Lodz University of Technology

Study programme

Faculty:	Faculty of Electrical, Electronic, Computer and Control Engineering
Major:	Automation and Robot Control
Level of study:	second-cycle programme (magister inżynier)
Form of study:	full-time studies
Academic year:	2025/26

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Basic information

Name of the field of study:	Automation and Robot Control
Level of study:	second-cycle programme (magister inżynier)
Study profile:	general academic
Form of studies:	full-time studies
Duration of studies (number of semesters):	3
The number of ECTS points required to complete studies:	90
Total number of hours of classes:	1125
The number of ECTS points a student obtains as part of classes conducted with the direct participation of academic teachers or other persons conducting classes:	45
Professional title awarded to graduates:	magister inżynier
ISCED code:	0714
Language of study:	polish

Assigning the course to the disciplines to which the learning outcomes relate

Discipline	Percentage share
Automation, electronics and electrical engineering	90%
Technical computing and telecommunications	10%

Learning outcomes (in relation to the PQF)

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
1	**2ASR1**	Knows and understands, at an advanced level, the facts, theories, methods, and the complex interrelations between them within the scientific disciplines related to the field of study, in particular: automation, electronics, electrical engineering, as well as computer science and telecommunications, with consideration of the theoretical foundations of control and regulation system design, robotic systems, and programming of automation and robotics systems. The student also knows and understands the main developmental trends in these scientific areas.	P7U_W	P7S_WG, P7S_WK, P7S_WG_inż
2	**2ASR2**	Knows and understands the fundamental economic, legal, ethical and other conditions of various types of professional activities related to the field of automation and robot control, including the concepts and principles of intellectual property protection and copyright law, the principles of establishing and developing different forms of entrepreneurship, as well as the principles of commercializing the results of scientific research.	P7U_W, P7U_K	P7S_WK, P7S_KO, P7S_KR, P7S_WK_inż
3	**2ASR3**	Has the ability to apply acquired knowledge, including advanced information and communication technologies, to solve complex and non-standard problems also in an innovative manner. Is able to select and apply appropriate IT methods and tools, and to adapt existing or develop new methods, tools, and technologies in the field of automation and robot control.	P7U_U	P7S_UW, P7S_UW_inż
4	**2ASR4**	Is able to formulate and test hypotheses related to research problems, particularly in the areas of prototyping new control algorithms, identification, and robotics. Is able to properly select sources and information derived from them, and to carry out evaluation, critical analysis, synthesis, creative interpretation, and presentation of this information using specialist terminology and appropriate IT tools.	P7U_U	P7S_UW, P7S_UK, P7S_UW_inż
5	**2ASR5**	Has the ability to use a foreign language at the B2+ level, including specialist terminology related to the field of automation and robot control.	P7U_U	P7S_UK
6	**2ASR6**	Is able to independently acquire and apply new knowledge, plan their own development, as well as function and collaborate within a team, taking on various roles, including that of a leader.	P7U_U	P7S_UO, P7S_UU
7	**2ASR7**	Is prepared to critically evaluate their own knowledge and information received, as well as to engage in discussion in the context of complex cognitive and practical problems in the field of automation and robotics. The student understands the need to base solutions on the knowledge of experts and users.	P7U_U, P7U_K	P7S_UK, P7S_KK
8	**2ASR8**	Understands the role of automation and robotics and their impact on society. Is prepared to act in this field in an ethical, responsible, and entrepreneurial manner.	P7U_K	P7S_KO, P7S_KR

Matrix of course modules in relation to learning outcomes and curriculum content

No.	Course name	Program content	2ASR1	2ASR2	2ASR3	2ASR4	2ASR5	2ASR6	2ASR7	2ASR8
1	Selected Problems in Automation and Robot Control		x		x					
2	Profile Project: Automation 1		x		x				x	
3	Profile Project: Robotics 1		x		x				x	
4	Optimization Methods		x		x					
5	Robust Control		x				x			
6	Industrial Control Systems		x		x	x				
7	The Modern Job Market			x				x		x
8	Digital Signal Processing and Measurement Data Analysis									
9	Design of Electronic Control Systems		x			x		x		
10	Profile Project: Automation 2				x				x	
11	Foreign Language for Specialist Purposes	Foreign language course at B2+ level; developing the ability to communicate effectively in speech and writing, using specialist terminology from the field of study.					x		x	
12	Prototyping Control Systems Using DSP Boards		x			x		x		
13	Robot Dynamics and Control		x		x	x				
14	Profile Project: Robotics 2				x				x	
15	Nonlinear Control		x		x	x				
16	Optimal Control		x		x					
17	Power Electronic Converters for Renewable Energy				x					
18	Diploma Seminar		x		x	x			x	
19	Java Applications in Industrial Applications		x		x					
20	Final Project		x	x	x	x			x	

No.	Course name	Program content	2ASR1	2ASR2	2ASR3	2ASR4	2ASR5	2ASR6	2ASR7	2ASR8
21	Evolutionary Algorithms in Optimization		x		x					
22	Automatic Measurement and Control Systems		x		x					
23	Automated Drive Systems		x		x	x		x		
24	Flexible Manufacturing Systems									
25	Circuit-field Modeling of Electrical Transducers		x		x					
26	Modeling of Dynamic Systems		x		x					
27	Web Programming		x		x					
28	Design of Control Systems Implemented on DSP Boards		x		x					
29	Fuzzy Control		x		x					
30	Ethics of New Technologies			x						x

ECTS - subjects

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
1	Selected Problems in Automation and Robot Control	5			5	
2	Profile Project: Automation 1	7		7	7	
3	Profile Project: Robotics 1	7		7	7	
4	Optimization Methods	5			5	5
5	Robust Control	3			3	
6	Industrial Control Systems	4			4	
7	The Modern Job Market	3	3			
8	Digital Signal Processing and Measurement Data Analysis	3			3	
9	Design of Electronic Control Systems	6		6	6	
10	Profile Project: Automation 2	7		7	7	
11	Foreign Language for Specialist Purposes	2				
12	Prototyping Control Systems Using DSP Boards	6		6	6	
13	Robot Dynamics and Control	5			5	
14	Profile Project: Robotics 2	7		7	7	
15	Nonlinear Control	4			4	
16	Optimal Control	3			3	
17	Power Electronic Converters for Renewable Energy	3			3	
18	Diploma Seminar	2				
19	Java Applications in Industrial Applications	2		2	2	
20	Final Project	20		20	20	
21	Evolutionary Algorithms in Optimization	2		2	2	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
22	Automatic Measurement and Control Systems	2		2	2	
23	Automated Drive Systems	2			2	
24	Flexible Manufacturing Systems	2		2	2	
25	Circuit-field Modeling of Electrical Transducers	2		2	2	
26	Modeling of Dynamic Systems	2		2	2	
27	Web Programming	2		2	2	
28	Design of Control Systems Implemented on DSP Boards	2		2	2	
29	Fuzzy Control	2		2	2	
30	Ethics of New Technologies	2	2			

ECTS indicators

Name	Value
The total number of ECTS credits that a student must obtain through elective courses (amounting to no less than 30% of the total ECTS credits required to obtain the qualification corresponding to the given level of study).	44/90 (48.89%)
The total number of ECTS credits to be earned by a student through courses in the fields of humanities or social sciences	5
The total number of ECTS credits that a student must obtain from courses related to research conducted at the university, amounting to more than 50% of the total ECTS credits required to graduate from a given level of study	81/90 (90%)

Methods of verifying and assessing learning outcomes

Verification of achieved learning outcomes requires the use of diverse forms of student assessment, appropriate to the categories of knowledge, skills, and social competencies to which these outcomes relate. The selection of suitable tools also depends on the specifics of the subject and the form of classes, and is described in the syllabi of individual courses. The achievement of the required learning outcomes is verified through:

1. Written work (exams, tests, reports, essays, projects, posters, thesis, etc.);
2. Oral statements (oral knowledge checks, public presentations such as delivering a paper, presentation, etc.);
3. Practical and/or project tasks (both group and individual);
4. Observation and evaluation of student activity during classes;
5. Self-assessment and peer assessment (especially in the case of group projects);
6. Competency exam and diploma exam.

Verification may be formative (partial, repeated during classes) and/or summative (final assessment). The final verification result is given according to the currently applicable grading scale.

The course coordinator or instructor is obliged, during the first class, to discuss the course syllabus and to formulate and provide documented information to students regarding the methods of verification and the conditions for conducting assessments of learning outcomes.

Professional internships

Not applicable.

Characteristics of the course

Graduate profile

Master’s studies in Automation and Robot Control provide graduates with advanced knowledge, inspiration, and familiarity with techniques that they can creatively apply in their further professional development. The programme prepares graduates to solve new and unconventional engineering problems in automation and robotics. The curriculum ensures a balance between courses presenting innovative control concepts and courses covering modern technologies and advanced skills that are already applicable in Polish industrial practice. Graduates acquire up-to-date knowledge in the areas of digital control and industrial automation, nonlinear control, robust control, robot control, IT tools for automation and robotics, optimization and optimal control, and artificial intelligence in control systems. They gain practical experience in the application of modern automation and robotics technologies and devices, and they develop their own technical solutions. Thanks to a wide range of elective courses, the programme allows students to shape their educational path in line with their individual career plans. Graduates of the Master’s programme in Automation and Robot Control can work in innovative companies, R&D departments, and system integrator companies designing and implementing automation systems and IT systems for modern industry. The professional sectors in which graduates may find employment include, among others: industrial automation, robotics, power engineering, transport, logistics, industrial process control, and control systems. Graduates are prepared to undertake third-cycle (doctoral) studies in the discipline of automation, electronics, electrical engineering, and space technologies, as well as in related disciplines. Key graduate competencies: A graduate of the second-cycle programme in Automation and Robot Control is able to: -independently deepen and expand the knowledge acquired during studies in the field of new control and robotics theories and techniques; -conduct research work and, as a result, develop original solutions addressing contemporary challenges of automation, control, and robotics in industry, transport, medicine, and everyday life; -publish and disseminate these solutions in the form of reports, scientific and popular science publications, and patents; -use modern technologies (including IT technologies) and devices applied in automation and robotics systems; -integrate automation and robotics systems; -design their own original devices and integrate them with existing systems; -plan and supervise the work of a research or design team, allocate tasks, assess their importance, and efficiently organise work so that it consistently leads toward the intended goal; -properly manage data used and generated during team activities.

The relationship between the field of study and the university's strategy

"Development Strategy of the Lodz University of Technology for 2025–2030” listed in the Education section: a) General objective: Development of a model of education for students and doctoral candidates that prepares graduates for the dynamically changing needs of the socio-economic environment. b) Specific objectives: -Continuous improvement of the competencies of academic teachers in modern teaching methods, up-to-date knowledge, technological development, and scientific trends – by ensuring that specialist courses are taught by experts conducting research in the discipline, involved in project implementation, actively publishing, participating in the work of international organizations, conferences, and other bodies, and by supporting such staff activities. -Improvement of the educational offer, including complementary forms of education, in response to socio-economic challenges – through continuous interaction with the socio-economic environment, encouraging the implementation of joint projects, introducing new forms of education, and promoting such staff initiatives. -Strengthening talent management processes through the individualization of educational paths for students and doctoral candidates – by seeking engaged study candidates and providing individual supervision during project implementation and scientific club activities. -Supporting the scientific development of students and doctoral candidates with an emphasis on interdisciplinarity and internationalization – by involving visiting professors from renowned universities in programme delivery and by implementing interdisciplinary projects within the curriculum. -Increasing student participation in research conducted at the university and intensifying the acquisition of practical experience outside the university – through individual supervision of students cooperating in research conducted at the Institute of Automation, scientific club activities, support for student publications, and the creation of a hardware base entrusted to students for project implementation. The programme is also particularly aligned with many other objectives listed in the “Development Strategy of the Lodz University of Technology for 2025–2030”, for example in the areas of: impact on the socio-economic environment (IMPACT), internationalisation (INTERNATIONALIZATION), innovation and technology transfer (INNOVATION), science (SCIENCE), infrastructure (INFRASTRUCTURE), talents (TALENTS), sustainable development (SUSTAINABILITY), and students (STUDENTS). The programme also aligns with the plans outlined in the document “Long-term Strategic Vision for the Development of the Lodz University of Technology for 2025–2050” (Draft “2”). The structure of the curriculum is adapted to enable future implementation of the recommendations listed in the section “Education of the Future and Modern Models of Teaching”. The programme content directly corresponds to the recommendations defined in “Digital Technologies, Artificial Intelligence and Industrial Transformation”, and direct equivalents of the programme content can be found in the sections “Robotisation, Digitisation and Decarbonisation of Manufacturing Processes” and “Integration of Digital Twins” in engineering programmes.

Educational objectives and employment and continuing education opportunities

Master's studies provide graduates with a foundation of knowledge, inspiration, and techniques that they can creatively apply in their further professional development. The programme prepares graduates for doctoral school, employment in R&D units of companies in the field of automation and robotics, and for the creative solution of unconventional engineering problems. The curriculum ensures a balance between theoretical courses presenting the most innovative control concepts and courses introducing technologies and providing advanced skills that are already useful in Polish and international industrial practice. Graduates acquire up-to-date knowledge in:1. Digital control and industrial automation; 2 Nonlinear control; Robust control; 3 Robot control; 4. IT tools for automation and robotics; 5 Optimisation tools and optimal control. Thanks to a high degree of elective courses, the programme allows students to shape their educational path according to two suggested profiles: 1. Industrial automation – PLC control systems, visualisation systems, and management of complex automation systems; 2. Robot control – use of vision systems, mobile and rehabilitation robots, and robot autonomy.

The professional sectors in which graduates may find employment include, among others: industrial automation, robotics, power engineering, transport, industrial process control, and control systems, which are ubiquitous across all branches of industry. Graduates of the Automation and Robot Control programme may work in positions such as maintenance engineer, automation engineer, robotics engineer, designer of automation systems, designer of IT systems, or conduct engineering activities within their own companies. Graduates are prepared to undertake third-cycle (doctoral) studies in the discipline of automation, electronics, electrical engineering, and space technologies, as well as in related disciplines.

Description of the process and outcome of consultations on the proposed study program with the socio-economic environment

The proposed modifications implement Resolution No. 24/2025 of the Senate of the Lodz University of Technology of 26 February 2025 concerning guidelines for Programme Councils on the development and improvement of study programme designs. Experience gained from cooperation with employers during the previous delivery of the Automation and Robot Control programme at the Faculty of Electrical, Electronic, Computer and Control Engineering of the Lodz University of Technology, as well as graduate career tracking studies, confirm the validity of continuing the adopted educational approach.

The Institute of Automation of the Lodz University of Technology, which is the leading unit responsible for the programme, has signed several dozen cooperation agreements with companies of various sizes and continuously monitors employer needs. Numerous diploma theses are prepared based on inspiration from, and in cooperation with, the employers of our diploma candidates and graduates. In recent years, surveys have been conducted repeatedly, including among working students, concerning employers' and graduates' perceptions of the key competencies of graduates.

Representatives of the Programme Council remain in continuous contact with representatives of companies of various profiles and sizes—manufacturing and system integrator companies, large corporations and family-owned businesses (e.g. Lamela Sp. z o.o. Sp.k., Aret Sp. z o.o. Sp.k., ABB Sp. z o.o., HetBot sp. z o.o., BSH Home Appliances Sp. z o.o., Corning Optical Communications Polska Sp. z o.o., Zemat Technology Group Sp. z o.o.). All of them emphasized the necessity of a strong mastery of the theoretical foundations of automation, the ability to independently deepen one's knowledge, and the capability to creatively apply various industrial automation devices (microprocessor technology, programmable logic controllers, industrial controllers, embedded systems), knowledge of electric drive control methods, programming skills in selected technologies and the ability to master new ones, the ability to create and analyse technical documentation, effective use of information sources and teamwork skills, proficiency in using digital resources, and language skills.

The conclusions from the extensive "Survey of Employers' Opinions on Graduates of the Lodz University of Technology", conducted systematically with the participation of many companies representing diverse sectors of the economy, were also taken into account. The conclusions drawn from consultations and studies were used in modifying the programme.

Description of competencies expected from a candidate applying for admission to studies

In accordance with the recruitment resolution in force for a given academic year.

The unit organizing education

Faculty of Electrical, Electronic, Computer and Control Engineering

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Selected Problems in Automation and Robot Control	Tutorials: 15 Lecture: 30	5	Graded assignment	Obligatory
Optimization Methods	Tutorials: 15 Laboratory classes: 15 Lecture: 15	5	Exam	Obligatory
Robust Control	Project work: 15 Lecture: 15	3	Graded assignment	Obligatory
Industrial Control Systems	Laboratory classes: 20 Lecture: 15	4	Graded assignment	Obligatory
The Modern Job Market	Tutorials: 15 Lecture: 15	3	Graded assignment	Obligatory
Digital Signal Processing and Measurement Data Analysis	Laboratory classes: 20 Lecture: 15	3	Graded assignment	Obligatory
Elective Courses 1		7	Graded assignment	Obligatory group
The student chooses 1 subject				
Profile Project: Automation 1	Seminar: 5 Project work: 40	7	Graded assignment	Optional
Profile Project: Robotics 1	Seminar: 5 Project work: 40	7	Graded assignment	Optional
Sum	**265**	**30**		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Foreign Language for Specialist Purposes	Tutorials: 45	2	Graded assignment	Obligatory
Robot Dynamics and Control	Tutorials: 15 Laboratory classes: 30 Lecture: 15	5	Exam	Obligatory
Nonlinear Control	Tutorials: 15 Laboratory classes: 15 Lecture: 15	4	Graded assignment	Obligatory
Optimal Control	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
Power Electronic Converters for Renewable Energy	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
Elective Courses 2		7	Graded assignment	Obligatory group
The student chooses 1 subject				
Profile Project: Automation 2	Seminar: 5 Project work: 40	7	Graded assignment	Optional
Profile Project: Robotics 2	Seminar: 5 Project work: 40	7	Graded assignment	Optional
Elective Courses 3		6	Graded assignment	Obligatory group
The student chooses 1 subject				
Design of Electronic Control Systems	Project work: 45	6	Graded assignment	Optional
Prototyping Control Systems Using DSP Boards	Project work: 45	6	Graded assignment	Optional
Sum	**300**	**30**		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Diploma Seminar	Seminar: 30	2	Exam	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Final Project	Diploma Thesis: 0	20	Pass	Obligatory subjects to choose from
Automated Drive Systems	Laboratory classes: 20 Lecture: 15	2	Graded assignment	Obligatory
Elective Courses 4		4	Graded assignment	Obligatory group
The student chooses 2 subjects.				
Java Applications in Industrial Applications	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Evolutionary Algorithms in Optimization	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Automatic Measurement and Control Systems	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Flexible Manufacturing Systems	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Circuit-field Modeling of Electrical Transducers	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Modeling of Dynamic Systems	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Web Programming	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Design of Control Systems Implemented on DSP Boards	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Fuzzy Control	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Ethics of New Technologies	Lecture: 15	2	Graded assignment	Obligatory
Sum	**140**	**30**		