

Faculty of Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish	Zaawansowane zagadnienia cyberbezpieczeństwa				
Name of subject in English	Advanced Cybersecurity Issues				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	W04IST-SM4031G				
Group of courses	YES				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	30
Number of hours of total student workload (CNPS)	50			25	50
Form of crediting (Examination / crediting with grade)	crediting with grade			crediting with grade	crediting with grade
For group of courses mark (X) final course					
Number of ECTS points	2			1	2
including number of ECTS points for practical classes (P)				1	2
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,3			0,9	1,4

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Intermediate level knowledge and competences in the field of computer networks, computer security and programming.
2. Knowledge of programming platforms for websites and mobile applications.
3. Awareness of the importance of social engineering threats and methods of protecting user identities in online systems and websites.

SUBJECT OBJECTIVES

- C1 Acquiring knowledge about cybersecurity. Issues related to threats to system and web services, communication services, hardware and system communication infrastructure, information resources and databases.
- C2 Learning about advanced methods of preventing attacks and minimizing the threats resulting from them.
- C3 Acquiring the ability to detect security incidents in cyberspace and eliminate the effects and causes of these incidents. Basic principles of computer forensics.

SUBJECT EDUCATIONAL EFFECTS

In terms of knowledge:

PEU_W01 – Has structured, theoretically based knowledge of the most important issues related to threats and security of IT systems.

PEU_W02 – has advanced knowledge of methods and tools for increasing security and ensuring accessibility to web and mobile resources, services and systems for users, social and business processes in cyberspace.

PEU_W03 – has knowledge about social engineering threats and protection methods user identities.

PEU_W04 – Knows the basic concepts related to the security of operating systems

PEU_W05 – Knows the use of tools used to ensure the security of computer systems and penetration tests.

In terms of skills:

PEU_U01 – has the ability to search for information on computer security from various sources, is able to critically analyze, synthesize, and interpret it creatively and is able to present it using information and communication techniques.

PEU_U02 - Is able to communicate on specialized topics with diverse audiences

In the field of social competences:

PROGRAMME CONTENT

Lecture		Number of hours
Lec1, Lec2	Basics of network and internet security.	4
Lec3	Legal and organizational foundations of cybersecurity in Poland and the EU	2
Lec4	Threats related to the improper use of cryptographic solutions. DevSecOps methodology, OWASP Top Ten	2
Lec5	Network and TCP/IP protocol security	2
Lec6	Security audit. Audit tools and systems. Auditing standards and norms.	2
Lec7	Basics of OT/IoT system security	2
Lec8	Security of systems based on Blockchain technology	2
Lec9	Computer forensics and post-incident analysis	2
Lec10	Responding to computer incidents	2
Lec11	Social engineering methods of attacks on users and IT infrastructure.	2
Lec12	Penetration testing	2
Lec13	Information security management	2
Lec14	Security related to artificial intelligence algorithms.	2
Lec15	Final colloquium	2
	Total hours	30

Seminar		Number of hours
Se1	Discussion of the seminar topics and recommended items literature.	2
Se2	Student presentations on the topics concerned. Discussion in a seminar group.	28
	Total hours	30
Project		Number of hours
Pr1	Discussion of the project topic, presentation of evaluation rules and requirements. Scope of project preparation and the division of topics.	1
Pr2	Individual study on the assigned topic	12
Pr3	Discussion in the project group on the results obtained during work on the implementation of the project task.	2
	Total hours	15
TEACHING TOOLS USED		
N1. Problem-based lecture based on multimedia presentations. N2. own work N3. Literature studies. N4. Preparing a seminar on a selected topic N5. Problem discussion		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1 - lecture	PEU_W01-W03	Colloquium
F2 - seminar	PEU_W04 PEU_U01 PEU_U02	Assessment of prepared presentations and active participation in the discussion
F3 - project	PEU_W05	grade for project implementation
$P = 0,4 * F1 + 0,3 * F2 + 0,3 * F3$		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Bentkowski M., Czyż A., Janicki ., Kamiński J., Michalczyk A., Niezabitowski M, Piosek M., Sajdak M., Trawiński G., Widła B., Bezpieczeństwo aplikacji webowych. Securitum Szkolenia sp. z o.o. sp. k., Wydanie I, Kraków, 2019.
- [2] Kennedy D., O'Gorman J., Kearns D., Aharoni M., Metasploit. Przewodnik po testach penetracyjnych. Wyd. Helion, Gliwice, 2013.
- [3] Chell D., Erasmus T., Colley S., Whitehous O., Bezpieczeństwo aplikacji mobilnych. Podręcznik hakera”, Wyd. Helion, Gliwice, 2017.
- [4] Fielding R.T., Architectural Styles and the Design of Network-based Software Architectures. Praca doktorska. University of California, Irvine, 2000.

[5] Mehta B., REST. Najlepsze praktyki i wzorce w języku Java. Wyd. Helion, Gliwice, 2015.

[6] Elenkov N., Android Security Internals. No Starch Press, Inc., San Francisco, CA, 2015.

[7] Eileen O., Darknet. Społeczny Instytut Wydawniczy Znak, Kraków, 2019.

SECONDARY LITERATURE:

[8] Moore D., Rid T., Cryptopolitik and the Darknet, Survival Global Politics and Strategy, 58:1, 7-38.

[9] Langill J.T., Industrial Network Security: Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Control Systems. Second Edition. Eric D. Knapp, 2015.

[10] Płonkowski M., Android Studio. Tworzenie aplikacji mobilnych (ebook). Wyd. Helion, Gliwice, 2018.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

dr inż. Michał Kędziora, michal.kedziora@pwr.edu.pl

FACULTY Information and Communication Technology	
SUBJECT CARD	
Name of subject in Polish	Współczesne wyzwania sztucznej inteligencji.
Name of subject in English	Advanced Topics in Artificial Intelligence
Main field of study (if applicable):	Applied Computer Science
Specialization (if applicable):	Computer Engineering
Profile:	academic
Level and form of studies:	2nd level, full-time
Kind of subject:	obligatory
Subject code	W04IST-SM4003G
Group of courses	YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	15
Number of hours of total student workload (CNPS)	75			75	25
Form of crediting (Examination / crediting with grade)	Exam			crediting with grade	crediting with grade
For group of courses mark (X) final course	X				
Number of ECTS points	3			3	1
including number of ECTS points for practical classes (P)				3	1
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1.3			1.5	0.7

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Proficiency in programming.
2. Ability to use scientific literature.
3. Teamwork skills.

SUBJECT OBJECTIVES

- C1. Extend and deepen the knowledge of intelligent methods, their uses and methods of validation.
- C2. The ability to select appropriate intelligent techniques and their validation to the task.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Awareness of the role of creative thinking and knowledge representation.

PEU_W02 Issues connected with Machine Learning task.

PEU_W03 Issues connected with Deep Learning and Generative AI

...

relating to skills:

PEU_U01 The ability to formulate problems in a way that facilitates its solution.

PEU_U02 Skilful selection of intelligent techniques to the given problem.

PEU_U03 The intelligent processing of information with Deep Learning and Multimodal Generative Models

relating to social competences:
PEU_K01 Cooperation in group.

PROGRAMME CONTENT

Lecture		Number of hours
Lec 1	Introduction to the course. Recent trends: generative foundational models, Deep Learning, towards general AI.	2
Lec 2	Data in AI: building datasets, annotation, quality evaluation, shared tasks.	2
Lec 3	Vector-based representation – pretrained models	2
Lec 4	Architectures and environments for AI	2
Lec 5	Multi-label classification	2
Lec 6	Deep Learning in classification tasks	2
Lec 7	Natural Language Processing – contemporary methods	2
Lec 8	Ensemble of classifiers and hybrid methods	2
Lec 9	Representation Learning and Knowledge Bases	3
Lec 10	Transfer learning, cross-lingual learning, Zero-shot and A Few Shot Learning	3
Lec 11	Semantic Retrieval, Sparse and Dense Models in Knowledge Processing	2
Lec 12	Reinforcement Learning and Deep Reinforcement Learning	2
Lec 13	Generative Large Language Models like Chat GPT and Generative AI	2
Lec 14	eXplainable AI (XAI) and Ethical Issues in AI	2
	Total hours	30
Project		Number of hours
Proj 1	Discussion about possible subjects of the project, teams, requirements	2
Proj 2	Decision and consultation about the project subject, its scope, etc.	2
Proj 3	Detailed plan of the project, consultation of used methods, approaches, etc.	6
Proj 4	Projects plan and progress presentation	4
Proj 5	Project realization and consultation	10
Proj 6	Student presentations of the project results	4
Proj 7	Summarization of the presented projects	2
	Total hours	30
Seminar		Number of hours
Semin 1	Discussion of the topics of student study (research) papers, how to study the topics, preparation of research documentation and presentations. Acquisition of topics for student research papers.	1
Semin 2	Presentations of the results of student study (research) work as scheduled. Discussion.	13

Semin 3	Summary of classes. Grading.	1
	Total hours	15

TEACHING TOOLS USED

- N1. Presentations with projectors.
 N2. E-learning system used for the publication of teaching materials.
 N3. On-line lectures, if needed.
 N4. Discussions.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1 – project	PEU_U01 PEU_U02	The presentation of the problem itself and the planned approach to solve the problem is evaluated.
F2 - project	PEU_U02 PEU_U03 PEU_K01	Presentation of the final results of the project
P1 - project	PEU_U02 PEU_U03 PEU_K01	Points for the presentations and additional points for the student's activity during the semester is summed.
P2 - lecture	PEU_W01 PEU_W02 PEU_W03	Exam. The exam is a written exam, checking knowledge of the lecture and the ability for practical use of this knowledge. It consists of test questions
P3 - seminar	PEU_U01 PEU_U02	Points for the presentations and additional points for the student's activity during the semester is summed.
P – total: The arithmetic mean of the project, seminar and exam grades.		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Literature items indicated during lectures, indicated on the slides for these lectures, like e.g.: „An Analysis of Quantitative Measures Associated with Rules”, https://www.researchgate.net/publication/220894386_An_Analysis_of_Quantitative_Measures_Associated_with_Rules, "Induction of Classification Rules by Granular Computing". J.T. Yao and Y.Y. Yao. http://www2.cs.uregina.ca/~yyao/PAPERS/rsctc02_yy.pdf
- [2] Wolfgang Ertel. Introduction to Artificial Intelligence. Springer, 2017.
- [3] Miroslav Kubat. An Introduction to Machine Learning. Springer, 2017.
- [4] Sandro Skansi. Introduction to Deep Learning. From Logical Calculus to Artificial Intelligence. Springer, 2018.
- [5] Umberto Michelucci. Advanced Applied Deep Learning. Apress, 2019.
- [6] Charu C. Aggarwal. Artificial Intelligence. A Textbook. Springer. 2021.
- [7] Richard S. Sutton and Andrew G. Barto. Reinforcement Learning: An Introduction. The MIT Press, 2020.
- [8] Jurafsky, D. & Martin, J. H. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition Prentice Hall, 2000; 3 edition (draft 2021):

SECONDARY LITERATURE:

Any current scientific article or book relevant to the course topic.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Maciej Piasecki, maciej.piasecki@pwr.edu.pl

FACULTY of Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish:	Zaawansowane bazy danych				
Name of subject in English:	Advanced databases				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	W04IST-SM4018G				
Group of courses	YES				

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	
Number of hours of total student workload (CNPS)	75			75	
Form of crediting (Examination / crediting with grade)	Examination / crediting with grade *	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*
For group of courses mark (X) final course	X				
Number of ECTS points	3			3	
including number of ECTS points for practical classes (P)	0			3	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,4			1,5	

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of elementary data models and database design methods
2. Elementary knowledge of Database architectures
3. Elementary knowledge of SQL

SUBJECT OBJECTIVES

- C1 To enhance students' knowledge about advanced methods of data storage and processing.
C2 To learn how to practically apply modern data models of data storage and processing

SUBJECT LEARNING OUTCOMES

relating to knowledge:

- PEU_W01 Has a basic knowledge about advanced data storage and processing methods
PEU_W02 Is able to present and evaluate usages of advanced data models

relating to skills:

- PEU_U01 Is able to apply modern methods of improving the efficiency of data storage and processing.

PEK_U02 Is able to use advanced data models in the design and development of database applications.

PROGRAM CONTENT

Lectures		Number of hours
Lec 1	Introduction. Architecture of modern DBMS	2
Lec 2	Modern Database types and their usages: - Relational - noSQL - Cloud	2
Lec 3	Efficient data storage	2
Lec 4	Data access performance improvements: - Indexing - Partitioning	2
Lec 5	Query processing: - Join algorithms	2
Lec 6	Query optimization: - Cost based optimization - Query plans	2
Lec 7	Transactional processing	2
Lec 8	Columnar data storage and compression	2
Lec 9	noSQL databases: - Disadvantages of classical databases - Feature review	2
Lec 10	NoSQL data models - Key-Value - Graph - Document	2
Lec 11	Data consistency in NoSQL databases: - CAP theorem	2
Lec 12	Data storage in cloud	2
Lec 13	Data processing in cloud	3
Lec 14	Data security	2
Lec 15	Test	1
	Total hours	30
Project		Number of hours
Proj 1	Introduction, Building of projects teams.	2
Proj 2	Formulation of topic and scope of project and tools used.	2
Proj 3 – Proj 5	Design and implementation of test database.	6

Proj 6 – Proj 14	Tests of enhanced data models (3 iterations, 6h each)	18
Proj 15	Presentation, discussion and grading.	2
	Total hours	30

TEACHING TOOLS USED

N1. Lecture
N2. Individual consultations
N3. The course web page with references to literature
N4. Software development tools
N5. DBMS

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
F1 – Project	PEU_U01, PEU_U02,	Avg. of grades for each project phase
F2- Lecture	PEU_W01, PEU_W02	Test
P		$F1 * 0.5 + F2 * 0.5$

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] C.J. Date, Date on Database, Writings 2000-2006, Apress, 2006
- [2] R. Elmasri, S. B. Navathe, Fundamentals of Database Systems, Fourth Edition, Addison-Wesley, 2003
- [3] R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw-Hill, 2000
- [4] noSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, PJ Sodalage, M Fowler, Addison-Wesley, 2013

SECONDARY LITERATURE:

- [1] J. Gamper, et. al. Temporal Data Management: An Overview, eBISS 2017
- [2] Arasu, A. and Babcock, B. and Babu, S. and Cieslewicz, J. and Datar, M. and Ito, K. and Motwani, R and Srivastava, U. and Widom, J. (2004) STREAM: The Stanford Data Stream Management System. Technical Report. Stanford InfoLab.
- [3] Stavros Harizopoulos, Daniel Abadi, Peter Boncz, Column-Oriented Database Systems, VLDB 2009

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

dr inż. Artur Wilczek, artur.wilczek@pwr.wroc.pl

*delete if not necessary

FACULTY OF INFORMATION AND TELECOMUNICATION	
SUBJECT CARD	
Name of subject in Polish	Analiza systemów webowych
Name of subject in English	Analysis of Web-based Systems
Main field of study (if applicable):	Applied Computer Science
Specialization (if applicable):	Computer Engineering
Profile:	academic
Level and form of studies:	2nd level, full-time
Kind of subject:	obligatory
Subject code	W04IST-SM4038G
Group of courses	YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	
Number of hours of total student workload (CNPS)	50			75	
Form of crediting (Examination / crediting with grade)	crediting with grade			crediting with grade	
For group of courses mark (X) final course	X				
Number of ECTS points	2			3	
including number of ECTS points for practical classes (P)				3	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,2			1,5	

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of mathematical analysis
2. Basic knowledge and skills of programming

SUBJECT OBJECTIVES

- C1 Familiarize students with current knowledge in the field of Web-based systems
- C2 Presentation of Web-based systems performance prediction approaches and methods
- C3 Familiarize students with web data mining methods
- C3 Presentation of Web-based systems performance prediction approaches and methods
- C4 Obtaining skills in the development and analysis of web performance data

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Knows and understands the basic processes taking place in the life cycle of facilities and IT systems

PEU_W02 Knows the methods of representation of models used in computer science

relating to skills:

PEU_U01 Students can plan and carry out experiments, analyze and interpret the obtained results, and draw conclusions

relating to social competences:

PEU_K01 Is ready to critically evaluate the received content and is aware of the importance of knowledge in solving problems.

PEU_K02 Can think and act creatively and enterprisingly.

PROGRAMME CONTENT

Lecture		Number of hours
Lec 1	Introduction to the course. Description of the course, the organization of classes and examination. Basics of Internet.	2
Lec 2	Internet architecture and infrastructure	2
Lec 3	TCP/IP protocol stack, Distance metrics.	2
Lec 4	TCP transport, DNS	2
Lec 5-6	HTTP - current and future developments	4
Lec 7-8	Web traffic characteristics	4
Lec 9-10	Web performance issues	4
Lec 11-12	Web performance prediction.	4
Lec 13	Web mining. Web performance mining	2
Lec 14	Auction methods in the analysis of Web-based systems	2
Lec 15	Colloquium	2
	Total hours	30
Project		Number of hours
Proj 1	Rules for passing, health and safety, familiarization with the work environment	2
Proj 2	Working with the Orange tool, building prediction models for binary and numerical data. Prediction evaluation.	2
Proj 3	Real-world data sets. Preprocessing process (data preparation/cleaning)	2
Proj 4	A collection of mobile telephony logs for various operators. Preprocessing, data analysis, building predictive models, evaluation of prediction algorithms for a single operator, for all operators.	2
Proj 5	A collection of logs from mobile telephony. Continue the lab.	2
Proj 6	Preparation of a mobile telephony prediction test report	2
Proj 7	Selection of real network logs from the Internet (e.g. http logs)	2
Proj 8	Preprocessing, data analysis, building predictive models, evaluation of prediction algorithms for network logs.	2
Proj 9	Preprocessing, data analysis, building predictive models, evaluation of prediction algorithms for network logs.	2
Proj 10	Investigate the impact of input attributes on the prediction score (key attributes).	2
Proj 11	Preparation of a report on network data prediction tests	2
Proj 12	Choosing your own data prediction tool. Describes how to create a model.	2
Proj 13	Making predictions in a new tool, comparing the results of predictions for the same algorithms, but different tools.	2

Proj 14	Preparation of a prediction research report for network data, for 2 different tools and the same prediction algorithms.	2
Proj 15	Summary. Course grades.	2
	Total hours	30

TEACHING TOOLS USED

- N1. Lectures supported by multimedia presentations
N2. Multimedia presentations
N3 Scientific and technical publications, including own research
N4. E-learning system used for publication of teaching materials, announcements, collection and assessment of student works
N5. Student's own work - realization of a lab task in a group
N6. Additional consultations for students.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1 – lecture	PEU_W01, PEU_W02,	Test
F2 - project	PEU_U01, PEU_K01, PEU_K02	Checking student preparation for classes. Evaluation of the progress of performed project tasks, planning experiments, analysis of results, and conclusion. Observation of student activity and teamwork.
P = (F1 – lecture + F2 – project)/2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Ilya Grigorik, High-Performance Browser Networking, O'Reilly 2013,
<http://chimera.labs.oreilly.com/books/1230000000545/index.html>
[2] Candace Leiden, Marshall Wilensky. TCP-IP For Dummies 6 Edition Wiley,2009
[3] Literature recommended on an ongoing basis for the lectures and projects

SECONDARY LITERATURE:

- [1] Documentation of tools: <https://www.webpagetest.org/>, <https://orangedatamining.com/>, <https://www.cs.waikato.ac.nz/ml/weka/> etc.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Prof. Leszek Borzemski, leszek.borzemski@pwr.edu.pl

FACULTY Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish	Seminarium dyplomowe				
Name of subject in English	Diploma seminar				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	W04IST-SM4013S				
Group of courses	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					30
Number of hours of total student workload (CNPS)					50
Form of crediting (Examination / crediting with grade)					crediting with grade
For group of courses mark (X) final course					
Number of ECTS points					2
including number of ECTS points for practical classes (P)					2
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					1,4

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Knowledge and competences in research methods and tools applied in the discipline of technical informatics and telecommunication.

SUBJECT OBJECTIVES
C1 To search, analyze and present specialized knowledge in the field of applied computer science
C2 To acquire related social competencies
SUBJECT EDUCATIONAL EFFECTS
relating to knowledge:
relating to skills:
PEU_U01 - is able to study a specified part of topics in applied computer science
PEU_U02 - is able to present the studied part of the subject matter in the field of applied computer science, and is able to lead a discussion with the audience on the studied subject matter
relating to social competences:
PEU_K01 - is ready to critically evaluate the received content and is aware of the importance of knowledge in problem solving

PROGRAMME CONTENT		
Seminar		Number of hours
Se 1	Discussion of the topics of student study (research) papers, how to study the topics, preparation of research documentation and presentations. Acquisition of topics for student research papers.	2
Se 2 – Se 14	Presentations of the results of student study (research) work as scheduled. Discussion.	26
Se 15	Summary of classes. Grading.	2
...		30
	Total hours	
TEACHING TOOLS USED		
N1. Traditional seminar based on multimedia presentations N2. Students' own work - participation in the implementation of student research papers N3. Consultations for students		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
P	PEU_U01 PEU_U02 PEU_K01	Grades for the presentation of completed work (scope, coherence, readability, timeliness) and class activity (ability to lead and participate in discussions).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Literature on the scope of the conducted study research selected by the student for the thesis.
- [2] Thesis Writing for Master's and Ph.D Program, Parija, Springer 2018
- [3] Rzędowska A., Rzędowski J.: Mistrzowskie prezentacje. Slajdowy poradnik mówcy doskonałego. Wydanie 2, Helion, Giwice 2017.
- [4] Requirements for a master's thesis at the Faculty and Technical University of Wrocław.

SECONDARY LITERATURE:

- [1] Kraśniewski A., Techniki Prezentacji, materiały dydaktyczne, http://cygnus.tele.pw.edu.pl/~andrzej/TP/tp_m.htm
- [2] Siuda P., Wasylczyk P., Publikacje naukowe. Praktyczny poradnik dla studentów, doktorantów i nie tylko. PWN, Warszawa 2018

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Dariusz Król dariusz.krol@pwr.edu.pl

FACULTY OF MANAGEMENT	
SUBJECT CARD	
Name of subject in Polish	Etyka nowych technologii
Name of subject in English	Ethics of new technologies
Main field of study (if applicable):	Applied Computer Science
Specialization (if applicable):	Computer Engineering
Profile:	academic
Level and form of studies:	2nd level, full-time
Kind of subject:	obligatory
Subject code:	W08IST-SM4017S
Group of courses:	NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					15
Number of hours of total student workload (CNPS)					60
Form of crediting	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	crediting with grade*
For group of courses mark (X) final course					
Number of ECTS points					2
including number of ECTS points for practical classes (P)					2
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					0,7

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
No prerequisites required.

SUBJECT OBJECTIVES
C1 Student acquires knowledge on ethical aspects of new and emerging technologies, including dilemmas related to technology assessment;
C4 Student is aware of the importance of ethical rules related to technology development and competent to initiate activities on behalf of the public interest.
C5 Student is aware of non-technical aspects of engineering and of social responsibility of an engineer.

SUBJECT EDUCATIONAL EFFECTS
Relating to knowledge:
PEU_W01 [P7S_WK1]: Knows and understands the etic and humanistic conditions of undertaking various types of professional activities relating to the awarded qualification.

PEU_W02 [P7_WK3]: Knows and understands the fundamental dilemmas of modern civilization.

Relating do skills:

PEU_U01 [P7S_UK]: Is able to lead debates.

Relating to social competences:

PEU_K01 [P7S_KK]: Is ready to critically evaluate the content he receives.

PEU_K02 [P7S_KO]: Is ready to take action in the public interest.

PROGRAMME CONTENT

Seminar		Number of hours
Semin 1	Introduction: morality, ethics, law. General ethics and applied ethics.	1
Semin 2	Ethical theories and types of justification of moral judgements. Disagreement in knowledge and in attitudes.	2
Semin 3	Ethical dilemma: structure and types. Ethical dilemmas related to engineering and technology assessment.	2
Semin 4	Expert and participatory technology assessment. Technology governance.	2
Semin 5	Risks and benefits of technology use; user experience. Case analyses, roboethics and other examples.	2
Semin 6	Ethical approaches tailored to new technologies. Ethical guidelines.	2
Semin 7	Ethical rules for professional engineering. Selected codes of ethics.	2
Semin 8	Obligations towards society: responsible research and innovation (RRI). Summary of the course.	2
	Total hours	15

TEACHING TOOLS USED

- N1. Interactive lecture with multimedial presentation.
- N2. Student groupwork.
- N3. Student individual work.
- N4. Case analysis.
- N5. Brainstorming.
- N6. Scenario workshop.
- N7. Thematic discussion.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_W02, PEU_U01, PEU_K01	Written work (case analysis)

F2	PEU_W01, PEU_W02, PEU_U01, PEU_K01, PEU_K02	Participation in discussions and group activities.
P=F1+F2 Weighted average of evaluation F1 (2/3 of concluding mark) and evaluation F2 (1/3 of concluding mark).		
PRIMARY AND SECONDARY LITERATURE		
<u>PRIMARY LITERATURE:</u>		
<p>[1] Gwiazdowicz M., Stankiewicz P. <i>Technology Assessment. Problematyka oceny technologii</i>, „Studia BAS” 2015, 3(43).</p> <p>[2] Małek M. Mazurek E., Serafin K., <i>Etyka i technika. Etyczne, społeczne i edukacyjne aspekty działalności inżynierskiej</i>, Wrocław 2014.</p> <p>[3] Michalski K., <i>Technology Assessment – nowe wyzwania dla filozofii nauki i ogólnej metodologii nauk</i>, Oficyna Wydawnicza Politechniki Rzeszowskiej 2019.</p>		
<u>SECONDARY LITERATURE:</u>		
<p>[1] Bińczyk E., <i>Technonauka w społeczeństwie ryzyka</i>, Wyd. Naukowe UMK 2012.</p> <p>[2] Chyrowicz B., <i>O sytuacjach bez wyjścia w etyce</i>, Wyd. Znak, Kraków 2008.</p> <p>[3] Małek-Orłowska M., <i>Niemoralność finansowania robota? O negatywnej rekomendacji AOTM dla robota Da Vinci</i>, „Prawo i Medycyna” 2016, 1 (62/18), s. 68-80.</p> <p>[4] Małek-Orłowska M., <i>Technologie human enhancement: zakres zastosowania i metody oceny</i>, (red. E.Bińczyk i in.) <i>Horyzonty konstrukttywizmu: inspiracje, perspektywy, przyszłość</i>, Wyd. UMK 2015.</p> <p>[5] Stankiewicz P. <i>Od przekonywania do współdecydowania: zarządzanie konfliktami wokół ryzyka i technologii</i>, „Studia Socjologiczne” 2011, 4 (203).</p> <p>[6] Stankiewicz P., <i>Zbudujemy wam elektrownię (atomową!). Praktyka oceny technologii przy rozwoju energetyki jądrowej w Polsce</i>, „Studia Socjologiczne” 2014, 1 (212), s. 77-107.</p>		
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)		
Monika Małek-Orłowska, monika.malek@pwr.edu.pl		

FACULTY of Information and Communication Technology	
SUBJECT CARD	
Name of subject in Polish:	Podstawy inżynierii wiedzy
Name of subject in English:	Foundations of Knowledge Engineering
Main field of study (if applicable):	Applied Computer Science
Specialization (if applicable):	Computer Engineering
Profile:	academic
Level and form of studies:	2nd level, full-time studies
Kind of subject:	obligatory
Subject code:	W04IST-SM4033G
Group of courses	YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			30
Number of hours of total student workload (CNPS)	50	25			25
Form of crediting	crediting with grade*	crediting with grade*	crediting with grade*	crediting with grade*	crediting with grade*
For group of courses mark final course with (X)	X				
Number of ECTS points	2	1			1
including number of ECTS points for practical (P) classes		1			1
including number of ECTS points for direct teacher-student contact (BK) classes	1,3	0,8			0,8

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of logics, knowledge of algorithms, set theory, probability theory, graph theory, basic linear algebra of vectors and matrices.
2. You are expected to know how to program in one of the programming languages, Python, Java, C++, C#.

SUBJECT OBJECTIVES

- C1 Acquiring understanding of issues related to using computers in solving engineering problems concerning knowledge.
- C2 Developing skills in formulating mathematical models based on available knowledge and/or on collected data, in designing solution algorithms to analysis, diagnostic, and decision-making problems, and in application of existing software tools.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Student is able to define a knowledge representation (KR) using relations or logical formulas, and formulate analysis problem (AP), diagnostic problem (DP), and decision-making problem (DMP) based on these KRs.

PEU_W02 Student is able to explain specific concepts of knowledge validation and updating devoted to a relational KR and to a logical KR

PEU_W03 Student is able to characterize the process of knowledge discovery in databases and define several data mining problems and methods useful in knowledge acquisition.

relating to skills:

PEU_U01 Student is capable of applying knowledge processing algorithms for solving AP, DP and DMP.

PEU_U02 Student is capable of applying knowledge validation and updating algorithms to relational and logical KRs.

PEU_U03 Student knows how to process data so as to discover knowledge, and how to use existing software to carry out this task.

PEU_U04 Student is capable of describing the fundamental data mining tasks like pattern mining, classification, regression and clustering.

PEU_U05 Student is capable of analyzing the key algorithms, implementing and applying the techniques to real world datasets.

PEU_U06 Student is able to demonstrate understanding of more advanced topics in data mining and implement more advanced algorithms.

relating to social competences:

PROGRAM CONTENT

Lectures		Number of hours
Lec 1	Introduction. Main problems of knowledge engineering. Classical mathematical models vs. knowledge representations (KRs).	2
Lec 2, Lec 3	Relational KR.	4
Lec 4	Logical KR. Issues on computational complexity.	5
Lec 5	Probabilistic uncertainty in logical KR – probabilistic reasoning and Bayesian networks.	4
Lec 6	Validation and updating of a relational knowledge KR.	3
Lec 7	Automated knowledge extraction from large data sets. Knowledge discovery in databases. Attributes' domains discretization and other data mining problems.	2
Lec 8	Pattern Mining and Association rules.	4
Lec 9	Decision trees	2
Lec 10	Data clustering.	2
Lec 11	Test	2
	Total hours	30
Classes		Number of hours
C11 – C14	Solving example problems of mathematical modeling with the use of knowledge representations, solving analysis, diagnostic and decision-making problems based on knowledge representations.	4
C15 – C18	Numerical examples on knowledge validation and updating. Logical KR, Bayesian networks, relational KR. Using software tools.	4
C19, C10	Mining data for association rules - numerical example, computer simulations.	2
C111, C112	Mining data for decision trees - numerical example, computer simulations.	2
C113, C114	Mining data for clusters - numerical example, computer simulations.	2

CI15	Test	1
	Total hours	15
Seminars		Number of hours
Sem 1	The teacher will provide topics related to the subject during the early meetings of the course. Students are required to select one of these topics to work in groups for their presentation.	2
Sem 2- Sem 15	Students collaborate in groups to deliver presentations.	28
	Total hours	30
TEACHING TOOLS USED		
<p>N1. Traditional lecture. N2. Students' individual work – solving computational exercises. N3. Students' individual work – programming. N4. Students' individual work – performing computer simulations. N5. Students' individual work – studying literature. N6. Students' individual and group activities – studying literature and presentations.</p>		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
F1 (lecture)	PEU_W01 – PEU_W03	Test
F2 (classes)	PEU_U01 – PEU_U03	Observation of students' activity during classes, evaluation of assignments, tests.
F3 (seminars)	PEU_U04 – PEU_U06	Observation of students' activity during seminars, evaluation of presentations.
P (lecture, classes and seminars as per GK)		Weighted average of F1, F2 and F3

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] [1] Tan, Steinbach & Kumar “Introduction to Data Mining” 2nd Edition, Pearson, 2018.
[2] Mohammed J. Zaki and Wagner Meira, Jr “Data mining and Machine Learning: Fundamental Concepts and Algorithms” 2nd Edition, Cambridge University Press, 2020.
[3] Charu C. Aggarwal “Data Mining”, Springer Verlag, 2015

SECONDARY LITERATURE:

- [1.] Han, Kamber & Pei “Data Mining: Concepts and Techniques” 3rd Edition, Morgan Kaufmann, 2013
[2.] T. Mitchell “Machine Learning”, McGraw-Hill, 1997
[3.] N. T. Nguyen “Advanced Methods for Inconsistent Knowledge Management”, Springer Verlag, 2007

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Thanh-Ngo Nguyen, thanh-ngo.nguyen@pwr.edu.pl

FACULTY of Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish	Podstawy biznesu i ochrona własności intelektualnej				
Name of subject in English	Fundamentals of Business and Intellectual Property Protection				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code:	W08IST-SM4018W				
Group of courses	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	90				
Form of crediting	Crediting with grade				
For group of courses mark final course with (X)					
Number of ECTS points	3				
including number of ECTS points for practical (P) classes					
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,2				

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

No prerequisites

SUBJECT OBJECTIVES

C1. The aim of the course is to familiarize students with the principles of creating, development and management of an enterprise.

C2. The aim of the course is to familiarize students with the principles of intellectual property management.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Student understands the essence of the concept of entrepreneurship and enterprise, knows the rules and areas of its operation.

PEU_W02 Has a general knowledge of the process of setting up a company.

PEU_W03 Student knows and understands the basic concepts and regulations concerning the Intellectual property protection.

PEU_W04 Student has general knowledge of available patent information sources and its use in innovation processes.

relating to social competences:

PEU_K01 The student understands the consequences of the activities undertaken as part of business activity.

PROGRAM CONTENT

Lectures		Number of hours
Lec 1	Introduction - an outline of the lecture, credit terms, literature. The company in a market economy.	2
Lec 2	The company's business environment, market intelligence.	2
Lec 3	The formal organization of the company.	2
Lec 4	The strategy creation in the company.	2
Lec 5	Determination of a business model – marketing management.	2
Lec 6	Determination of a business model – finance and logistics management.	2
Lec 7	Brand management.	2
Lec 8	Assesment part I	2
Lec 9	The concept and role of intellectual property protection.	2
Lec 10	Industrial property – patents: protection system (part I).	2
Lec 11	Industrial property – patents: protection system (part II).	2
Lec 12	Industrial property – trade marks: protection system.	2
Lec 13	Industrial property – designs: protection system. Other elements of industrial property: utility models, geographic indications.	2
Lec 14	Copyrights and related rights.	2
Lec 15	Assemesment part II	2
	Total hours	30

TEACHING TOOLS USED

- N1. Informative lecture supported by a multimedia presentation
- N2. Problem-based lecture supported by a multimedia presentation
- N3. Case study

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), C – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
F1	PEU_W01 PEU_W02 PEU_K01	Written test
F2	PEU_W03 PEU_W04	Presentation, written report
$C = 0,5 * F1 + 0,5 * F2$		
PRIMARY AND SECONDARY LITERATURE		
<u>PRIMARY LITERATURE:</u>		
Kotler P., Keller K.L., Marketing Management, 15th Global ed. Always Learning. Boston; Pearson, 2016		
Palfrey J., Intellectual property strategy, Cambridge; MIT Press, London 2012		
<u>SECONDARY LITERATURE:</u>		
Harvard Business Review		
World Intellectual Property Organization www.wipo.int		
European Patent Office www.epo.org		
Urząd Patentowy Rzeczypospolitej Polskiej www.uprp.pl		
Domestic Patent Office		
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)		
dr inż. Anna Sałamacha, anna.salamacha@pwr.edu.pl		

*delete if not necessary

FACULTY of Information and Communication Technology

SUBJECT CARD

Name of subject in Polish: Metody planowania i analizy eksperymentów
Name of subject in English: Methods of planning and analysing experiments
Main field of study (if applicable): Applied Computer Science
Specialization (if applicable): Computer Engineering
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code: W04IST-SM4020W
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				
Number of hours of total student workload (CNPS)	30				
Form of crediting (Examination / crediting with grade)	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	1				
including number of ECTS points for practical classes (P)					
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	0,7				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge and skills in mathematical analysis and algebra in the field of engineering programs.
2. Knowledge of basic concepts of probability in the field of engineering programs.

SUBJECT OBJECTIVES

- C1 Presentation of the main principles related to the design of a statistical experiment.
 C2 Transfer of knowledge on choosing appropriate descriptive analysis tools and statistical tests in order to analyze the experimental data.
 C3 Transfer of knowledge on building and correct interpretation of basic statistical models.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

- PEU_W01 knowledge of basic principles concerning design of a statistical experiment,
 PEU_W02 knowledge of descriptive data analysis tools,
 PEU_W03 knowledge of basic statistical tests and their specific assumptions,
 PEU_W04 basic knowledge on statistical analysis of the relationship between quantitative variables and linear regression models.

relating to skills:

PEU_U01 ability to choose and compute appropriate basic descriptive statistics for experimental data,
 PEU_U02 ability to use graphical methods of data presentation and interpretation of the results obtained,
 PEU_U03 ability to choose appropriate statistical tests to analyze experimental data,
 PEU_U04 ability to perform statistical analysis of correlation and to build and interpret linear regression models.

relating to social competences:
 PEU_K01 ability to use scientific literature, including accessing and reviewing source materials,
 PEU_K02 understanding the need for systematic and independent work on mastering the course material.

PROGRAMME CONTENT		
	Lecture	Number of hours
Lec 1	Elementary concepts of statistics. Population and sample. Types of statistical variables. Basic principles of experimental design.	2
Lec 2	Descriptive data analysis. Graphical presentation of data. Basic summary statistics and their properties.	2
Lec 3	Data preparation for statistical analysis (subset selection, standardization, discretization, simple transformations). Data quality problem: missing and unusual observations.	1
Lec 4	Theoretical foundations of statistical methods. Elements of probability theory. The most important discrete and continuous random variables and their distributions. Estimation of parameters. Fitting appropriate distribution to data. Confidence intervals. Determination of the sample size.	2
Lec 5	Introduction to statistical hypothesis testing. The main concepts: null and alternative hypothesis, statistical significance. General procedure used to verify a statistical hypothesis. Type I and type II errors. Power of a statistical test. One-sided and two-sided tests. Types of statistical tests (tests of significance, goodness-of-fit and independence tests). Relationship between hypothesis testing and confidence intervals.	2
Lec 6	Basic parametric tests for one and two populations. Tests of significance for mean and variance. Significance test for a proportion. Selected goodness-of-fit tests (chi-square test, test for normality).	2
Lec 7	Investigating the relationship between two quantitative variables: correlation coefficient and scatter plot. Statistical test for significance of correlation. Analysis of multiple correlation (correlation matrix). Nonlinear relationships between variables. Typical mistakes concerned with examining relationships between variables.	1
Lec 8	Linear regression model. Simple linear regression: model assumptions and interpretation. Model fitting and diagnostics. Choosing the best model. Multiple regression. Variable selection in regression. Using fitted regression model for prediction. Limitations of linear regression models.	2
Lec 9	Final test.	1

Total hours	15
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TEACHING TOOLS USED
N1. Lecture – traditional method. N2. Consultations. N3. The unassisted student work: homework, preparation for the test.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01-PEU_W04 PEU_U01-PEU_U04 PEU_K01-PEU_K02	Final test
F2	PEU_U01-PEU_U04 PEU_K01-PEU_K02	Homework
P – A student who has earned at least 50% of all possible points (obtained both from the final test and homework assignments) can receive a positive mark. However, the maximum number of homework points earned by a student cannot exceed 15% of the total number of points possible from the final test.		

PRIMARY AND SECONDARY LITERATURE
<u>PRIMARY LITERATURE:</u>
<p>[1] J. Koronacki, J. Mielniczuk, Statystyka dla studentów kierunków technicznych i przyrodniczych, WNT, Warszawa 2004.</p> <p>[2] A. D. Aczel, Statystyka w zarządzaniu, PWN, Warszawa 2007.</p> <p>[3] L. Gajek, M. Kałużka, Wnioskowanie statystyczne. Modele i metody, WNT, Warszawa 2004.</p> <p>[4] W. Klonecki, Statystyka dla inżynierów, PWN, Warszawa 1999.</p> <p>[5] W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, 2002.</p>
<u>SECONDARY LITERATURE:</u>
<p>[1] H. Jasiulewicz, W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2001.</p> <p>[2] W. Krysicki, J. Bartos, W. Dyczka, K. Królikowska, M. Wasilewski, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, Cz. I-II, PWN, Warszawa 2007.</p> <p>[3] H. Kaasyk-Rokicka, Statystyka. Zbiór zadań. PWE, Warszawa 2011.</p> <p>[4] T. Inglot, T. Ledwina, Z. Ławniczak, Materiały do ćwiczeń z rachunku prawdopodobieństwa i statystyki matematycznej, Wydawnictwo Politechniki Wrocławskiej, Wrocław 1984.</p> <p>[5] M. Sobczyk, Statystyka. PWN, Warszawa 2007.</p> <p>[6] K. Black, Business Statistics: For Contemporary Decision Making, Wiley, 5th edition, 2007.</p>

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Adam Zagdański, Adam.Zagdanski@pwr.edu.pl

Faculty of Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish	Multimedialne systemy mobilne				
Name of subject in English	Mobile and multimedia systems				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code:	W04IST-SM4035G				
Group of courses:	YES				

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	
Number of hours of total student workload (CNPS)	50			50	
Form of crediting	crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	crediting with grade*	Examination / crediting with grade*
For group of courses mark final course with (X)	X				
Number of ECTS points	2			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	1,3			1,5	

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Fundamentals of programming in ANDROID or APPLE iOS environment.
2. Fundamentals of mobile application interface design.
3. The basics of using Autodesk 3ds MAX or BLENDER.

SUBJECT OBJECTIVES
C1. Acquire the ability to design and program multimedia mobile systems using a variety of authoring environments.
C2. Acquire the ability to evaluate the time and cost of building a multimedia mobile system.
C3. Master the basics of marketing and operating mobile multimedia systems.

SUBJECT LEARNING OUTCOMES
In terms of knowledge:
PEU_W01 Knows and understands the characteristics of mobile multimedia applications.

PEU_W02 Has knowledge of the design and programming of mobile multimedia applications.

From the scope of skills:

PEU_U01 Can define a set of potential functional requirements of a mobile multimedia application, can collaborate with a potential user of a mobile multimedia application to define these requirements.

PEU_U02 Is able to design a mobile multimedia application taking into account the functional requirements and specifics of the potential users

PEU_U03 Can program a mobile multimedia application.

In terms of social competence:

PROGRAM CONTENT

Lectures		Number of hours
Lec 1	Organizational lecture. Presentation of the lecture idea. Basic concepts and definitions.	2
Lec2	Compression of media data. Compression formats used in mobile systems. Codecs. Surround sound systems - implementation in mobile devices.	2
Lec 3	Sources of multimedia acquisition. Internet multimedia collections. Commercial collections of multimedia elements. Recording studios, film studios, multimedia studios, graphic design studios.	2
Lec 4	How to reconcile design and functionality of mobile application interface ? Designing interface prototypes (mockap). Overview of programs for constructing interface prototypes.	2
Les 5	Mobile application interfaces. Interactive product presentation. Guidelines for constructing interfaces. Non-verbal guidelines. Recommendations - Material Design (Android) and Human User Interface (Apple)	2
Les 6	Basics of 2D and 3D computer animation. Discussion of basic animation mechanisms. Timeline. Modeling, texturing, setting up lights, camera selection, rendering, publishing animation. Interactive photorealistic visualization.	4
Lec 7	A complete, detailed account of the design and programming of a mobile, multimedia m-commers category application with elements of interactive 3d product visualisation.	4

Lec 8	Overview of libraries supporting mobile application programming on Android and Apple iOS platforms. Native programming in Kotlin (Android) and SWIFT UI (Apple) environments. Frameworks - overview and constructive analysis and comparison.	4
Lec 9	Mobile games. UNITY. Game engine. Constructing worlds, programming character behavior, setting up lights and camera, simulating physical phenomena, sound and its integration into the game action. Overview of popular games for mobile devices.	2
Lec 10	Review of selected multimedia applications. Modern TV - a high-speed graphics station, with its own operating system. Soundbar - a specialized sound processor. Built-in cameras in smartphones. 3D printers. Drones, as a transporter of specialized cameras.	2
Lec 11	Augmented reality (augmented reality). Generation of virtual objects. Application in m-commerce applications for photorealistic presentation of objects, in education, in tourism. Discussion of the stages of designing and programming a mobile application with augmented reality elements.	2
Lec 11	Directions of development of computer multimedia techniques. Summary.	1
Lec 12	Test	1
	Total hours.	30
Project		Number of hours
Pr 1	Organizational classes. Presentation of the idea of project classes. Leading topic - complete application of m-commers.	2
Pr 2	Discussion of the type of products sold and how they are presented on the screen of a mobile device. Discussion of the problem of responsiveness. Design of the interface prototype (mockup). Design of the mechanism for interactive multimedia presentation of the product. Discussion of the project implementation schedule.	2
Pr 3	Design and implementation of the m-commerce application interface in Adobe XD, FIGMA or other environment that allows for mockup design.	2
Pr 4	Basics of using Autodesk 3ds MAX or BLENDER environment. Scene design, creating simple 3d models and embedding them in the scene.	4

Pr 5	Modeling of the interior (scene) in which the objects will be presented. Modeling of objects. Camera selection. Animation of the camera along the set trajectory.	4
Pr 6	Texturing of objects and scene. Selecting the type of lights. Rendering of a static scene.	2
Pr 7	Prepare a storyboard and animation parameters (number of frames per second, animation length expressed in frames, resolution). Exporting the animation as a collection of files.	4
Pr 8	Design of a mobile application that manages animation prepared in 3ds MAX environment in KOTLIN or SWIFT language. Implementation of interaction mechanisms.	4
Pr 9	Adding interaction to selected objects - e.g. object rotation, color change, door opening, etc. Adding sound and ZOOM effect.	4
Pr 10	Showcase of project	2
	Total hours	30

TEACHING TOOLS USED

N1. Multimedia presentations.

N2. The practical introduction to the use of the software developer.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
F1 - Lecture	PEU_W01, PEU_W02	An essay on the indicated topic
F2 - Project	PEU_U01, PEU_U02, PEU_U03	The final grade for the project takes into account the partial grades obtained for the successive stages of the project.
F3 - Lecture		Test

P – concluding evaluation of the subject is equal to:

$$P = 0,4*(F1+F3) + F2*0,6$$

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Unity 2018 Game Development in 24 Hours, Mike Geig, Person Education, 2018
- [2] Designing Interfaces: Patterns for Effective Interaction Design, Jenifer Tidwell, Charlie Brewer, AynneValencia,
- [3] Augmented Reality with Unity AR Foudation (ebook), Jonathan Linowe, Pact Publishing, 2021
- [4] SwiftUI Cookbook – Second Edition (ebook), Giordano Scalzo, Edgar Nzokwe, Pact Publishing, 2020.
- [5] Android UI Development with Jet[ack Compose (ebook), Thomas Kunne, Pact Publishing, 2020.
- [6] Autodesk 3ds Max 2022: A Comprehensive Guide, 22nd Edition, Prof. Sham Tickoo Purdue Univ, CADCIM Technologies, 2021

SECONDARY LITERATURE:

- [1] [Jakob Nielsen, Raluca Budi: Funkcjonalność aplikacji mobilnych. Nowoczesne standardy UX i UI (tyt. org.: Mobile Usability; tł. Marta Najman), Helion, 2013
- [2] Jason Tyler, Will Verduzco : Hakowanie Androida : kompletny przewodnik XDA Developers po rootowaniu, ROM-ach i kompozycjach (tyt. oryg.:XDA Developers' Android Hacker's Toolkit : the complete guide to rooting, ROMs and theming; tł. Tomasz Walczak) , Helion, 2013
- [3] API Guides for Android Developers, <http://developer.android.com/> [odczyt z dn.: 2017.07.01]

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Stanisław Saganowski, stanislaw.saganowski@pwr.edu.pl

FACULTY of Information and Communication Technology

SUBJECT CARD

Name of subject in Polish: Monographic project
Name of subject in English: Projekt monograficzny
Main field of study (if applicable): Applied Computer Science
Specialization (if applicable):
Profile: academic
Level and form of studies: 2nd, full-time
Kind of subject: optional
Subject code:
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				30	
Number of hours of total student workload (CNPS)				50	
Form of crediting	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*
For group of courses mark final course with (X)					
Number of ECTS points				2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)				1,5	

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

None.

I am running a few minutes late; my previous meeting is running over.

SUBJECT OBJECTIVES

- C1 Acquiring the ability to obtain information, including in English, on important issues related to the subject of the diploma thesis.
 C2 Implementation of a review of literature/works related to the diploma thesis topic.
 C3 Defining the purpose and scope of the diploma thesis.

SUBJECT EDUCATIONAL EFFECTS

relating to skills:

PEU_U01 – Student can search for information from various sources, analyze it, synthesize it and document it

PEU_U02 – Student can critically analyze existing solutions and propose improvements if necessary

PEU_U03 – Student can plan and implement the process of self-education, determine possible directions of further learning

relating to social competences:

PEU_K01 – Student is ready to evaluate the received content critically and is aware of the importance of knowledge in solving problems.		
Project		Number of hours
Pr1	Defining the scope of work to be carried out in the semester.	2
Pr2	Searching for information from various sources and its initial assessment in terms of its adequacy to the subject of the diploma thesis.	6
Pr3	Literature analysis includes a critical evaluation of existing solutions and a proposal for improvement.	10
Pr4	Preparation of documentation – critical review of the literature, clarification of the purpose and scope of the work.	10
Pr5	Documentation overview.	2
	Total hours	30
TEACHING TOOLS USED		
N1. Own work – literature studies.		
N2. Examples of literature reviews.		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
F1	PEU_U01, PEU_U02, PEU_U03, PEU_K01	Progress in the project – grades based on individual interviews with students
F2	PEU_U01, PEU_U02	Evaluation of project documentation

P – resultant of F1 and F1 formative grades

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Barbara Kitchenham, Lech Madeyski, and David Budgen (2023), “SEGRESS: Software Engineering Guidelines for REporting Secondary Studies”, IEEE Transactions on Software Engineering, 49(3):1273–1298. URL: <https://doi.org/10.1109/TSE.2022.3174092>

[2] Pat Cryer, The Research Student’s Guide to Success, Maidenhead: McGraw-Hill Education, 2006

SECONDARY LITERATURE:

[1] Current literature directly related to the topic selected according to the teacher's instructions and found by the student.

[2] David Evans, Paul Gruba, Justin Zobel, How to Write a Better Thesis, Springer International Publishing, 2014, url: [\(99+\) David Evans, Paul Gruba, Justin Zobel \(auth.\)-How to Write a Better Thesis-Springer International Publishing \(2014\) | GERARDO VASQUEZ GONZALEZ - Academia.edu](#)

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Lech Madeyski, lech.madeyski@pwr.edu.pl

FACULTY Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish	Praca dyplomowa				
Name of subject in English	Master Thesis				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	W04IST-SM4040D				
Group of courses	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				12	
Number of hours of total student workload (CNPS)				450	
Form of crediting (Examination / crediting with grade)				crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points				18	
including number of ECTS points for practical classes (P)				18	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)				0,5	

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Knowledge and competence in applied research methods and tools in the discipline of technical informatics and telecommunication.

SUBJECT OBJECTIVES
C1 Implementation and documentation of the research conducted in the thesis.
SUBJECT EDUCATIONAL EFFECTS
relating to knowledge:
relating to skills:
PEU_U01 - Is able to find information from various sources, analyze, synthesize and document it
PEU_U02 - Is able to critically analyze existing solutions and, if necessary, propose their improvements
PEU_U03 - Can plan and implement the process of self-education, identify possible directions for further learning
relating to social competences:
PEU_K01 - Can think and act creatively and entrepreneurially
PROGRAMME CONTENT

Project		Number of hours
Pr 1	Clarification of the topic of the work, its purpose and scope. Organisational arrangements. Agreeing on a plan and schedule of tasks.	1
Pr 2	Formulating the research problem. Making hypotheses.	2
P3 3	Planning and preparation of the experiment. Selection of research methods to verify hypotheses.	2
Pr 4	Implementation of the research according to the schedule. Documenting the research and the results obtained	2
Pr 5	Discussion of results. Quantitative and qualitative analysis. Verification of hypotheses. Formulation of conclusions. Preparation of a comprehensive research report.	2
Pr 6	Drafting the text of the Master's thesis	2
Pr 7	Summary. Evaluation of the work	1
	Total hours	12
TEACHING TOOLS USED		
N1. Students' own work - participation in the implementation of student's research work. N2. Examples of theses, including those containing original results of a cognitive nature. N3. Consultation for students.		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
P	PEU_U01...PEU_U03 PEU_K01	Evaluation of the presented solution, the way in which the research was carried out, the ability to reliably assess the results obtained, the formulation of conclusions, the ability to prepare documentation and the writing of the thesis (scope, consistency, readability, cleanliness of language timeliness, originality of research/improvements).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Current literature directly relevant to the topic being pursued.
- [2] Thesis Writing for Master's and Ph.D Program, Parija, Springer 2018.

SECONDARY LITERATURE:

- [1] Requirements for a master's thesis at the Faculty and Technical University of Wrocław.
- [2] Maciej Sydor: Wskazówki dla piszących prace dyplomowe. Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu, Poznań 2014.
- [3] Siuda P., Wasylczyk P., Publikacje naukowe. Praktyczny poradnik dla studentów, doktorantów i nie tylko. PWN, Warszawa 2018.

[4] Komitet Etyki w Nauce Polskiej Akademii Nauk, Dobre obyczaje w nauce – zbiór zasad i wytycznych. <http://www.ken.pan.pl/images/stories/pliki/pdf/down.pdf> (6.02.2009).

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Dariusz Król dariusz.krol@pwr.edu.pl

FACULTY of Information and Communication Technology	
SUBJECT CARD	
Name of subject in Polish:	Fizyczne podstawy współczesnej informatyki
Name of subject in English:	Physics of Contemporary Computer Science
Main field of study (if applicable):	Applied Computer Science
Specialization (if applicable):	Computer Engineering
Profile:	academic
Level and form of studies:	2nd level, full-time
Kind of subject:	obligatory
Subject code:	W04IST-SM4015W
Group of courses	NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				
Number of hours of total student workload (CNPS)	25				
Form of crediting (Examination / crediting with grade)	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	1				
including number of ECTS points for practical classes (P)					
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	0,7				

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. None

SUBJECT OBJECTIVES

- C1 Educating the abilities of understanding the principles of physics of Computer Science.
 C2 Educating the competences in the scope of understanding physical nature of information and thermodynamics of information media.
 C3 Acquiring the knowledge of physics of the telecommunication media, principles of physics of storages, and physical nature of computing machines.
 C4 Providing knowledge of contemporary trends in the scope of new data security solutions, algebraic and quantum cryptography and security with use group, field and character theory.
 C5 Providing the knowledge of the nature of quantum information.
 C6 Acquiring the knowledge of physical nature of bioinformatics.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

- PEU_W01 Student has a knowledge about of physical principles of contemporary computer science.
 PEU_W02 Student has a knowledge about the physical nature of information and thermodynamics of informational media.
 PEU_W03 Student knows physical phenomena used for creating storage devices.
 PEU_W04 Student has knowledge of quantum information and quantum information

processing.
 PEU_W05 Student has a knowledge of classical and quantum gates, quantum computers, and physical principles of bioinformatics.
 relating to skills:
 relating to social competences:

PROGRAMME CONTENT		
Lecture		Number of hours
Lec 1	Introduction. Great discoveries in physics and mathematics leading to originate of computer science.	2
Lec 2	Physical nature of information. Thermodynamics of informational media. Physics and computer software.	2
Lec 3	Modern materials. Quantum properties and quantum physics.	2
Lec 4	Quantum physics in theory and computer science applications.	2
Lec 5	Quantum information and quantum gates.	2
Lec 6	Quantum computers and quantum software.	2
Lec 7	Final test. Biophysics and bioinformatics	1
Lec 8	Final test.	2
	Total hours	15
TEACHING TOOLS USED		
N1. Multimedia presentations N2. The course Web page N3. Electronics and paper books and library references		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 - PEU_W05	Short tests, activity, final test
P = F1		

PRIMARY AND SECONDARY LITERATURE
<p><u>PRIMARY LITERATURE:</u> [1] Aaronson S.: Quantum computing since Democritus. Cambridge University Press 2013. [2]. Feynmann R.: The Feynman Lectures on Physics. Basic Books; Slp edition. 2011. [3] Pardalos P.M., Principe J.C.: Biocomputing. Springer 2002.</p> <p><u>SECONDARY LITERATURE:</u> [1] Rohrkemper R.: Effective Topologies for Computation in Cortex-like Networks: Tools for evaluating computational richness and robustness/ LAP LAMBERT Academic Publishing 2012. [2] Yanofsky N.S.: Quantum Computing for Computer Scientists. Cambridge University Press 2008. [3] Stakhov A.: Mathematics of Harmony: From Euclid to Contemporary Mathematics and Computer Science. World Scientific Publishing 2009. [4] Selected science papers. [5] ACM Self Assessment Procedure XXII: Ethics, CACM, vol 33, no 11, November 1990. [6] Kock K.: A Case of Academic Plagiarism. Comm of the ACM, vol 42, no 7, July 1999. [7] Simon H.: Understanding the natural and the artificial worlds, The Sciences of the Artificial, pp 3-29, 3rd printing, 1984.</p>

[8] Smith A.J.: The task of the Referee, IEEE Computer, vol 23, no 4, April 1990

More reading material will be added during the course.

[9] Sandewall E.: *The Methodology of Design Iteration for Systems-oriented Research in Computer Science.*

<http://www.ida.liu.se/ext/caisor/pm-archive/morador/001/index.html>

[10] Selected scientific papers

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Arkadiusz Liber, arkadiusz.liber@pwr.edu.pl

FACULTY of Information and Communication Technology

SUBJECT CARD

Name of subject in Polish: Zarządzanie projektem
Name of subject in English: Project Management
Main field of study (if applicable): Applied Computer Science
Specialization (if applicable): Computer Engineering
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code: W04IST-SM4034G
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	15
Number of hours of total student workload (CNPS)	50			50	25
Form of crediting (Examination / crediting with grade)					
For group of courses mark (X) final course	X				
Number of ECTS points	2			2	1
including number of ECTS points for practical classes (P)				2	1
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,2			1,4	0,7

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Completing courses in data base and/or information system design
2. Completing courses in programming web and/or mobile systems
3. Completing courses in software engineering

SUBJECT OBJECTIVES

- C1 Familiarize students with modern methods for software project management.
 C2 Acquiring knowledge of risk management and project quality assurance.
 C3 Acquiring knowledge of team management and communication in IT projects.
 C4 Gaining skills in work breakdown, planning, scheduling, cost estimation, and monitoring in IT projects.
 C5 Gaining skills in utilizing software tools supporting IT project management.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

- PEU_W01 student knows and understands the basic processes of an IT project life cycle
 PEU_W02 student has a systematised knowledge concerning methods for software project management.
 PEU_W02 student knows and understands the notions of risk and quality in IT project.
 PEU_W03 student has a well-ordered and theoretically supported knowledge concerning team management and communication in IT project.

relating to skills:

PEU_U01 student can select and apply management methods appropriate for different phases of information system development.

PEU_U02 student is able to carry out work breakdown, allocate resources, workout schedule, estimate costs, monitor and report IT project accomplishment.

PEU_U03 student is able to select software supporting tools for software project management.

PEU_U04 student is able to manage a team accomplishing IT project.

relating to social competences:

PEU_K01 student is ready to play a role in IT project management.

PROGRAMME CONTENT

Lecture		Number of hours
Lec 1	Introduction. Basic notions. Methodologies for IT project management	2
Lec 2	Feasibility study	2
Lec 3	Requirement management	2
Lec 4	Project planning and scheduling	2
Lec 5	IT project control and monitoring	2
Lec 6	Risk management in IT project	2
Lec 7	Project size estimation	2
Lec 8	Project cost estimation	2
Lec 9	Project quality management	2
Lec 10	Project team management	2
Lec 11	Communication in project team	2
Lec 12	Soft skills of project team members	2
Lec 13	IT service management	2
Lec 14	Psychophysiological methods of user experience (UX) research	2
Lec 15	Final test	2
	Total hours	30
Project		Number of hours
Proj 1	Introduction. Division into project teams. Selecting IT projects to be managed.	2
Proj 2-3	Working out feasibility study.	4
Proj 4-5	Working out requirement specification.	4
Proj 6	Working out Work Breakdown Structure.	2
Proj 7	Planning and scheduling: Gantt and PERT chart construction.	2
Proj 8	Workload optimization.	2
Proj 9	Project duration shortening.	2
Proj 10-13	Project monitoring: earned value method. Project accomplishment simulation.	8
Proj 14	Project reporting, assessment of techniques used and supporting	2

	software.	
Proj 15	Working out final report.	2
	Total hours	30
Seminar		Number of hours
Semin 1	Introduction. Allocation of seminar topics.	1
Semin 2	Feasibility study problems and techniques.	1
Semin 3	Prototyping problems and techniques.	1
Semin 4	Requirements elicitation problems and techniques.	1
Semin 5	Requirements management problems and techniques.	1
Semin 6	Work breakdown structure problems and techniques.	1
Semin 7	Planning and scheduling problems and techniques.	1
Semin 8	Workload optimization problems and techniques.	1
Semin 9	Project duration shortening problems and techniques.	1
Semin 10	Project monitoring problems and techniques.	1
Semin 11	Earned value method problems and techniques.	1
Semin 12	Project quality management problems and techniques – quality gates.	1
Semin 13	Project quality management problems and techniques – testing.	1
Semin 14	Project reporting problems and techniques.	1
Semin 15	Final evaluation.	1
	Total hours	15

TEACHING TOOLS USED

- N1. Lecture (delivered with slides)
- N2. Project (using supporting software tools)
- N3. Consultations
- N4. Student's own work
- N5. Seminar (researching a topic)

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
P1 - lecture	PEU_W01 - W03	Final test
F1 - project	PEU_U01 - U04	Assessment of tasks accomplished during project and interim reports
P2 - project	PEU_U01 - U04	Presentation of completed project and final report
P3 - seminar	PEU_U01 -U04	Presentation of elaborated topic
<p>P - the final evaluation shall take into account the test result, the project and seminar evaluation</p> $P = 0,4*P1 + 0,4*P2 + 0,2*P3$		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK Guide) 6th Edition 2017 and 7th Edition 2021
- [2] Kathy Schwalbe: Information Technology Project Management, 9th Edition. Cengage Learning 2018
- [3] Sommerville Ian: Software Engineering (10th Edition). Pearson India 2018
- [4] Roger Pressman, Bruce Maxim: Software Engineering: A Practitioner's Approach, McGraw-Hill (9th Edition) 2019

SECONDARY LITERATURE:

- [1] Cindy Lewis, Carl Chatfield, Timothy Johnson: Microsoft Project 2019 Step by Step. Microsoft Press (1st edition) 2019
- [2] Srikanth Shirodkar: Learning Microsoft Project 2019. Packt Publishing 2020
- [3] P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014; www.swebok.org
- [4] Joseph Phillips: Project Management with compTIA Project+: On Track from Start to Finish, McGraw Hill (4th Edition) 2017

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Piotr Zabawa, piotr.zabawa@pwr.edu.pl

FACULTY of INFORMATION and COMMUNICATION TECHNOLOGY					
SUBJECT CARD					
Name of subject in Polish:	Najnowsze Osiągnięcia w Informatyce				
Name of subject in English:	Recent Advances in Computer Science				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Science				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code:	W04IST-SM4035S				
Group of courses:	NO				

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					30
Number of hours of total student workload (CNPS)					50
Form of crediting	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*
For group of courses mark (X) final course					
Number of ECTS points					2
including number of ECTS points for practical classes (P)					2
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					1,3

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of IT systems.
2. Basic knowledge of the construction and operation of computer networks.
3. Basic skills for searching, systematizing, and presenting knowledge.

SUBJECT OBJECTIVES

- C1 Providing students with basic skills related to preparation and presentation of scientific texts, beginning from the choice of topic, selection of tasks to be performed, use of literature to the interpretation of the results.
- C2 Preparing students to make a short presentation.
- C3 Stimulate students to follow the latest trends in the development of information and telecommunication technologies.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Knowledge of recent advances in computer science and telecommunication

relating to skills:

PEU_U01 Ability to analyze scientific and professional texts, beginning from the choice of topic, selection of retrieved information in the Internet, use of traditional literature, and to interpret the presented ideas, as well as to prepare multimedia presentation.

PEU_U02 Ability to present some specific topics and interest others with them.

PEU_U03 Ability to conduct a scientific and professional debate.

relating to social competences:

PEU_K01 Consciousness of the significance of new advances in the development of information and telecommunication technologies.

Seminar		Number of hours
Semin 1	Introduction. Rules related to student presentations. Review of basic skills related to preparation and presentation of scientific texts by students, beginning from the retrieval and choice of information in the Internet, use of traditional literature, selection of tasks to be performed, and also preparation of a short report. Determining the schedule of student presentations. The topics listed below can be adapted to current development trends.	2
Semin 2	Human-computer interfaces: intelligent interfaces, brain-computer interface, natural language question answering, chatbots, virtual assistants, voice interaction, VR and AR.	2
Semin 3	Human-computer interfaces: virtual assistants, voice interaction, VR and AR.	2
Semin 4	Speech-to-speech automatic translation. Deep learning methods vs. statistical methods of automatic translations.	2
Semin 5	Intelligent crimes: deepfakes, driverless vehicles as a weapon; tailored phishing, disrupting AI-controlled systems, large-scale blackmail.	2
Semin 6	Intelligent crimes: AI-authored fake news, burglar bots.	2
Semin 7	BlockChain: principles, typology, application area.	2
Semin 8	Security: security in the Web, AI-assisted stalking on social media.	2
Semin 9	Security: forgery of content such as art or music.	2
Semin 10	Polish or other computer systems in medicine.	2
Semin 11	TeleMedicine: security and personal data protection.	2
Semin 12	Autonomous intelligent vehicles: definitions and technologies, levels and classifications, incidents, moral and legal issues.	2
Semin 13	ADDW (Advanced Driver Distraction Warning) systems.	2
Semin 14	Quantum computer science: quantum technology, photonic integrated circuit (PIC), 1Qbit, D-Wave Systems.	2
Semin 15	Hamiltonian simulation, Shor's algorithm, Grover's algorithm – quantum search algorithms.	2
	Total hours	30

TEACHING TOOLS USED

- N1. Books and handbooks. Literature related to the scope of the realized topic selected by a student as well as recommended by the teacher.
- N2. Online materials in the Web.
- N3. Documents available for students in a faculty e-learning system.
- N4. Digital projector and analog pointer for presentations at the seminar.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 PEU_U01 PEU_U02 PEU_U03 PEU_K01	The quality of prepared final presentations and reports assessment
F2	PEU_W01 PEU_U01 PEU_U02 PEU_U03 PEU_K01	Evaluation of active participation in discussions
P = (F1 + F2)/2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] M. Campbell-Kelly, et al.: Computer: A history of the Information Machine. Taylor & Francis, 2023.
- [2] The Gartner Top 10 Strategic Technology Trends for 2022
<https://www.gartner.com/en/information-technology/insights/top-technology-trends>
- [3] B. Gupta, G.M. Pérez, D.P. Agrawal, D. Gupta (reds.): Handbook of Computer Networks and Cyber Security : Principles and Paradigms. Cham : Springer Nature Switzerland AG, 2020.
- [4] A.R. Hurson: Advances in Computers, Academic Press 2021
- [5] K. Sandhu: Handbook of Research on Advancing Cybersecurity for Digital Transformation. IGI Global 2021

SECONDARY LITERATURE:

- [1] The 25 Biggest Failed Google Products,
<https://www.failory.com/blog/google-failed-products>
- [2] Top Computer Science Trends,
<https://www.create-learn.us/blog/top-computer-science-trends/>
- [3] M. Frot: 5 Trends in Computer Science Research
<https://www.topuniversities.com/courses/computer-science-information-systems/5-trends-computer-science-research>

[4] N. Duggal: Top 18 New Technology Trends,
<https://www.simplilearn.com/top-technology-trends-and-jobs-article>

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Kazimierz Choroś, Ph.D., D.Sc., prof.
kazimierz.choros@pwr.edu.pl

FACULTY of Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish:	Metodologia badań				
Name of subject in English:	Research Methodology				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	W04IST-SM4030G				
Group of courses	YES				

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		15
Number of hours of total student workload (CNPS)	25		50		25
Form of crediting (Examination / crediting with grade)	crediting with grade		crediting with grade		crediting with grade
For group of courses mark (X) final course	X				
Number of ECTS points	1		2		1
including number of ECTS points for practical classes (P)			2		1
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,2		1,3		0,7

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

- C1 Providing the knowledge of definitions, characteristics and theories of research. Main components in research processes. Types of research. Research in computer science. Criteria for selecting problems for research. Analyzing and formulating the research problem. Literature collecting and review. Definition of the science objectives. Types of research methods. Phases in research process. Methods of measurement.
- C2 Educating the abilities of organization of research, research report. Creation of science papers and science presentations.
- C3 Acquiring competence in applying new research methods to contemporary computer engineering.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Student has a widened and deepened knowledge about definitions, characteristics and theories of research. He has a knowledge about analyzing and formulating the research problem, fundamental methods of analysis, phases in research process, data collection and measurements, writing the research proposals, reports, papers and preparation of science presentations.

PEU_W02 Student knows methodology of contemporary research in computer science and software engineering.

relating to skills:
 PEU_U01 Student can understand the research process and contemporary research methods. He can apply knowledge related to providing science research, collecting and analysing data, preparing science report, science paper and science presentation.
 PEU_U02 Student can identify and describe science problems and select appropriate methods to conduct the correct research process.
 relating to social competences:
 PEU_K01 Student has competence for solving ethical and social problems related to contemporary research in computer science.
 PEU_K02 Student can cooperate and research in a group.

PROGRAMME CONTENT		
Lecture		Number of hours
Lec 1	Introduction to philosophy of science and research methodology. Short history notes.	2
Lec 2	Introduction to research. Definitions, characteristics and theories of research. Main components in research processes. Types of research. Research in computer science.	2
Lec 3	Problem identification and topic selection. Literature collecting and review. Sources of information. Selecting, indexing and verification.	2
Lec 4	analyzing and formulating the research problem statement. Exploring and defining research objectives.	2
Lec 5	Research Methods. Types of methods and their selection. Plans and documentation. Formulation of research hypothesis.	2
Lec 6	Methods of measurement. Single and multi-item measures. Indexing and scaling. The special role of measurement in research. Strategies. Accuracy and precision of measurements.	2
Lec 7	Models in scientific research. Model selection and verification.	2
Lec 8	Data in research. Types of data. Data collection, data preparation, data processing, calculations and documentation.	2
Lec 9	Statistical methods. Statistical calculations and hypotheses. Limitations of statistical methods. Verification of research hypothesis.	2
Lec 10	Analytical methods. Mathematical models and their solution.	2
Lec 11	Mathematical models and real data in scientific research.	2
Lec 12	Software in scientific research. Reliability and accuracy of calculations.	2
Lec 13	Reports and publications. Types. Preparation of publications. Academic style of writing papers. Presentations of research results.	2
Lec 14	Final test	2
Lec 15	Applying new research methods to contemporary computer engineering. Ethics of scientific research.	2
	Total hours	30
Seminar		Number of hours
Semin 1	History and philosophy of research methodology	5
Semin 2	Research methodology design and tools.	6
Semin 3	Research reports and presentations.	4
	Total hours	15

Laboratory		Number of hours
Lab 1	Research data. Acquisition, preparation, verification.	6
Lab 2	Data processing and calculations in research.	12
Lab 3	Presentation of data in research.	6
Lab 4	Verification of research hypotheses.	6
	Total hours	30

TEACHING TOOLS USED

N1. Multimedia presentations
N2. The course Web page
N3. Electronics and paper books and library references

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU-W01, PEU-W02, PEU- U01, PEU-U02, PEU-K01, PEU-K02	Partial tasks, quizzes, activity. Final test
F2	PEU-W01, PEU-W02, PEU- U01, PEU-U02, PEU-K01, PEU-K02	The completion of laboratory exercises.
F3	PEU-W01, PEU-W02, PEU- U01, PEU-U02, PEU-K01, PEU-K02	The completion of seminar presentations and seminar activity.

$$P = F1 + F2 + F3$$

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Creswell J.W.: Resarch Design: Qualitative, Quantitative, and Mixed Approaches. Sage Publications 2008.
[2] Packer M.: The Science of Qualitative Research. Cambridge University Press 2010.
[3] Kuipers T.A.F.: General Philosophy of Science: Focal Issues. Elseviere 2007.
[4] Alcorn V. F.: Fundamentals of Research Methodology. Omnia Science 2020.

SECONDARY LITERATURE:

- [1] Collins H., Pinch T.: The Golem. What You Should Know about Science. Cambridge University Press 2003.
[2] Chalmers A.F.: What is this thing called Science?, Latest ed., Open University Press, (Previous edition can be used if the course leader is informed before the examination.)
[3] Denning P.J., et al.: Computing as a Discipline, Communications of the ACM, vol 12, no 1, Jan 1989. [4] Hägglund S. (ed.): Selected term papers on Methodology of Research in Computer Science, Vol II, Lecture Notes, IDA, LiTH, 1997
[5] ACM Self Assessment Procedure XXII: Ethics, CACM, vol 33, no 11, November 1990.
[6] Kock K.: A Case of Academic Plagiarism. Comm of the ACM, vol 42, no 7, July 1999.
[7] Simon H.: Understanding the natural and the artificial worlds, The Sciences of the Artificial, pp 3-29, 3rd printing, 1984.
[8] Smith A.J.: The task of the Referee, IEEE Computer, vol 23, no 4, April 1990

More reading material will be added during the course.

[9] Sandewall E.: *The Methodology of Design Iteration for Systems-oriented Research in Computer Science.*
<http://www.ida.liu.se/ext/caisor/pm-archive/morador/001/index.html>

[10] Selected scientific papers

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Arkadiusz Liber, arkadiusz.liber@pwr.edu.pl

FACULTY of Information and Communication Technology					
SUBJECT CARD					
Name of subject in Polish:	Projektowanie Systemów Informatycznych				
Name of subject in English:	Software System Development				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code:	W04IST-SM4032G				
Group of courses:	YES				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	15
Number of hours of total student workload (CNPS)	75			50	25
Form of crediting (Examination / crediting with grade)	Examination	Examination / crediting with grade*	Examination / crediting with grade*	crediting with grade*	crediting with grade*
For group of courses mark (X) final course	X				
Number of ECTS points	3			2	1
including number of ECTS points for practical classes (P)	0			2	1
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1.4			1.5	0,7

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. A student has fundamental knowledge from software engineering: basic processes, life-cycle models, modelling, and specification languages.
2. A student knows any object-oriented programming language.
3. A student knows how to design, create, and use relational database.

SUBJECT OBJECTIVES

- C1. To familiarize students with modern software development processes
- C2. To allow students to gain practical experience from application of a selected process (resulting with at least a minimal set of documents) to the development of a software system
- C3. To develop students' skills that will enable them to assess the quality of a software product at early stages of development

SUBJECT LEARNING OUTCOMES

relating to knowledge:

- PEU_W01 A student knows different models used during software system development and understands the role of modeling
- PEU_W02 A student knows typical processes (phases) of software development, their work products, and relationships among them

PEU_W03 A student knows methods used for quality assessment of software projects (and particular work products)

relating to skills:

PEU_U01 A student designs an architecture of distributed software system using appropriate languages and tools according to the selected development process

PEU_U02 A student implements a software system in accordance to the project

PEU_U03 A student defines tasks aiming at realization of specific engineering problems, and estimates their duration

PEU_U04 Is able to search for information from different sources, is able to its critical analysis, synthesis and creative interpretation and presentation using information and communication techniques

PEU_U05 Is able to communicate on specialized topics with different audiences

PEU_U06 Knows how to conduct a debate

PROGRAM CONTENT

Lectures		Number of hours
Lec 1	Introduction	2
Lec 2	Project goals and objectives	1
Lec 3	Stakeholders	1
Lec 4	Information system domain	2
Lec 5	Scope and context of the project	2
Lec 6	Requirements management	6
Lec 7	Project risk management	4
Lec 8	Project time management	3
Lec 9	Project costs estimation	2
Lec 10	Overview of managerial activities	2
Lec 11	The Unified Process	2
Lec 12	Business process modelling	3
	Total hours	30
Project		Number of hours
Proj 1	Inception phase	2
Proj 2	Elaboration phase – Requirements and analysis	4
Proj 3	Elaboration phase – Design	8
Proj 4	Elaboration phase – Implementation and tests	14
Proj 5	Final grading	2
	Total hours	30
Seminar		Number of hours
Sem 1	Introduction, assignment presentation topics	1
Sem 2	Presentation of topics by students	13
Sem 3	Final grading	1
	Total hours	15

TEACHING TOOLS USED

- N1. Informative lecture supported by multimedia presentations
 N2. Examples of documents or templates
 N3. CASE tool, IDE used for programming and testing
 N4. E-learning system used for materials publication

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Learning outcomes number	Way of evaluating learning outcomes achievement
F1 - lecture	PEU_W01, PEU_W02, PEU_W03	Test. The grade calculated on the base of sum of points: $F1 = \frac{\text{points scored on the test}}{\text{maximum number of points on the test}}$
F2 - project	PEU_U01, PEU_U02, PEU_U03	A grade proposed to a student taking into account the quality of the software product and all intermediate documents; the engagement of the person in software development (the number of tasks, their accuracy, etc.) $F2 = \frac{\text{points scored on the project}}{\text{maximum number of points on the project}}$
F3 - seminar	PEU_U04 PEU_U05 PEU_U06	The substantive correctness of the presentation and the legibility of the presented content are assessed, i.e. visual legibility and clarity of the oral message. $F3 = \frac{\text{points scored on the seminar presentation}}{\text{maximum number of points on the seminar presentation}}$

P – final grade condition:

if $F1 > 0.5$ and $F2 > 0.5$ and $F3 > 0.5$ then

$$P = 0.4 \cdot F1 + 0.4 \cdot F2 + 0.2 \cdot F3$$

else

$$P = 0$$

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] L. Maciaszek, B.L. Liong, Practical software engineering: a case study approach, Pearson Addison Wesley, 2005
 [2] P. Kroll, P. Kruchten, The Rational Unified Process Made Easy: A Practitioner's Guide to the RUP, Addison-Wesley Object Technology Series, 2003

SECONDARY LITERATURE:

- [1] Per Kroll, Agility and Discipline Made Easy: Practices from Open UP and RUP, Addison-Wesley Professional, 2006
 [2] OpenUP description (Eclipse project)

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Marek Krótkiewicz, marek.krotkiewicz@pwr.edu.pl

Faculty of Information and Communication Technology					
SUBJECT CARD					
Name in Polish	Projektowanie doświadczeń użytkownika				
Name in English	User Experience				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Profile:	academic				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	W04IST-SM4026G				
Group of courses	YES				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			45	
Number of hours of total student workload (CNPS)	50			100	
Form of crediting (Examination / crediting with grade)	examination			crediting with grade	
For group of courses mark (X) final course	X				
Number of ECTS points	2			4	
including number of ECTS points for practical classes (P)				4	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,3			2,1	

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of methods and techniques of data analysis
2. Designing and implementing web systems skills

SUBJECT OBJECTIVES

- C1 To get knowledge in the field of user experience design.
 C2 To acquaint with the methods of testing usability of interactive systems.
 C3 To design and implement interactive systems based on natural user interface.
 C4 To verify usability and availability of implemented interactive systems.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

- PEU_W01 student has ordered knowledge of designing and managing complex interactive systems, especially connected with user experience and interaction;
 PEU_W02 student knows methods of usability and user experience testing dedicated to various stages of the life cycle of facilities and IT systems

relating to skills:

PEU_U01	student is able to project – according to fixed specification – an information system, especially user interaction and integration with other systems; student is able to realize the project, at least in part
PEU_U02	student is able to plan and perform usability tests of user interface and user experience tests, student is able to judge existing information solutions and to propose the improvements

PROGRAMME CONTENT		
Lectures		Number of hours
Lec 1	Research area "User Experience"	2
Lec 2	Interaction Design	2
Lec 3	Interaction concept. Understanding user needs	2
Lec 4	Design, prototyping, construction	2
Lec 5	Testing and evaluation of interactions	2
Lec 6	Usability of interactive systems	2
Lec 7	Typology of usability testing methods	4
Lec 8	Optimization, project improvement	2
Lec 9	Heuristic usability study	2
Lec 10	Usability tests with users	4
Lec 11	Analyzing and reporting results	4
Lec 12	IT system personalization	2
	Total hours	30

Project		Number of hours
Proj 1	Overview of the course organization. Safety instructions.	1
Proj 2	IT project design	4
Proj 3	Implementation of IT system logic	6
Proj 4	Design and implementation of user interface	4
Proj 5	Usability tests scenario	2
Proj 6	Usability test with users	4
Proj 7	Implementation of IT system interactions	6
Proj 8	Usability test with users	4
Proj 9	IT system redesign	6
Proj 10	Heuristic usability test with users	4
Proj 11	Demonstration of the system	4
	Total hours	45

TEACHING TOOLS USED

- N1. Lecture
- N2. Project exercises in the computer laboratory
- N3. Student's own work - preparation for laboratory classes, reading topic literature
- N4. Develop reports of project
- N5. Consultations

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F – project	PEU_U01 PEU_U02	Notes for each part of project and reports
P – project	PEU_U01 PEU_U02	Average note from part notes and final test
P - lecture	PEU_W01 PEU_W02	Exam

$$P = (P - \text{project} + P - \text{lecture})/2$$

PRIMARY AND SECONDARY LITERATURE**LITERATURA PODSTAWOWA:**

- [1] Mościchowska I., Rogoś-Tuerk B.: *Badania jako Podstawa Projektowania User Experience*. Wydawnictwo Naukowe PWN, 2015.
- [2] Sharp H., Preece J., Rogers Y.: *Interaction Design: beyond human-computer interaction*. Wiley; 5th Edition 2019.
- [3] Albert W., Tullis T.: *Measuring the User Experience*. 3rd Edition, Elsevier Books 2022.
- [4] Krug S.: *Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability*. New Riders 2013.
- [5] Sikorski M., *Interakcja Człowiek-Komputer*. Wydawnictwo PJWSTK 2010.
- [6] Sobcecki J., *Rekomendacja interfejsu użytkownika w adaptacyjnych webowych systemach informacyjnych*. Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej, 2009.

LITERATURA UZUPELNIAJĄCA:

- [1] Klein L.: *Build Better Products: A Modern Approach to Building Successful User-Centered Products* 1st Edition. Rosenfeld Media, 2016.
- [2] Marcus A., Wang W. (Eds): *Design, User Experience, and Usability. Practice and Case Studies*. Springer 2019.
- [3] Ahram T. Z., Falcão Ch. S., *Advances in Usability, User Experience, Wearable and Assistive Technology*. Proceedings of AHFE 2021.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Bernadetta Maleszka, bernadetta.maleszka@pwr.edu.pl

FACULTY of Information and Communication Technology					
SUBJECT CARD					
Name in Polish: :	Projektowanie gier komputerowych				
Name in English:	Video Game Design				
Main field of study (if applicable):	Applied Computer Science				
Specialization (if applicable):	Computer Engineering				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code:	W04IST-SM4037G				
Group of courses:	YES				

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	
Number of hours of total student workload (CNPS)	50			50	
Form of crediting	crediting with grade			crediting with grade	
For group of courses mark (X) final course	X				
Number of ECTS points	2			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BU) classes	1,3			1,5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of software design.
2. Ability to process multimedia information at basic level.
3. Practical knowledge of basic technologies in online systems.

SUBJECT OBJECTIVES

- C1. To acquaint students with basic issues of designing and developing video games.
 C2. To introduce students to the problems of domain integration in video game development workflow.
 C3. To provide practical skills of game design and prototyping using existing components and libraries.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Basic knowledge about designing and developing video games.

PEU_W02 Knowledge enabling the characterization of domain and roles in video game development process.

PEU_W03 Knowledge about tools for video game design and prototyping.

relating to skills:

PEU_U01 The use of tools for video game design and prototyping for selected platforms.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours
Lec 1	History of video games	1
Lec 2	Classification of video game genres and platforms	2
Lec 3	Process of video game development (milestones)	2
Lec 4	Roles in the process of development	2
Lec 5	Games in Virtual Reality	2
Lec 6	Mobile gaming	2
Lec 7	GDD and prototyping	2
Lec 8	Game feel	2
Lec 9	Narrative design	2
Lec 10	Gameplay design	2
Lec 11	Level design principles and best practices	2
Lec 12	Level editors	2
Lec 13	Game hacking and mods	2
Lec 14	Cooperation and MMORPG	2
Lec 15	Indie games and video game trends	2
Lec 16	Test	1
	Total hours	30

Form of classes - project		Number of hours
Proj 1	Choosing project subject.	2
Proj 2	Video game design.	4
Proj 3	Project implementation – sprint 1	4
Proj 4	Project implementation – sprint 2	4
Proj 5	Project implementation – sprint 3	4
Proj 6	Project implementation – sprint 4	4
Proj 7	Project implementation – sprint 5	4
Proj 8	Project outcome presentation	4
	Total hours	30

TEACHING TOOLS USED
N1. Multimedia presentations and videos introducing and illustrating the subjects presented in the lecture.
N2. Practical introduction to using developer software via remote desktop / projector.
N3. Online learning management system (moodle) for communication and monitoring progress of student learning.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
F1 – project	PEU_U01 PEU_W03	Progress evaluation after sprint 3 - individual conversation with project team members.
P1 – lecture	PEU_W01 PEU_W02 PEU_W03	Multiple choice test
P2 – project	PEU_U01 PEU_W03	Final mark after the presentation of a finished project.
P: the final evaluation shall take into account the test result P1 and the project evaluation P2 $P = (P1 + P2)/2$		

PRIMARY AND SECONDARY LITERATURE
<u>PRIMARY LITERATURE:</u>
[1] Rollings, Andrew & Morris, Dave: Game Architecture and Design, New Riders, ISBN-10: 0735713634, ISBN-13: 978-0735713635, 2012
[2] J. F. DiMarzio: Tworzenie gier na platformę Android 4 (tyt. org.: Practical Android 4 Games Development; tł. Szymon Pietrzak), Helion, 2013
[3] Gabe Zichermann, Christopher Cunningham : Grywalizacja. Mechanika gry na stronach WWW i w aplikacjach mobilnych (tyt. org.: Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps; tł. Rafał Jońca), Helion, 2012
<u>SECONDARY LITERATURE:</u>
[1] Adams, Ernest & Rollings, Andrew: Fundamentals of Game Design, Prentice Hall, ISBN-10: 0131687476, ISBN-13: 978-0131687479, 2006
[2] Rabin, Steve: Introduction to Game Development, Charles River Media. ISBN-10: 1584503777, ISBN-13: 978-1584503774, 2005
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