

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	test, current progress in project completion	L, SW
LO2	test, current progress in project completion	L, SW
LO3	evaluation of project completion	SW
LO4	test, current progress in project completion	L, SW
LO5	current progress in project completion	SW
LO6	current progress in project completion	SW
LO7	current progress in project completion	SW
Basic references	1	<i>D. Graham, E. Van Veenendaal, I. Evans, R. Black: Foundations of Software Testing: ISTQB Certification.</i>
	2	<i>M.L. Hutcheson: Software Testing Fundamentals: Methods and Metrics. Wiley Publishing, Inc., 2003.</i>
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Supplementary references	1	<i>R. Patton: Testowanie oprogramowania. Wydawnictwo MIKOM, 2002.</i>
	2	<i>S. Jarzabek: Podręcznik projektu inżynierskiego (PDF udostępniany przez prowadzącego), 2020.</i>
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Author of the programme:		Data: 22.05.2020

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Supplementary references

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- 1 G. Strang, Computational Science and Engineering, Wellesley-Cambridge Press, 2007
2 E. S. Gopi, Mathematical Summary for Digital Signal Processing Applications with Matlab, Springer Science &
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Author of the programme:

Data:

04.04.2023

Bialystok University of Technology		Faculty of Computer Science	
Field of study	Computer science	Degree level and programme type	full-time Master's degree
Specjalization / diploma path	common subject	Study profile	general academic
Field of study	Distributed Internet Systems	E Course code	INF2RSI
		Course type	obligatory
Forms and number of hours	L 30	C	LC
		P	SW 30
		FW	S
			Semester 1
			No. of ECTS credits 4

Entry requirements

Course objectives	The aim is to familiarize students with selected methodologies for implementing distributed systems on the Internet. Detailed discussion of issues related to SOAP and RESTful web services.
Course content	<p>Lecture:</p> <ol style="list-style-type: none"> 1. JAVA Remote Method Invocation – remote objects, register, interfaces, substitutes, passing arguments. 2. The concept of Web Services, components, review of specifications and implementation. 3. SOA model. 4. Simple examples of web services. 5. Transport implementation for WWW services - SOAP protocol. Web service description - WSDL language. 6. Secure execution of calls to web services - WS-Security specifications, use of SSL. 7. Transferring binary files, handlers, error handling, asynchronous calls. 8. WS-Addressing, WS-Policy specifications. 9. Features of the REST architecture and its applications in the implementation of web services. 10. Selected issues of building RESTful web services: safe and idempotent methods, HTTP response codes, HATEOAS implementation, filters, interceptors, error capture. 11. Enterprise messaging systems, JMS API Programming Model. <p>Specialist workshop:</p> <ol style="list-style-type: none"> 1. Java RMI – running examples and writing applications with Java RMI. 2. Issues with SOAP web services: launching web services using the JAX-WS specification, monitoring SOAP messages, WSDL analysis, WS implementation on the server, creating a client application, using SoapUI, testing the impact of JAX-WS annotations on WSDL, handlers, authentication implementation, using WS-Security and SSL, generating exceptions, sending binary attachments, writing projects. 3. Issues with RESTful web services: creating web services using the JAX-RS specification, testing annotations, generating various resource representations, testing web services using the Postman application, building applications with CRUD functionality, context, creating a client based on the Jersey library, WADL, monitoring queries and responses, definition of subresources, HATEOAS implementation, filter implementation, writing projects. 4. Implementation of an application using enterprise messaging systems based on JMS.

	Student workload (in hours):	No. of hours	with direct teacher participation	
			practical	
	Lecture attendance	30	30	
	Project attendance	30	30	30
	Lecture test(s) attendance	2	2	
	Participation in teacher-student sessions related to the module	5	5	
	Preparation for lecture test(s)	3		
Calculation:	Preparation for project classes	30		30
				0
				0
				0
				0
				0
				0
	Total hours:	100	67	60
	Total of ECTS credits:	4	2,7	2,4

Author of the programme: Data:

Teaching methods	L Informative-problem lecture
	SW Programming using a computer
	-
	-
Assesment methods	L Informative-problem lecture
	SW Programming using a computer
	-
	-

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
Student		
LO1	understands the semantics of remote procedure call, identifies problems related to its implementation and knows the solutions used	INF2_W05
LO2	has knowledge of the concept of Web Services, the SOA model and the protocols and standards used to implement these issues	INF2_W05
LO3	knows the structure of an application compliant with the J2EE specification and understands the mechanisms implemented within this specification	INF2_W05
LO4	can design and implement a distributed system using the Web Services concept	INF2_U08

LO5	can design and implement a distributed system using the J2EE specification	INF2_U03
LO6	is able to analyze the needs of a potential customer ordering an information system and adapt its solutions to the identified needs	INF2_U04

LO7

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	exam	L
LO2	exam	L
LO3	exam	L
LO4	evaluation of project completion	SW
LO5	evaluation of project completion	SW
LO6	evaluation of project completion	SW
LO7		

Basic references	1	Java API for XML-Based Web Services, https://jcp.org/en/jsr/detail?id=224
	2	Java API for RESTful Web Services, https://jcp.org/en/jsr/detail?id=339 .
	3	http://www.w3c.org
	4	Jersey User Guide, https://jersey.github.io/documentation/latest/index.html
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Supplementary references	1	Metro - Webservice toolkit, https://javaee.github.io/metro/ .
	2	GlassFish Server, https://javaee.github.io/glassfish/ .
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Author of the programme:	Data:	22.05.2020
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Białystok University of Technology		Faculty of Computer Science	
Field of study	Computer science	Degree level and programme type	full-time Master's degree
Specjalization / diploma path	common subject	Study profile	general academic
Field of study	Advanced Database Systems and Data Warehouses	Course code	INF2ZBD
		Course type	obligatory
Forms and number of hours	L C LC P SW FW S	Semester	1
	30	No. of ECTS credits	4
Entry requirements			
Course objectives	The aim is to familiarize students with data warehousing, query optimization in practice, NoSQL databases and data analysis based on Bayesian network models. Most of these issues will also be covered as part of specialist workshop classes.		
Course content	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Procedural SQL language. 2. Advanced database objects: functions, packages, triggers. 3. Query optimization in practice. 4. Data models in data warehouses. 5. Data warehouse architecture. 6. SQL for OLAP: multiple grouping. 7. SQL for OLAP: analytical functions. 8. Integration of data from various sources. 9. NoSQL databases (DB based on key values, document BD, column BD, graph BD). 10. Data analysis based on Bayesian networks. <p>Specialist workshop:</p> <ol style="list-style-type: none"> 1. Procedural SQL language. 2. Advanced database objects: functions, packages, triggers. 3. Data models in data warehouses. 4. SQL for OLAP: multiple grouping. 5. SQL for OLAP: analytical functions. 6. Integration of data from various sources. 7. NoSQL databases (DB based on key values, document BD, column BD, graph BD). 8. Data analysis based on Bayesian network models. 		
Calculation:	Student workload (in hours):	No. of hours	with direct teacher participation
	Lecture attendance	30	30
	Project attendance	30	30
	Lecture test(s) attendance		0
	Participation in teacher-student sessions related to the module	5	5
	Preparation for lecture test(s)	10	
	Preparation for project classes	25	25
			0
			0
			0
			0
			0
			0
	Total hours:	100	65
	Total of ECTS credits:	4	2,6
Author of the programme:	Data:		
Teaching methods	L Informative-problem lecture		
	SW Programming using a computer		
	-		
	-		
Assesment methods	L exam		
	SW evaluation of project completion, tests, activity during classes		
	-		
	-		
Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study	
	Student		
LO1	knows the principles of creating advanced SQL queries to data warehouses based on analytical functions; can create these types of queries	INF2_W03 INF2_W05 INF2_U06	
LO2	can use a NoSQL database and formulate commands for selecting and modifying data	INF2_U04 INF2_U08	
LO3	can design data warehouse models	INF2_U04 INF2_U06	
LO4	can integrate data from various sources	INF2_U03 INF2_U04 INF2_U06	
LO5	is able to analyze data based on Bayesian network models	INF2_W07 INF2_U08 INF2_U09	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	test	L, SW	

LO2	activity during classes	SW
LO3	evaluation of project completion	SW
LO4	evaluation of project completion	SW
LO5	test, activity during classes	L, SW

Basic references	1	B. Inmon, D. Strauss, G. Neushloss, DW 2.0 – Architecture for the Next Generation of Data Warehousing,
	2	F. Silvers, Building and Maintaining a Data Warehouse, Auerbach Publications, 2008.
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Supplementary references	1	
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Author of the programme:	Data:	20.05.2020
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Białystok University of Technology		Faculty of Computer Science	
Field of study	Computer science	Degree level and programme type	full-time Master's degree
Specjalization / diploma path	common subject	Study profile	general academic
Field of study	Internet of Things	Course code	INF2IOT
		Course type	obligatory
Forms and number of hours	L C LC P SW FW S	Semester	1
	15 30	No. of ECTS credits	3
Entry requirements			
Course objectives	The aim of the course is to introduce students to the issues of "Internet of Things". Students will learn and learn to use the possibilities of IoT, the systems used, standards, and they will check everything in real conditions.		
Course content	<p>Lecture: The concept of "Internet of Things". IoT platforms and environments used. Standards. Tests and self-testing. Wired interfaces. Wireless interfaces. Design focused on reducing energy consumption (low power design).</p> <p>Lab: IoT platforms. Development environments. Preparation for work and first start-up. Basic tests and self-testing. Communication with peripheral devices. Remote communication. Practical use of methods to reduce energy consumption. Design and implementation of an IoT system.</p>		
	Student workload (in hours):	No. of hours	with direct teacher participation
	Lecture attendance	15	15
	Laboratory classes attendance	30	30
	Lecture test(s) attendance		0
	Participation in teacher-student sessions related to the module	5	5
	Preparation for lecture test(s)		
Calculation:	Preparation for project classes	25	25
			0
			0
			0
			0
			0
			0
	Total hours:	75	50
	Total of ECTS credits:	3	2,0
Author of the programme:	Data:		
Teaching methods	L Informative-problem lecture SW Programming using a computer, simulation, exercises - -		
Assesment methods	L test SW evaluation of project completion, activity during classes - -		
Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study	
	Student		
LO1	knows and understands key issues in the field of "Internet of Things" and its applications	INF2_W03 INF2_W06	
LO2	knows and is able to use platforms, environments and standards in IoT design	INF2_W05 INF2_U03 INF2_U06	
LO3	knows, uses and properly selects communication interfaces	INF2_W05 INF2_U03 INF2_U08	
LO4	can take into account the need to reduce energy consumption when designing and programming	INF2_U08	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	test	L	
LO2	test, evaluation of project completion, activity during classes	L, LC	
LO3	evaluation of project completion, activity during classes	LC	
LO4	evaluation of project completion, activity during classes	LC	
Basic references	1 https://www.raspberrypi.org/ 2 https://www.arduino.cc/ 3 https://www.espressif.com/en/products/socs/esp32/overview 4 https://www.st.com/en/microcontrollers-microprocessors/stm32-32-bit-arm-cortex-mcus.html 5		
Supplementary references	1 2 3 4 5		

Author of the programme:

Data:

22.05.2020

Bialystok University of Technology		Faculty of Computer Science	
Field of study	Computer science	Degree level and programme type	full-time Master's degree
Specjalization / diploma path	common subject	Study profile	general academic
Field of study	Entrepreneurship	Course code	INF2PRZ
		Course type	obligatory
Forms and number of hours	L C LC P SW FW S	Semester	1
	15	No. of ECTS credits	3

Entry requirements

Course objectives The aim of the course is to improve the students competence of academic entrepreneurship in advanced topics.

1. Introduction to the subject, definition of passing requirements and the method of dividing students into groups.
2. Short business presentations of all projects submitted by students.
3. Division into groups. Organizational culture.
4. Obtaining funds - types of financing sources.
5. One-pager document - discussion and preparation.
6. Pitch-Elevator document - discussion and preparation.
7. Cost estimate document - discussion and preparation.
8. BrandBook document - discussion and preparation.
9. Business Plan document - discussion and preparation.
10. Final project presentations.

Course content

	Student workload (in hours):	No. of hours	with direct teacher participation	
			practical	practical
	Lecture attendance		0	
	Project attendance	15	15	15
	Lecture test(s) attendance		0	
	Participation in teacher-student sessions related to the module	5	5	
	Preparation for lecture test(s)			
Calculation:	Preparation for project classes	55		55
				0
				0
				0
				0
				0
				0
	Total hours:	75	20	70
	Total of ECTS credits:	3	0,8	2,8

Author of the programme:

Data:

Teaching methods	L	project method, brainstorming, subject exercises
	-	
	-	
	-	
Assesment methods	C	evaluation of project completion
	-	
	-	
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Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Student	
LO1	knows the process of incubation of technology companies established based on the effects of commercialization of projects resulting from the transfer of knowledge to the economy	INF2_W09 INF2_W10 INF2_U07 INF2_K04
LO2	creates assumptions for the business model of an innovative economic venture	INF2_W09 INF2_W10 INF2_U07 INF2_K04
LO3	verifies the adopted business model of the designed product or service	INF2_W09 INF2_W10 INF2_U07 INF2_K04
LO4	has the attitude of an enterprising constructor/designer who repeatedly verifies the designed product/service	INF2_W09 INF2_W10 INF2_U07 INF2_K04
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	evaluation of project completion	C
LO2	evaluation of project completion	C
LO3	evaluation of project completion	C
LO4	evaluation of project completion	C

Basic references	1
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Supplementary references	2	
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Author of the programme:	Data:	22.05.2020

Białystok University of Technology		Faculty of Computer Science							
Field of study	Computer science	Degree level and programme type		full-time Master's degree					
Specjalization / diploma path	common subject	Study profile		general academic					
Field of study	IT Project Management		Course code	INF2ZPI					
Forms and number of hours	L	C	LC	P	SW	FW	S	Semester	1
	30	15						No. of ECTS credits	3
Entry requirements									
Course objectives									
The basic and main goal of the course is to introduce students to issues related to project management. Students will learn what IT project management is all about and will also acquire practical knowledge related to them. They will also learn about good practices in a given field.									
Course content									
Lecture:									
1. Understanding the growing demand for better project management, especially for IT projects.									
2. Explain what a project is, provide examples of information technology projects, list various project attributes and describe the 'resource triangle'.									
3. Describe project management and discuss key elements of project management, including project stakeholders, project management knowledge areas, commonly used tools and techniques, and project success factors.									
4. Understand the role of a project manager, describe what project managers do, what skills they need and what the career path for information technology project managers is.									
5. Describe the project management profession, including its history, the role of professional organizations such as the Project Management Institute, the importance of certification and ethics, and show the development of project management software.									
Classes:									
During practical classes, students will acquire practical knowledge related to IT project management. They will also learn what the basic stages of the project are as well as acquire adequate knowledge in team cooperation and planning and estimating project tasks. The detailed scope of issues covered in the exercises is as follows:									
1. Methodologies for determining the scope of the project and detailed functional and non-functional requirements. Development of milestones and project indicators. Creating a project card.									
2. Estimating the time required for each task. Assessment of task performance indicators. Planning and implementing project opening meetings.									
3. Preparation of the project budget, estimation of financial resources necessary to implement individual tasks. Determining the resources necessary to achieve the project goal and the internal goals of each task.									
4. Determining project quality indicators. Describing elements indicating that the task was performed with adequate quality. Analysis of completed tasks. Assessment of the degree of implementation of functional and non-functional requirements.									
5. Supervising the team. Organization of project meetings. Agile methodology. Selection of the appropriate methodology for the project being implemented.									
6. Risk analysis. Preparing a strategy to respond to emerging risks. Risk avoidance. Procedure in the event of risk.									
7. Positions in the project team. Division of tasks for individual team members. Team Leader.									
8. Issues related to closing the project. Final report.									
Student workload (in hours):									
No. of hours									
with direct teacher participation									
practical									
Lecture attendance									
30									
Project attendance									
15									
Lecture test(s) attendance									
0									
Participation in teacher-student sessions related to the module									
5									
Preparation for lecture test(s)									
0									
Preparation for project classes									
20									
0									
0									
0									
0									
0									
0									
0									
Total hours:									
70									
50									
35									
Total of ECTS credits:									
3									
2,0									
1,4									
Author of the programme:									
Data:									
Teaching methods									
L lecture problem, talk, informative lecture									
C project method, subject exercises, demonstration, programming, simulation games, situational method									
-									
-									
Assesment methods									
L test									
C evaluation of project completion, activity during classes									
-									
-									
Symbol of learning outcome									
Learning outcomes									
Reference to the learning outcomes for the field of study									
Student									
LO1									
knows the history of project management; understands what a project is and what its key elements are									
INF2_W02 INF2_W08									

LO2	is able to independently implement project management procedures; understands the role of a project manager and demonstrates knowledge of the skills necessary for this role; is able to independently develop appropriate strategies for acquiring adequate	INF2_W02 INF2_W08 INF2_U10 INF2_U13 INF2_K05
LO3	can independently describe what a project is, what its key elements are, and knows what the "design triangle" is; understands the essence of the project and is able to independently plan and implement the design process	INF2_W02 INF2_W08 INF2_U10 INF2_U13 INF2_K05
LO4	rozumie potrzebę zarządzania zespołem projektowym; umie zarządzać niewielkim zespołem i wykazuje się wiedzą w zakresie organizacji prac zespołu	INF2_W02 INF2_W08 INF2_U10 INF2_U13 INF2_K04 INF2_K05

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	test	L
LO2	test, activity during classes	L, C
LO3	test, activity during classes	L, C
LO4	test, activity during classes	L, C

Basic references	1
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Supplementary references	1
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Author of the programme:	Data:	22.05.2020
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Supplementary references	2	
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Author of the programme:	Data:	22.05.2020

Białystok University of Technology		Faculty of Computer Science								
Field of study	Computer science	Degree level and programme type	full-time Master's degree							
Specjalization / diploma path	common subject	Study profile	general academic							
Field of study	Introduction to Photography		Course code	INF2FOT						
			Course type	elective						
Forms and number of hours	L	C	LC	P	SW	FW	S	Semester	1	
	30				30			No. of ECTS credits	2	
Entry requirements										
Course objectives	To familiarize students with the history of photography from its origins to the present day. To introduce students to photographers and different types of photographs. To familiarize students with the process of preparing photographs for presentation and copyright protection and image protection.									
Course content	<ol style="list-style-type: none"> 1. Basic photographic terms. 2. Selected aspects of visual perception. 3. The most famous artists and their most famous photographs. 4. Types of photography. 5. Basic principles in photography - framing, exposure, lighting, etc. 6. Protection of intellectual property in photography. 7. The impact of technology development on the development of photography. 8. The role and use of photography in the modern world. 									
Student workload (in hours):										
								No. of hours	with direct teacher participation	practical
								Lecture attendance	30	30
								Project attendance		0
								Lecture test(s) attendance		0
								Participation in teacher-student sessions related to the module	5	5
								Preparation for lecture test(s)	15	
Calculation:								Preparation for project classes		0
										0
										0
										0
										0
										0
										0
										0
								Total hours:	50	35
								Total of ECTS credits:	2	1,4
										0,0
Author of the programme:	Data:									
Teaching methods	L	Informative lecture								
	-									
	-									
	-									
Assesment methods	L	test								
	-									
	-									
	-									
Symbol of learning outcome	Learning outcomes		Reference to the learning outcomes for the field of study							
	Student									
LO1	knows the basic principles in photography		INF2_K02							
LO2	knows the most outstanding photographs and their creators		INF2_K01 INF2_K02							
LO3	can describe the known principles and means and analyze the image		INF2_K02 INF2_K04							
LO4	understands the joint influence of technology and art on social development		INF2_K03 INF2_K04							
LO5	knows the problems of intellectual property protection in photography		INF2_K03 INF2_K04							
Symbol of learning outcome	Methods of assessing the learning outcomes		Type of tuition during which the outcome is assessed							
LO1	test		L							
LO2	test		L							
LO3	test		L							
LO4	test		L							
LO5	test		L							
Basic references	1									
	2									
	3									
	4									
	5									
Supplementary references	1									
	2									
	3									
	4									

Supplementary references	1	Robert Rosenthal, Ralph L. Rosnow, "Essentials of Behavioral Research: Methods and Data Analysis", New York: McGraw-Hill, 1991, ISBN 0-07-053929-4
	2	Fred N. Kerlinger, "Foundations of Behavioral Research," Hartcourt Brace Jovanovich College Publishers, 1986,
	3	Geoffrey Keppel, "Design and Analysis: A Researcher's Handbook," third edition, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1991, ISBN 0-13-200775-4
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Author of the programme:	Data:	22.05.2020