ECTS points** 5

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	knowledge of development trends and most important recent achievements in mechatronics	IMA2A_W03	Examination
W2	knowledge and understanding of the methodology of designing complex mechatronic devices and methods and techniques used for their design, knowledge of computer tools for the design and simulation of mechatronic devices	IMA2A_W04	Execution of a project, Project, Examination
Skills – Student can:			

U1	ability to work in team, taking various roles, to estimate the time needed to complete a task, and meet the deadline for the task	IMA2A_U02	Execution of a project
U2	ability to develop detailed documentation related to the completion of a project; ability to prepare and give a presentation on the completion of a project and conduct a discussion regarding the presentation given	IMA2A_U03, IMA2A_U04	Participation in a discussion, Project, Presentation
U3	ability to design mechatronic systems and devices for various applications, according to a independently formulated specification, employing CAD and CAE tools, integrating the knowledge of electronics, electrical engineering, IT sciences, automatics, robotics, mechanics, machine construction and operation and other disciplines using the system-oriented approach	IMA2A_U09, IMA2A_U10, IMA2A_U12	Execution of a project, Project
U4	ability to analyze, assess and compare design solutions of complex mechatronic devices and systems in terms of the functional criteria given and to propose improvements to the existing design solutions	IMA2A_U08, IMA2A_U13, IMA2A_U14	Participation in a discussion, Execution of a project, Project, Examination, Presentation
U5	ability to formulate and test hypotheses related to designing mechatronic devices and systems	IMA2A_U11	Execution of a project, Project, Presentation
U6	ability to acquire information from data sheets, application notes, databases and other sources in English to design mechatronic devices or systems; ability to integrate, interpret and critically assess the information obtained, draw conclusions, formulate and justify opinions	IMA2A_U01, IMA2A_U05	Execution of a project, Project, Presentation
Social competences – Student is ready to:			
K1	ability to think and act in a creative manner	IMA2A_K01, IMA2A_K03	Activity during classes, Execution of a project, Project

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Project classes	52
Preparation for classes	9
Realization of independently performed tasks	10
Examination or Final test	1
Preparation of project, presentation, essay, report	50
Student workload	**Hours** 150

Workload involving teacher	Hours 80

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Project classes	W2, U1, U2, U3, U4, U5, U6, K1	
Lecture	W1, W2, U3, U4, U5	

Smart materials and structures

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2PJO.75c9c864dbfb6274be54a7503b5e1b9e.23 **Lecture languages** English **Mandatory** Elective **Block** Elective Modules in Foreign Language **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 2	Assessment **Activities and hours** Lecture: 28 Laboratory classes: 14 Project classes: 14	3

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Student has consistent knowledge regarding the selected types of smart materials and structures including their properties, modeling and applications.	IMA2A_W01, IMA2A_W03, IMA2A_W04, IMA2A_W07	Execution of a project, Execution of laboratory classes, Test, Report
W2	Student has consistent knowledge regarding current trends in manufacturing and development of the systems equipped with smart materials and structures.	IMA2A_W03, IMA2A_W04, IMA2A_W07	Execution of a project, Execution of laboratory classes, Test, Report

Skills – Student can:			
U1	Student has skills to model a system equipped with a smart material or structure of the selected type and perform numerical simulations to identify its properties.	IMA2A_U07, IMA2A_U14	Execution of a project, Execution of laboratory classes, Report
U2	Student has skills to elaborate a project of a system equipped with a smart material or structure of the selected type.	IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U07, IMA2A_U14	Execution of a project, Report
Social competences – Student is ready to:			
K1	Student understands the need for team work and responsibility for his/her contribution, and is aware of the necessity for continuous training to gain knowledge on smart materials and structures.	IMA2A_K01, IMA2A_K02	Activity during classes, Participation in a discussion, Execution of a project, Execution of laboratory classes, Involvement in teamwork

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Laboratory classes	14
Project classes	14
Preparation for classes	10
Realization of independently performed tasks	14
Examination or Final test	2
Preparation of project, presentation, essay, report	8
Student workload	**Hours** 90
Workload involving teacher	**Hours** 56

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**

Lecture	W1, W2	Module deals with the properties, modeling and applications of the selected types of smart materials and structures. Gained knowledge and skills cover analysis and synthesis of the systems equipped with smart materials and structures. Gained social competences deal with willingness for team work and awareness of the necessity for continuous training within the merit scope of module.
Laboratory classes	W1, U1, K1	
Project classes	W2, U2, K1	

3D printing technology

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language	**Didactic cycle** 2023/2024
Speciality Mechatronic Design	**Subject code** RIMAMDS.IIi2PJO.a9420442277e20c671a67f6f286b2faa.23
Department Faculty of Mechanical Engineering and Robotics	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatory** Elective
Study form Full-time studies	**Block** Elective Modules in Foreign Language
Education profile General academic	**Subject related to scientific research** Yes
	Subject shaping practical skills No

Period	**Examination**	**Number of ECTS points**
Semester 2	Assessment **Activities and hours** Lecture: 28 Laboratory classes: 28	3

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Student has consistent knowledge regarding theoretical and practical fundamentals for 3D printing technology and required CAD/CAM tools, construction of 3D printers and their usage for rapid prototyping.	IMA2A_W03, IMA2A_W04, IMA2A_W07	Execution of laboratory classes, Test, Report
Skills – Student can:			
U1	Student has skills to design 3D printed parts using CAD/CAM tools.	IMA2A_U02, IMA2A_U07, IMA2A_U10, IMA2A_U13, IMA2A_U14	Execution of laboratory classes, Report

U2	Student has skills to use a 3D printer including: printing, calibrating, assembling and disassembling of the printer’s components.	IMA2A_U02, IMA2A_U08, IMA2A_U13, IMA2A_U14	Execution of laboratory classes, Report
Social competences – Student is ready to:			
K1	Student understands the need for team work and responsibility for his/her contribution, and is aware of the necessity for continuous training to gain knowledge on 3D printing technology and rapid prototyping.	IMA2A_K01, IMA2A_K02	Activity during classes, Participation in a discussion, Execution of laboratory classes, Involvement in teamwork

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Laboratory classes	28
Preparation for classes	10
Realization of independently performed tasks	14
Examination or Final test	2
Preparation of project, presentation, essay, report	8
Student workload	**Hours** 90
Workload involving teacher	**Hours** 56

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Laboratory classes	U1, U2, K1	Module deals with the properties and applications of the selected types of 3D printing technology. Gained knowledge and skills cover CAD/CAM tools required for 3D printing as well as construction of 3D printers and their usage in the process of rapid prototyping. Gained social competences deal with willingness for team work and awareness of the necessity for continuous training on 3D printing technology and rapid prototyping.
Lecture	W1, U1	

MEMS fabrication systems

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2PJO.1181479c360138ff3c9c888a6aaa48c3.23 **Lecture languages** English **Mandatory** Elective **Block** Elective Modules in Foreign Language **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 2	Assessment **Activities and hours** Lecture: 14 Laboratory classes: 28	3

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Basic knowledge of phenomena related to the change of scale from macro and meso to micro and nano and their impact on phenomena occurring in micro and nano systems	IMA2A_W01	Test results
W2	Knowledge of the requirements for the environment in which MEMS and NEMS systems can be produced and can determine the requirements for a specific process	IMA2A_W07	Test results

W3	Knowledge of the methods and techniques of layer deposition and etching for materials in the process of manufacturing MEMS systems, is able to choose the proper method and process parameters for selected materials	IMA2A_W01, IMA2A_W07	Test results, Completion of laboratory classes
W4	Knowledge of the photo-lithographic methods and techniques, materials and devices used in the photolithography process	IMA2A_W01, IMA2A_W07	Test results
Skills – Student can:			
U1	Is able to design and conduct simulations of selected MEMS systems	IMA2A_U07	Execution of laboratory classes
U2	Is able to use selected CAE tools in the process of designing MEMS systems and with their use, perform simulation verification of the developed project	IMA2A_U07	Execution of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	14
Laboratory classes	28
Preparation for classes	10
Realization of independently performed tasks	25
Examination or Final test	1
Student workload	**Hours** 78
Workload involving teacher	**Hours** 42

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Laboratory classes	W3, W4, U1, U2	
Lecture	W1, W2, W3, W4	

English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2JO.ef4557fa02b1ccf0f1bd0a9191bdbc2f.23 **Lecture languages** English **Mandatory** Elective **Block** Foreign Language **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 2	Exam **Activities and hours** Foreign language classes: 30	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Skills – Student can:			
U1	Can understand extensive, even detailed texts and oral statements, for example, texts from specialist literature, lectures and presentations, when they relate to the field of study and contemporary issues, as well as messages and instructions in work environment. Can interpret obtained data and information, and notice hidden meaning expressed indirectly.	IMA2A_U05	Activity during classes, Participation in a discussion, Test, Examination

U2	Can write various types of text, for example, an extensive informative and argumentative text related to the field of study and specialisation, and texts related to the results of conducted research. Can make clear and extensive oral statements, especially with the use of language related to the academic environment, work placement, recruitment, and work environment.	IMA2A_U05	Execution of exercises, Examination, Report, Scientific paper, Essays written during classes
U3	Can prepare an extensive oral presentation related to the field of study, specialisation, and professional interests. Can take an active part in discussions with a suitable degree of fluency and spontaneity, also in the professional environment, and make clear and complex statements about phenomena and ones that express various points of view.	IMA2A_U05	Activity during classes, Participation in a discussion, Presentation
U4	Can carry on correspondence typical of work environment with the use of specialist language. Can make use of available academic and learning materials.	IMA2A_U05	Execution of exercises, Test, Examination
U5	Can use grammatical structures, phraseology and vocabulary necessary to understand texts related to the field of study as well as general academic texts, and notice hidden meaning expressed indirectly. Can use structures and phraseology that enable fluent and spontaneous communication in the academic and professional environment with the use of accurate specialist vocabulary.	IMA2A_U05	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Test results

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Foreign language classes	30
Preparation for classes	4
Realization of independently performed tasks	15
Examination or Final test	2
Contact hours	1
Preparation of project, presentation, essay, report	8
Student workload	**Hours** 60
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Foreign language classes	U1, U2, U3, U4, U5	English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics

English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2JO.5ecdcd70c5f967f68d851387d4713913.23 **Lecture languages** English **Mandatory** Elective **Block** Foreign Language **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 2	Exam **Activities and hours** Foreign language classes: 30	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Skills – Student can:			
U1	Can understand extensive, even detailed texts and oral statements, for example, texts from specialist literature, lectures and presentations, when they relate to the field of study and contemporary issues, as well as messages and instructions in work environment. Can interpret obtained data and information, and notice hidden meaning expressed indirectly.	IMA2A_U01, IMA2A_U05	Activity during classes, Participation in a discussion, Test, Examination

U2	Can write various types of text, for example, an extensive informative and argumentative text related to the field of study and specialisation, and texts related to the results of conducted research. Can make clear and extensive oral statements, especially with the use of language related to the academic environment, work placement, recruitment, and work environment.	IMA2A_U01, IMA2A_U05	Execution of exercises, Examination, Report, Scientific paper, Essays written during classes
U3	Can prepare an extensive oral presentation related to the field of study, specialisation, and professional interests. Can take an active part in discussions with a suitable degree of fluency and spontaneity, also in the professional environment, and make clear and complex statements about phenomena and ones that express various points of view.	IMA2A_U01, IMA2A_U05	Activity during classes, Participation in a discussion, Presentation
U4	Can carry on correspondence typical of work environment with the use of specialist language. Can make use of available academic and learning materials.	IMA2A_U01, IMA2A_U05	Execution of exercises, Test, Examination
U5	Can use grammatical structures, phraseology and vocabulary necessary to understand texts related to the field of study as well as general academic texts, and notice hidden meaning expressed indirectly. Can use structures and phraseology that enable fluent and spontaneous communication in the academic and professional environment with the use of accurate specialist vocabulary.	IMA2A_U01, IMA2A_U05	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Test results

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Foreign language classes	30
Preparation for classes	4
Realization of independently performed tasks	15
Examination or Final test	2
Contact hours	1
Preparation of project, presentation, essay, report	8
Student workload	**Hours** 60
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Foreign language classes	U1, U2, U3, U4, U5	English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics

English B2+ course - compulsory course for students of SECOND-CYCLE STUDIES at the Faculty of Computer Science, Electronics and Telecommunications (Computer Science)

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language	**Didactic cycle** 2023/2024
Speciality Mechatronic Design	**Subject code** RIMAMDS.IIi2JO.ff5757b98a7d5ad732f45e4c01bbb9e5.23
Department Faculty of Mechanical Engineering and Robotics	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatory** Elective
Study form Full-time studies	**Block** Foreign Language
Education profile General academic	**Subject related to scientific research** No
	Subject shaping practical skills No

Period	**Examination**	**Number of ECTS points**
Semester 2	Exam **Activities and hours** Foreign language classes: 30	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Skills – Student can:			

U1	Can understand extensive, even detailed texts and oral statements, for example, texts from specialist literature, lectures and presentations, when they relate to the field of study and contemporary issues, as well as messages and instructions in work environment. Can interpret obtained data and information, and notice hidden meaning expressed indirectly.	IMA2A_U01, IMA2A_U05	Activity during classes, Participation in a discussion, Test, Examination
U2	Can write various types of text, for example, an extensive informative and argumentative text related to the field of study and specialisation, and texts related to the results of conducted research. Can make clear and extensive oral statements, especially with the use of language related to the academic environment, work placement, recruitment, and work environment.	IMA2A_U01, IMA2A_U05	Execution of exercises, Examination, Report, Scientific paper, Essays written during classes
U3	Can prepare an extensive oral presentation related to the field of study, specialisation, and professional interests. Can take an active part in discussions with a suitable degree of fluency and spontaneity, also in the professional environment, and make clear and complex statements about phenomena and ones that express various points of view.	IMA2A_U03, IMA2A_U05	Activity during classes, Participation in a discussion, Presentation
U4	Can carry on correspondence typical of work environment with the use of specialist language. Can make use of available academic and learning materials.	IMA2A_U01, IMA2A_U05	Execution of exercises, Test, Examination
U5	Can use grammatical structures, phraseology and vocabulary necessary to understand texts related to the field of study as well as general academic texts, and notice hidden meaning expressed indirectly. Can use structures and phraseology that enable fluent and spontaneous communication in the academic and professional environment with the use of accurate specialist vocabulary.	IMA2A_U01, IMA2A_U05	Activity during classes, Participation in a discussion, Execution of exercises, Test, Examination, Test results

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Foreign language classes	30
Preparation for classes	4
Realization of independently performed tasks	15
Examination or Final test	2
Contact hours	1
Preparation of project, presentation, essay, report	8
Student workload	**Hours** 60

Workload involving teacher	Hours 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Foreign language classes	U1, U2, U3, U4, U5	English B2+ course - compulsory ESP course for students of SECOND-CYCLE STUDIES in MECHATRONICS with ENGLISH as the instruction language at the Faculty of Mechanical Engineering and Robotics

Mechatronic design

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language	**Didactic cycle** 2023/2024
Speciality Mechatronic Design	**Subject code** RIMAMDS.IIi2K.b9b04e35dacca7185105bf5accebae6d.23
Department Faculty of Mechanical Engineering and Robotics	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatory** Obligatory
Study form Full-time studies	**Block** Core Modules
Education profile General academic	**Subject related to scientific research** Yes
	Subject shaping practical skills No

Period	Examination	Number of ECTS points
Semester 2	Exam **Activities and hours** Lecture: 56 Laboratory classes: 56 Project classes: 42	8

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	knows theoretical foundations of the design and numerical modeling of mechatronic devices and systems	IMA2A_W02, IMA2A_W04, IMA2A_W07	Activity during classes, Participation in a discussion, Examination, Report
W2	has the knowledge about the basic numerical analyses and tools (CAx) utilized in the process of design, manufacturing and virtual testing of mechatronic devices	IMA2A_W02, IMA2A_W04, IMA2A_W07	Activity during classes, Participation in a discussion, Examination, Report

W3	has the knowledge about the modeling of complex physical phenomena, including multiphysics simulations, present in mechatronic devices	IMA2A_W01	Activity during classes, Participation in a discussion, Examination, Report
Skills – Student can:			
U1	is able to formulate a numerical model of a mechatronic device, or a subsystem of a device, considering the physical phenomena relevand for the intended application of a model	IMA2A_U07, IMA2A_U10, IMA2A_U11	Test, Project
U2	is able to formulate a geometrical model (CAD) and a computational model (CAE) of a mechatronic device and perform a numerical analysis of that device for a desired application	IMA2A_U07, IMA2A_U10, IMA2A_U11	Test, Project
U3	is able to perform an assessment of simulation results and relate them to experimental data with use of relevant validation criteria	IMA2A_U11	Test, Project
U4	is able to perform the analysis of influence of characteristic model parameters on the performance of a mechatronic device - local and global sensitivity analysis	IMA2A_U11, IMA2A_U13, IMA2A_U14	Test, Project
U5	is able to present the results of individual work and the work of a project team. Is able to discuss the results and propose improvements and future works.	IMA2A_U13, IMA2A_U14, IMA2A_K01	Presentation
Social competences – Student is ready to:			
K1	has the ability to bring innovation into the design	IMA2A_U13, IMA2A_U14, IMA2A_K01	Project

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	56
Laboratory classes	56
Project classes	42
Preparation for classes	15
Realization of independently performed tasks	15
Examination or Final test	2
Preparation of project, presentation, essay, report	15
Student workload	**Hours** 201
Workload involving teacher	**Hours** 154

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	Subject learning outcomes	Programme content that ensure achieving learning outcomes for the module
Project classes	U1, U2, U3, U4, U5, K1	This teaching module deals with the computer-aided mechatronic design process of mechatronic devices and systems. The lectures are intended to provide an overview and necessary theoretical background of the computer-aided tools used in the mechatronic design process. During the laboratory classes the students get familiar with the commercial software tools used in mechatronic design. During the project class the students solve a predefined engineering problem working in a group.
Laboratory classes	U1, U2, U3, U4, U5, K1	
Lecture	W1, W2, W3, U1, U3	

Individual research project related to mechatronic design

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2K.fddc8b412e3fbdce845e32a9fe38f98b.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period Semester 2	**Examination** Assessment **Activities and hours** Project classes: 0	**Number of ECTS points** 7

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Possesses knowledge about structures, principles of operation, design and operation of mechatronic devices	IMA2A_W03, IMA2A_W07	Project, Report
W2	Possesses theoretical knowledge that is the base for formulation of physical and mathematical models of mechatronic systems	IMA2A_W01	Project, Report
Skills – Student can:			
U1	Can prepare and carry out presentation of results of realization of engineering tasks	IMA2A_U03, IMA2A_U04, IMA2A_U05	Project, Report

U2	Can apply theoretical knowledge in analysis and sythesis of mechatronic systems	IMA2A_U07, IMA2A_U10	Project, Report
U3	Is able to apply the tools of Computer Aided Engineering for analysis and synthesis of mechatronic systems	IMA2A_U07, IMA2A_U12	Project, Report
U4	Can acquire information from professional sources and use it in realization of engineering tasks	IMA2A_U01	Project, Report
Social competences – Student is ready to:			
K1	Knows, understands and applies in practice professional code of an engineer	IMA2A_K02	Project, Report
K2	Can learn systematically, keeps deadlines, accepts the matter-of-fact critique of his/her achievements	IMA2A_K01	Project, Report

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Preparation of project, presentation, essay, report	175
Student workload	**Hours** 175

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Project classes	W1, W2, U1, U2, U3, U4, K1, K2	Students carry out their individual research being an initial part of their thesis, or activity in a student scientific associations or activity in a scientific research project.

Electronics in mechatronics

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi2K.21de89247e43b7693594928121ceed9f.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 2	Exam **Activities and hours** Lecture: 28 Laboratory classes: 42	5

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Knows the basics of technology and production of integrated circuits and digital systems architecture	IMA2A_W04	Execution of laboratory classes
W2	Knows the basic FPGA circuits an principles of their design	IMA2A_W07	Execution of laboratory classes
Skills – Student can:			
U1	Is able to obtain information from the documents of IC and used it to perform the tasks of engineering	IMA2A_U01, IMA2A_U02, IMA2A_U04	Report

U2	Is able to prepare a program to generate functional FPGA systems support for a particular system design	IMA2A_U07, IMA2A_U09	Completion of laboratory classes
Social competences – Student is ready to:			
K1	Is able to interact in a group with a fixed division of tasks and responsibilities	IMA2A_K01	Involvement in teamwork

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	28
Laboratory classes	42
Preparation for classes	40
Preparation of project, presentation, essay, report	15
Student workload	**Hours** 125
Workload involving teacher	**Hours** 70

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, W2	
Laboratory classes	U1, U2, K1	

Design of composite parts

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4S.e235cf0f5046b57507f20a29d9225d77.23 **Lecture languages** English **Mandatory** Elective **Block** Major Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period Semester 3	**Examination** Assessment **Activities and hours** Lecture: 10 Laboratory classes: 20	**Number of ECTS points** 2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	The student will be familiar with the types of plastics and composites, their properties and application	IMA2A_W01, IMA2A_W07	Execution of laboratory classes, Test
W2	knows and understands the methodology for designing plastic and composite structures	IMA2A_W04, IMA2A_W07	Execution of laboratory classes, Test
W3	understands the requirements for composite and plastic structures and knows the possible analysis methods of above mentioned structures	IMA2A_W04, IMA2A_W07	Activity during classes, Execution of laboratory classes, Test
Skills – Student can:			

U1	is able to design plastic and composite part taking into account their pros and cons	IMA2A_U01, IMA2A_U07, IMA2A_U08	Activity during classes, Execution of laboratory classes, Test
U2	is able to develop technologically correct composite/plastic part and estimate the costs of the tooling	IMA2A_U01, IMA2A_U07, IMA2A_U08, IMA2A_U11	Engineering project
U3	is able to estimate strength and lifetime of the plastic/composite parts. Moreover, is able to assess the influence if the design features on the unit price of the product	IMA2A_U01, IMA2A_U10, IMA2A_U11, IMA2A_U14	Activity during classes, Execution of laboratory classes, Test
U4	is able to critically analyze the simulation results, prepare techniocal documentation and clearly present results of the calculations	IMA2A_U07, IMA2A_U08	Engineering project
U5	is able to select manufacturing technology and optimize the plastic/composite structure taking into account manufacturing restrictions	IMA2A_U03, IMA2A_U04, IMA2A_U08, IMA2A_U11, IMA2A_U13	Activity during classes, Execution of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	10
Laboratory classes	20
Preparation for classes	10
Realization of independently performed tasks	20
Student workload	**Hours** 60
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, W2, W3, U2, U3	
Laboratory classes	W2, W3, U1, U2, U3, U4, U5	

Operation and maintenance of mechatronic devices

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4S.0f9927bdddfabf8e869a5e0e8cdd3e70.23 **Lecture languages** English **Mandatory** Elective **Block** Major Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Lecture: 10 Laboratory classes: 10 Seminars: 10	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Knows dependability theory (definitions of hazard, durability, availability, and maintainability) and is able to list dependability characteristics of non-maintainable objects.	IMA2A_W07	Test
W2	Knows quantitative characteristics of dependability	IMA2A_W07	Test, Presentation

W3	Has a fundamental knowledge about dependability of simple and advanced technical objects, and understands assumptions made to describe technical objects with conditional elements.	IMA2A_W07	Test
W4	Know basic dependability models approximated by probabilistic distributions(exponential, Weibull, normal, logarithmic-exponential	IMA2A_W03	Test
W5	Understands advanced elements of dependability theory, e.g. conditional dependability	IMA2A_W01	Test, Presentation

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	10
Laboratory classes	10
Seminars	10
Realization of independently performed tasks	18
Examination or Final test	2
Student workload	**Hours** 50
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Seminars	W1, W2, W4, W5	Operation and maintenance of mechatronic devices
Lecture	W1, W2, W3	
Laboratory classes	W1, W2, W4, W5	

Embedded systems

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4S.228078523cb7f097ecc55879565d142c.23 **Lecture languages** English **Mandatory** Elective **Block** Major Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Lecture: 10 Laboratory classes: 20	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	extensive knowledge of the Hardware Abstraction Layer in software for embedded systems	IMA2A_W02	Execution of laboratory classes, Test results
W2	ordered knowledge in the field of real-time software for embedded systems, created without the use of operating systems	IMA2A_W02	Execution of laboratory classes, Test results
Skills – Student can:			

U1	ability to write and debug software for embedded systems using development environments	IMA2A_U07, IMA2A_U10	Execution of laboratory classes
U2	ability to design architecture of a simple embedded system in FPGA, implement it and bring to operation	IMA2A_U10, IMA2A_U11, IMA2A_U13	Execution of laboratory classes
Social competences – Student is ready to:			
K1	ability to think and act in creative manner during writing and debugging software for embedded systems	IMA2A_K01	Execution of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	10
Laboratory classes	20
Preparation for classes	25
Student workload	**Hours** 55
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, W2	
Laboratory classes	W1, W2, U1, U2, K1	

Diploma Training

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language	**Didactic cycle** 2023/2024
Speciality Mechatronic Design	**Subject code** RIMAMDS.IIi4K.f00878b72b1aae627be56073cdece963.23
Department Faculty of Mechanical Engineering and Robotics	**Lecture languages** English
Study level Second-cycle (engineer) programme	**Mandatory** Obligatory
Study form Full-time studies	**Block** Core Modules
Education profile General academic	**Subject related to scientific research** No
	Subject shaping practical skills No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Thesis-internship programme: 0	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Has knowledge concerning techniques and methods of solving engineering problems in companies/ research and scientific institutions/ universities	IMA2A_W04, IMA2A_W07	Report on completion of a practical placement, Confirmation of completion of practical placement programme
Skills – Student can:			

U1	Is able to work individually and in teams	IMA2A_U02	Report on completion of a practical placement, Confirmation of completion of practical placement programme
U2	Can solve complex engineering problems via appropriate planning and persuing of activities, as well as elaborating and reporting of results	IMA2A_U02, IMA2A_U03, IMA2A_U04	Report on completion of a practical placement, Confirmation of completion of practical placement programme
Social competences – Student is ready to:			
K1	Can apply acquired knowledge and skills to search for creative solutions of conducted tasks	IMA2A_K01, IMA2A_K02	Report on completion of a practical placement, Confirmation of completion of practical placement programme

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Preparation for classes	60
Student workload	**Hours** 60

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Thesis-internship programme	W1, U1, U2, K1	Diploma training is an individual activity of students that is connected with practical part of preparation of their Master thesis.

Diploma Thesis

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4K.e53bc1ffec52171870fc55d1cec2fa6a.23 **Lecture languages** English **Mandatory** Elective **Block** Core Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Diploma Thesis: 0	20

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Students have sufficient knowledge to produce a valuable thesis on mechatronic engineering	IMA2A_W01, IMA2A_W02, IMA2A_W03, IMA2A_W04, IMA2A_W05, IMA2A_W06, IMA2A_W07	Diploma thesis preparation
Skills – Student can:			

U1	Students can prepare the text of the thesis according to demands	IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U06, IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14	Diploma thesis preparation
U2	Students acquired fluency in selection and application of appropriate equipment and software tools	IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U06, IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14	Diploma thesis preparation
Social competences – Student is ready to:			
K1	Students acquired ability of achieving continuous progress in their individual research work, as well as they proved ability to meet deadlines.	IMA2A_K01, IMA2A_K02	Diploma thesis preparation

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Preparation for classes	100
Realization of independently performed tasks	100
Examination or Final test	2
Preparation of project, presentation, essay, report	150
Other	200
Student workload	**Hours** 552

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Diploma Thesis	W1, U1, U2, K1	Students carry out their individual research under supervision of a scientist. The achieved results are reported in the thesis that is subjected to review and defense.

Project management

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4HS.8a38ca14dfd6a4112fda620666db2f11.23 **Lecture languages** English **Mandatory** Obligatory **Block** Humanities and Social Sciences Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Lecture: 20 Laboratory classes: 10 Seminars: 10	3

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Within this subject students will learn basic problems on project management, particularly project definition, formulation of project specification, task planning, formulation of project scheduling, resources planning, management of project progress and preparation of reports.	IMA2A_W06, IMA2A_W08	Activity during classes
Skills – Student can:			

U1	Ability to formulate a design specification of a complex mechatronic system or device, taking into consideration the legal aspects.	IMA2A_U09	Activity during classes
U2	Graduated students will have ability to manage project using modern methods and procedures.	IMA2A_U08	Activity during classes
Social competences – Student is ready to:			
K1	Ability to think and act in an enterprising and creative manner.	IMA2A_K01	Activity during classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	20
Laboratory classes	10
Seminars	10
Realization of independently performed tasks	35
Student workload	**Hours** 75
Workload involving teacher	**Hours** 40

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Lecture	W1, U1, U2, K1	
Laboratory classes	W1, U1, U2, K1	
Seminars	U2, K1	

MEMS and nanotechnology

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4K.07b7a2f01a9cf93f1023f15453228f06.23 **Lecture languages** English **Mandatory** Obligatory **Block** Core Modules **Subject related to scientific research** Yes **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Lecture: 10 Laboratory classes: 10	2

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Basic knowledge of phenomena related to the change of scale from macro and meso to micro and nano and their impact on phenomena occurring in micro and nano systems	IMA2A_W01	Test results
W2	Knowledge of the requirements for the environment in which MEMS and NEMS systems can be produced and can determine the requirements for a specific process	IMA2A_W07	Test results

W3	Knowledge of the methods and techniques of layer deposition and etching for materials in the process of manufacturing MEMS systems, is able to choose the proper method and process parameters for selected materials	IMA2A_W01, IMA2A_W07	Execution of laboratory classes, Test results
W4	Knowledge of the photo-lithographic methods and techniques, materials and devices used in the photolithography process	IMA2A_W07	Execution of laboratory classes, Test results
W5	Knowledge of the methods of quality control and testing of mechanical and electrical properties of MEMS systems,	IMA2A_W07	Test results
Skills – Student can:			
U1	Is able to use selected CAE tools in the process of designing MEMS systems and with their use, perform simulation verification of the developed project	IMA2A_U07	Execution of laboratory classes, Test results
U2	Is able to design and conduct simulations of selected MEMS systems	IMA2A_U07	Execution of laboratory classes

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lecture	10
Laboratory classes	10
Realization of independently performed tasks	33
Student workload	**Hours** 53
Workload involving teacher	**Hours** 20

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Laboratory classes	W3, W4, W5, U1, U2	
Lecture	W1, W2, W3, W4, W5	

Diploma Seminar

Educational subject description sheet

Basic information

Field of study Mechatronic Engineering with English as instruction language **Speciality** Mechatronic Design **Department** Faculty of Mechanical Engineering and Robotics **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2023/2024 **Subject code** RIMAMDS.IIi4S.113e607328fe3b1feac36d5c37a13bcd.23 **Lecture languages** English **Mandatory** Obligatory **Block** Major Modules **Subject related to scientific research** No **Subject shaping practical skills** No

Period	**Examination**	**Number of ECTS points**
Semester 3	Assessment **Activities and hours** Seminars: 15	1

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods
Knowledge – Student knows and understands:			
W1	Students can prepare and give presentations on their individual research results	IMA2A_W01, IMA2A_W02, IMA2A_W03, IMA2A_W04, IMA2A_W05, IMA2A_W06, IMA2A_W07	Review of a thesis, Diploma thesis preparation
Skills – Student can:			

U1	Students are able to discuss on topics related to mechatronic engineering	IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U06, IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14	Review of a thesis, Diploma thesis preparation
U2	Students can formulate critical comments regarding the presented research results	IMA2A_U01, IMA2A_U02, IMA2A_U03, IMA2A_U04, IMA2A_U05, IMA2A_U06, IMA2A_U07, IMA2A_U08, IMA2A_U09, IMA2A_U10, IMA2A_U11, IMA2A_U12, IMA2A_U13, IMA2A_U14	Review of a thesis, Diploma thesis preparation
Social competences – Student is ready to:			
K1	Students are able to accept critical comments regarding the presented results	IMA2A_K01, IMA2A_K02, IMA2A_K03	Review of a thesis, Diploma thesis preparation

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Seminars	15
Preparation for classes	15
Student workload	**Hours** 30
Workload involving teacher	**Hours** 15

* hour means 45 minutes

Programme content that ensure achieving learning outcomes for the module

Activities	**Subject learning outcomes**	**Programme content that ensure achieving learning outcomes for the module**
Seminars	W1, U1, U2, K1	Students train elaboration and presentation of results of their individual research conneted with Master thesis.

Detailed rules of the implementation of the study programme estabilished by the Dean of the Faculty (the so-called Study Rules)

Major: Mechatronic Engineering with English as instruction language
Specialty: Mechatronic Design

Enrollment rules for the next semester

According to the AGH University of Science and Technology Study Regulations (can be downloaded from https://international.agh.edu.pl/).

Enrollment rules for the next semester as a part of the so-called ECTS credits debt ceiling

Students may register for the next semester if their total ECTS point deficit does not exceed the admissible amount:
2nd semester registration - 12 ECTS
3rd semester registration - 6 ECTS

ECTS credits debt ceiling

6

Organization of classes within the so-called blocks of classes (i.e. such organization of subjects or individual forms of classes that creates exceptions to the cyclical nature of classes in particular weeks of a given semester of studies)

There are no blocks of courses available

Monitoring semesters

Study rules in case of the individual organization of studies approved for a specific student

Individual studies are supervised by associate or full professors.
It is required to achieve at least 4.5 average study grade. It is recommended to possess additional achievements (like publications, activity in student associations, community service, awards).
The syllabus of individual studies is composed of modules taken from approved study syllabi and non-approved individual modules. The non-approved modules must be approved by the Faculty Council. Finally, the dean approves every individual study syllabus.

Implementation of apprenticeships including monitoring system and completion rules

The scope of the diploma training corresponds to the thesis subject. The thesis supervisor oversees the choice of the training place and scope as well as gives the training credit. It is admissible to obtain the training credit for placement completed during the study before the 3rd semester.

Rules of elective modules taking

Principles concerning choice of elective modules are stated in a Syllabus of the Master’s studies in Mechatronic Engineering.

Rules of study paths, diploma paths, specialty choice/eligibility

Choice of study speciality is carried out during registration for study prior the 1st semester. The qualification bases on the completed 1st cycle study final grade.

Rules related to the preparation of diploma projects and theses as well as the implementation of the degree granting

Process of getting Master's degree is carried out according to the AGH University of Science and Technology Study Regulations (can be downloaded from https://international.agh.edu.pl/). Students take the diploma exam, prepare and defend the degree thesis.

Principles for determining the overall evaluation of graduation (the final grade)

The general result of graduation is calculated as the sum of: 0.6 of the average of grades obtained during studies + 0.3 of the final grade of the diploma thesis and + 0.1 of the grade of the diploma exam.

Other requirements related to the implementation of the study programme resulting from the AGH UST Study Regulations or other regulations in force at the University