GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Team Project Organization, PG_00067980		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2027/2028
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Michał Czubenko	
	Teachers	dr hab. inż. Michał Czubenko	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	15.0	15.0	30
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	30	4.0	41.0	75

Subject objectives

The aim of the course is to enable students to gain practical experience in implementing a large system project that reflects the real conditions of teamwork in the engineering and IT industry. Classes focus on the full life cycle of the project - from problem analysis and system architecture design, through implementation, testing and documentation, to the presentation of the final solution.

The projects implemented as part of the course are diverse. Students can implement both hardware and software projects. In the case of hardware, projects are related to the general concept of robotics and issues of data fusion from various measurement sources, such as sensors, vision systems, IoT devices or context data. In the case of software solutions, we can distinguish projects related to IoT devices, edge processing, mobile applications and aspects of machine learning. Students learn to use modern data processing algorithms, system integration and design decision logic.
Projects are implemented in teams of 8-10 people, which allows us to reflect the scale and complexity of real engineering projects. Each group operates in an organized manner, with a designated project leader responsible for planning, task allocation, progress management, and internal communication. This approach develops not only technical skills, but also soft skills, such as team management, conflict resolution, and responsibility for a common result.
The source code created as part of the project is versioned and stored in a version control system (e.g. Git), which allows for ongoing progress tracking, code quality control, and learning how to work in a distributed repository - a skill necessary in a professional programming environment. The project may use different platforms and devices (e.g. microcontrollers, embedded systems, desktop or web applications), which requires cooperation between team members working on different components of the system.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U12] can analyze the operation of components, circuits and systems related to the field of study, as well as measure their parameters and examine technical specifications, and plan and conduct experiments related to the field of study, including computer simulations and measurements, and interpret obtained results and draw conclusions	The student is able to plan and implement experiments and design tasks related to the integration and analysis of measurement data from various sources, as well as conduct measurements, computer simulations and tests of the operation of complex systems.	[SU2] Assessment of ability to analyse information
	[K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n	The student is able to identify and formulate a specification of an engineering task related to the design of a system integrating measurement data and making decisions based on them, independently or in a team. During the project, the student uses appropriate analytical methods (e.g. modeling dependencies), simulation methods (e.g. analysis of system behavior in various conditions), and experimental methods (e.g. testing devices or algorithms in real or simulated conditions).	[SU1] Assessment of task fulfilment
	[K6_W11] knows and understands, to an advanced extent, the general principles of setting up and development of business entities, forms of individual entrepreneurship and running ventures and the fundamental dilemmas of modern civilization and basic economic, legal and other conditions of various types of activities related to the field of study, including the basic concepts and principles in the field of industrial property and copyright protection	The student understands the importance of organizational, legal and ethical aspects related to the implementation of complex technical projects. During team work on a system project, the student gains practical experience in planning and implementing an engineering project, which allows him to better understand the principles of team work management, role division, responsibility and project risk. Additionally, the student knows and understands aspects of copyright and software licenses.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student is able to design and implement – in accordance with the adopted functional and technical specification – a simple system or process typical of the field of automation, robotics or embedded systems. As part of team work on the system project, the student selects appropriate engineering methods, tools and technologies, taking into account both functional requirements and hardware and environmental constraints.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents

Project:
Students work in 10-person teams with an organizational structure with a designated project leader responsible for dividing tasks and supervising the progress of work. The projects are advanced in nature and often exceed the level of a typical master's project - their implementation requires intensive cooperation, good organization and effective code and documentation management.
During the introduction to the project, students recall aspects related to version control systems, source code management, using branching, committing, conflict resolution and code integration mechanisms. Particular emphasis is placed on good teamwork practices, code reviews, documentation versioning and continuous integration. At the same time, students learn how to manage a medium-scale IT or engineering project - from formulating goals, through sprint planning, monitoring progress (e.g. burndown charts, Kanban boards), to retrospectives and presentations of results. The work is carried out in accordance with the Agile methodology, in a two-week sprint system. Support tools such as GitHub Projects are used to organize tasks and track the fulfillment of requirements.
The thematic scope of the projects is wide and includes:
- simulations of robots in complex environments
- construction of complex robotic systems (e.g. hexapod)
- interactive systems processing images from depth cameras
- control of computer games using real user movements
- creation of games using artificial intelligence
- immersive reality
- creation of narrative games with intelligent NPCs based on AI
- design of educational assistants using language models (LLM),

During the implementation of the project, students develop skills in the following areas:
- team management and cooperation,
- maintaining technical and design documentation,
- integration of complex systems (hardware + software),
- application of engineering standards and work in a professional IT environment.

The subject prepares students for project work in conditions similar to industrial and research and development, emphasizing interdisciplinarity, responsibility, communication and the use of modern IT tools in the process of producing advanced technological solutions.
Seminar:
The seminar is held in two-week intervals as a kind of sprint. At the seminar, all groups implementing projects present themselves. There are two types of seminars, working and reporting (milestone). At the working seminar, the group presents completed tasks, discusses future plans and problems that have occurred. At the reporting seminar, the group presents the project assumptions (set by the group during the first class). At the last seminar, a public presentation of the entire project takes place for people not associated with the direction.

Prerequisites and co-requisites

- High-level language programming
- Signal processing knowledge
- Sensor and transducer knowledge
- Embedded systems design knowledge
- Mobile robotics knowledge

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	60.0%	30.0%
Leader	60.0%	20.0%
Group	60.0%	50.0%

Recommended reading

Basic literature

Gacovski, Z. (2011). *Mobile robots: current trends / edited by Zoran Gacovski.* (Z. Gacovski, Ed.). IntechOpen.

Efren Gorrostieta Hurtado. (2019). *Applications of Mobile Robots / edited by Efren Gorrostieta Hurtado.* (E. G. Hurtado, Ed.). IntechOpen.

Pawlak, M., & Wydawnictwo Naukowe PWN Wydawca. (2006). *Zarządzanie projektami / Marek Pawlak.* (Wydanie pierwsze.). Wydawnictwo Naukowe PWN.

Kaczyński, M. (2020). Zwinne zarządzanie projektami IT w obliczu wyzwań rozproszonych zespołów. *Organization Review / Przeglad Organizacji*, 3743. https://doi.org/10.33141/po.2020.08.05

	Supplementary literature	Kerzner, Harold. *Advanced project management: edycja polska*. Ed. Paweł Dąbrowski. Helion, 2005. Liggins II, Martin, David Hall, and James Llinas, eds. *Handbook of multisensor data fusion: theory and practice*. CRC press, 2017.
	eResources addresses	
Example issues/ example questions/ tasks being completed	• Street View of the WETI corridor made with a mobile robot • Solving the problem of patelization with a custom 6-axis robot • Integrating sensory data for train scheduling • Building and controlling a mobile robot mapping the environment • Building a hexapod • Implementing the control of a streetfighter game hero using body poses • Implementing a bot for StarCraft II • Implementing a bot for Heroes of Might and Magic 3	
Work placement	Not applicable	

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