GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Telemetric Distributed Systems, PG_00047479		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
Education level	second-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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marcin Gnyba	
	Teachers	dr hab. inż. Marcin Gnyba	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	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	3.0	42.0	75

Subject objectives	Understanding the basis of the design, operation and control of telemetric distributed networks.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U07] can apply advanced methods of process and function support, specific to the field of study	The student lists the components of TSR, describes the stack of TCP/IP microservers, characterizes the construction and functioning of TCP/IP microservers.	[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[K7_U03] can design, according to required specifications, and make a complex 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 lists the components of TSR, describes the stack of TCP/IP microservers, characterizes the construction and functioning of TCP/IP microservers.	[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	Student defines telemetry distributed systems (TDS), characterizes applications and requirements of TSD, describes layers of TDS protocols.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student defines telemetry distributed systems (TDS), characterizes applications and requirements of TSD, describes layers of TDS protocols.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge

Subject contents

1. Introduction, plan of the lecture, definition of the Telemetric Distributed Systems (TDS).
2. Characteristics, fields of applications and requirements for TDS.
3. Standards : IEEE 1451, IEEE 802.15, ZigBee.
4. Specifics of star, peer-to-peer, cluster-tree topologies for TDS networks.
5. Components of TDS networks: coordinator with Ethernet gateway, coordinator with the router function, full function device, reduced function device.
6. Architecture of ending devices (nodes) of TDS networks (power, sensing, computing and communication subsystems).
7. TDS protocol stack for nodes (physical, data link, network, transport and application layers).
8. MAC layer of the TDS protocol stack.
9. Routing protocols in TDS networks (requirements, classifications, operation principles).
10. Approaches of the Middleware Layer for TDS nodes.
11. Application Layer – controlling of sensors and preliminary processing of measurement data.
12. Parameters defining of QoS (Quality of Services) for TSR: throughput, reliability, security, mobility, latency, data accuracy in relation to energy usage.
13. Security in TSR networks. Robustness again passive and active attacks. Security in standards: IEEE 802.15.4 and ZigBee.
14. Construction of the coordinator with the Ethernet gateway.
15. Advantages of connection of TSR networks to Internet.
16. Minimal TCP/IP stack for microservers serving function of the coordinator with the Ethernet gateway.
17. Hardware realizations of TCP/IP microservers in TDS.
18. Specific of the Ethernet Layer in TCP/IP microservers.
19. Implementation of ARP and IP protocols in TCP/IP microservers.
20. Adaptation of ICMP and TCP protocols for computing power of control units controlling TCP/IP microservers.
21. Application Layer controlling TSR on the example of the HTTP protocol.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written examination	50.0%	100.0%

Recommended reading

Basic literature	Czaja Z.: Telemetric distributed systems – materiały do wykładu, http://www.pg.gda.pl/~zbczaja, Gdańsk 2009. Kuorilehto M., Kohvakka M.: Ultra-low energy wireless sensor networks in practice, Wyd. John Wiley & Sons, Ltd., 2007.
Supplementary literature	Eady F.: Hands-on ZigBee. Implementing 802.15.4 with microcontrollers, Wyd. Elsevier, 2007.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable