GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Resilience of Network Systems, PG_00067102		
Field of study	Informatics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group Specialty 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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Computer Communications -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Rak	
	Teachers	dr hab. inż. Jacek Rak	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	15.0	0.0	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	6.0	39.0	75

Subject objectives

Lectures aim to familiarize students with the methods for assessment and principles of designing architectures of networked systems with increased resilience. The project part of the course is oriented on the use of knowledge from the lecture part of the course in designing networked systems characterized by increased resistance to failures caused by random factors, forces of nature (including disasters), and intentional destructive activities (attacks).

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	The student is able to assess the vulnerability of networked systems to failures caused by random factors, forces of nature (including disasters) and intentional destructive activities (attacks), and is able to propose adequate mechanisms to increase the level of system resilience.	[SU1] Assessment of task fulfilment
[K7_W08] knows and understands, to an increased extent, the fundamental dilemmas of modern civilisation, the main development trends of scientific disciplines relevant to the field of education	The student knows and understands methods for designing architectures of networked systems with improved resilience, adequate to the needs and expectations of users (society).	[SW3] Assessment of knowledge contained in written work and projects
[K7_U08] while identifying and formulating engineering tasks specifications and solving these tasks, can: - apply analytical, simulation and experimental methods, - notice their systemic and non-technical aspects, - make a preliminary economic assessment of suggested solutions and engineering work	The student is able to propose resilience mechanisms, taking into consideration the environmental challenges of networked systems.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

<table>
<tr><td>Subject contents</td><td>Course content – lecture
1. Classification of failures in networked systems; 2. Recovery of services; 3. Challenges, faults, errors and failures; 4. Networked systems resilience; 5. Resilience disciplines: survivability and fault tolerance, disruption tolerance, traffic tolerance, dependability, performability; 6. Evaluation and improvement of system availability; 7. Evaluation and improvement of system reliability; 8. System- and element-related metrics for the evaluation of resilience; 9. Resilient routing in ring networks; 10. Resilient routing in mesh networks; 11. Mechanisms for resilient communications in packet-switched networks; 12. Optimization methods for resilient routing; 13. Time-efficient methods to determine disjoint paths in mesh networks; 14. Case study (i): Mechanisms for resilience in content delivery networks; 15. Case study (ii): Mechanisms for resilience in disruption-tolerant networks.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>group project (3-person groups)</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>exam</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. J. Rak, D. Hutchison (Eds.): Guide to Disaster-resilient Communication Networks, Springer (2020)

2. A.S. Tanenbaum, N. Feamster D.J. Wetherall: Computer Networks, 6th edition, Pearson (2021)</td></tr>
<tr><td>Supplementary literature</td><td>No requirements</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Tasks for groups of three students related to the design and evaluation of selected architectures of networked systems with improved resilience.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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