



**FIND OUT MORE**

about

**Computer Engineering  
Bachelor**

University of Business in Wrocław

**STUDENT'S GUIDE**

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# 1. WHY WSH?

## The structure and the concept of education in WSH

Currently, education is carried out at four faculties:

- first cycle (bachelor) studies with a practical profile: IT, Finance and Accounting, Tourism and Leisure, and Management
  - second degree (master's degree, including MBA) with a practical profile: Tourism and Leisure, Management
- In addition, the university offers 20 specialties at post-graduate studies and additionally, post-graduate MBA studies.

DEGREE OF STUDY	BACHELOR 3 years		MASTER 2 years	
	POLISH	ENGLISH	POLISH	ENGLISH
MANAGEMENT	✓	✓	✓	✓
TOURISM & LEISURE	✓	✓	✓	✓
FINANCE & ACCOUNTING	✓			
COMPUTER ENGINEERING	ENGINEER 3,5 YEARS ✓	ENGINEER 3,5 YEARS ✓		
LOGISTICS	ENGINEER 3,5 YEARS ✓			

The WSH education system is distinguished by:

- ✓ *High quality of education*
- ✓ *Continuously reviewed and improved program*
- ✓ *Lecturers and practitioners with extensive experience in education and business*
- ✓ *Guest lectures with international experts*
- ✓ *Individual approach to a student*
- ✓ *The practical nature of education:*
  - *Cooperation with business practitioners in the creation of the Curricula Program*
  - *30 ECTS of internships*
  - *50% of practical forms of lectures*
  - *Lectures outside the University*
  - *Study visits*
  - *Modules dedicated to Professional Career Tracking*
- ✓ *Programs based on the latest trends in the education and business market*
- ✓ *Focus on innovations and new technologies*
- ✓ *Emphasis on sustainable development*
- ✓ *Flexibility in the choice of subjects and specializations (including inter-departmental specializations)*
- ✓ *English-language based learning paths*
- ✓ *On Polish-language courses, 25% of classes in English on two levels of English proficiency*

## 2. WHY COMPUTER ENGINEERING?



### GAIN SKILLS REQUIRED ON THE MARKET AND BECOME A SPECIALIST FOR DIGITAL ERA

It is hard to imagine contemporary world without computers and WWW. Information and Communications Technology (ICT) sector has big impact on today's world and this tendency will increase in the future. "The digital economy is worth \$11.5 trillion globally, equivalent to 15.5 percent of global GDP and has grown two and a half times faster than global GDP over the past 15 years"<sup>1</sup>

1. Huawei & Oxford Economics, 2017, Digital Spillover. Measuring the true impact of the Digital Economy

### HAVE PERSPECTIVES OF BROAD CAREER CHOICES

ICT sector is a leading source of employment. Computer Engineering graduates can work as ICT specialists and managers of lower and middle management in organizations, as well as can run their own business.

### NO SPECIAL EQUIPMENT NEEDED TO START

It is not required to have expensive equipment or infrastructure to start. All what is needed is just a computer or laptop.

### JOIN INTERNATIONAL AND FRIENDLY COMMUNITY

ICT community is international as technology crosses all the barriers. However faster development requires global cooperation. ICT professionals are usually very friendly and try to help one another.

## WHY COMPUTER SCIENCE MATTERS



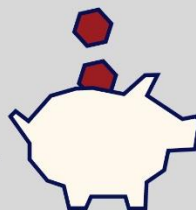
### CAREERS IN COMPUTER SCIENCE

Facts on this Flourishing Field You Can No Longer Ignore

Computer science careers are projected to grow **12 percent** through 2024.



By comparison, the average rate for all occupations is **7 percent**.



That's **more than double** the national average for all occupations, which is \$36,200.

The median annual salary for computer and information technology occupations in 2015 was **\$81,430**.



Computer science bachelor's degree holders qualify for **9.6 more jobs** than those with no degree at all.

Source: Bureau of Labor Statistics

### 3. WHY COMPUTER ENGINEERING AT WSH?

We offer bachelor's in Computer Engineering that enables you to gain knowledge and skills required to work in various positions in the IT industry. There are a number of reasons to choose us and study Computer Engineering at University of Business in Wroclaw.

1

#### Wide range of courses

We offer a business-oriented program with bachelor's degree to suit your interests and give you better career prospects. Our educational programme has been created in cooperation with business environment and thanks to that you can specialize in the most desired IT areas in the labour market.

#### Computer Engineering – concept of the study program

**COMPUTER SCIENCE**

WSH University of Business in Wroclaw

DEGREE OF STUDY: ENGINEER, 3,5 years

LANGUAGE: POLISH, ENGLISH

SPECIALIZATIONS:

- Internet Engineering
- Software Engineering
- Computer Graphics and Multimedia
- Security of Networks and Teleinformation Systems
- E - business



Students can select one out of five modern IT specializations: Security of Networks and Teleinformation Systems, Graphics and Multimedia, Internet Technologies, Software Engineering, E-business. However at least 20 declared students are required to run particular specialization.

2

#### Hands-on experience

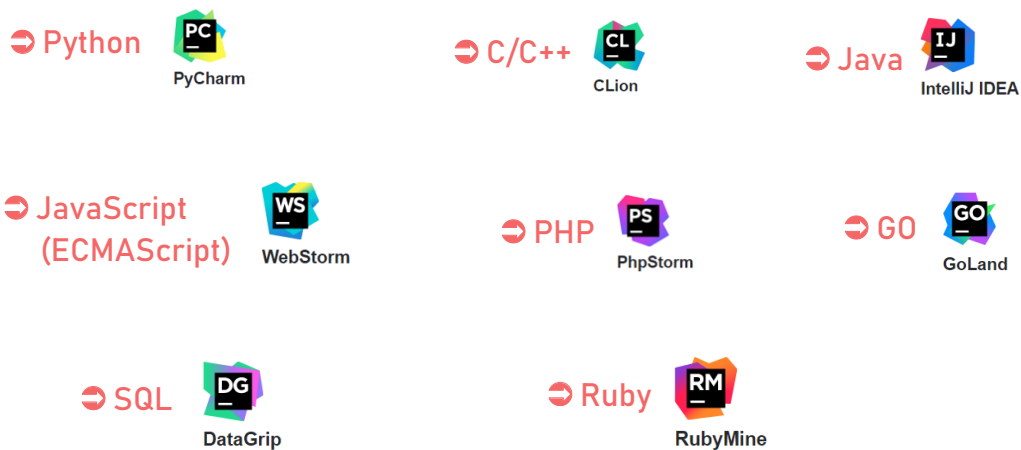
Computer Engineering studies focus on learning by practicing. Students gain access to current knowledge in the ICT field, necessary software, equipment as Arduino Kits and develop their skills facing inspiring projects. They participate in internships for 6 months, take part in study visits and meetings with ICT professionals speakers. Students are active participants rather than passive observers.

3

#### A world of opportunity

Students can get MSDNAA (Microsoft Developer Network Academic Alliance) license, G-Suite for Education license, participate in courses from Cisco and Oracle Academies and have access to software distributed by various vendors

(Oracle, JetBrains, Cypherdog, etc.). In scope of University's educational license for JetBrains software, integrated development environments for the most important modern programming languages are available, such as:



Students are able to take part in trainings and professional internships beyond the borders of the country. They also can go for the international student exchange to our partner universities around Europe. We are also finalizing cooperation agreements allowing them to study two semesters abroad to gather Double Degree in Computer Engineering studies with Centria University of Applied Sciences, Finland.

4

#### Better learning

Our courses are taught by teachers and ICT professionals with various business and industry experience. Learning environment is additionally supported by university facilities, library, multimedia equipment and educational initiatives held by university, such as conferences and workshops.

5

#### More than an education

Our students have a huge range of extra-curricular activities which help them to maximize potential and develop. For instance, they participate in Students' Clubs, organize events, create city games or take part in engaging projects.

## 4. HOW DO I STUDY?

### 4.1. PROGRAM CURRICULUM BY SEMESTER

#### PROGRAM CURRICULUM UNIVERSITY OF BUSINESS IN WROCLAW

*FIELD OF STUDY: COMPUTER ENGINEERING*

*LEVEL OF STUDY: ENGINEER*

*STUDY PROFILE: PRACTICAL*

*MODE OF STUDY: FULL TIME*

*SPECIALIZATIONS: Security of Networks and Teleinformation Systems, Graphics and Multimedia, Internet Technologies, Software Engineering, E-business*

*ACADEMIC YEAR: 2020/2021, 2021/2022, 2022/2023, 2023/2024*

THEMATIC BLOCK	Course	ECTS		assessment	number of hours													ECTS
		compulsory	optional		contact hours											student workload	total	
					lecture	e-learning	exercises	language course	project/case study	seminar	workshop (lab/project/sem)	internship	consultations	total				
<b>SEMESTER 1</b>																		
Podstawowe	Basic	Basics of management	4		E		20	12						2	34	66	100	<b>4</b>
		Mathematical Analysis	5		E	15		30						2	47	78	125	<b>5</b>
		Logic and Set Theory	3		Zo	15		30						2	47	28	75	<b>3</b>
kierunkowe	Major courses	Introduction to Programming	3		Zo	15		30						2	47	28	75	<b>3</b>
		Programming Languages and Paradigms	2		Zo	15		15						2	32	18	50	<b>2</b>
		Basics of Electronics and Electrical Engineering	3		E	30								2	32	43	75	<b>3</b>
kompetencje społeczne	Social competences	Communication	3		Zo		30					12		2	44	31	75	<b>3</b>
		ICT	3		Zo		20							2	22	53	75	<b>3</b>
		Academic savoir vivre	1		Zo		6					4		2	12	13	25	<b>1</b>

język obcy	Foreign Languages	Foreign Language (Polish, German, Spanish)		4	Zo		15		30					2	47	53	100	4	
<b>TOTAL</b>			<b>27</b>	<b>4</b>	<b>-</b>	<b>90</b>	<b>91</b>	<b>117</b>	<b>30</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>20</b>	<b>364</b>	<b>411</b>	<b>775</b>	<b>31</b>	
<b>SEMESTER 2</b>																			
język obcy	Foreign Languages	Foreign Language (Polish, German, Spanish)		4	Zo		15		30					2	47	53	100	4	
WF	Physical Education	Gym	0		Z			30						2	32	0	32	0	
Podstawowe	Basic	Physics	3		Zo	15		15				15		2	47	28	75	3	
		Basics of Digital Electronics	2		Zo	15								2	17	33	50	2	
		Linear Algebra with Analytical Geometry	4		E	15		15						2	32	68	100	4	
kierunkowe	Major courses	Database Concepts	4		E	15						30		2	47	53	100	4	
		Practical Aspects of Electronics and Electrical Engineering	2		Zo							15		2	17	33	50	2	
		Algorithms and Data Structures	3		E	15							20		2	37	38	75	3
		Building Database Applications	3		Zo	15				15			15		2	47	28	75	3
		Operating Systems	2		Zo	15							15		2	32	18	50	2
		Computer Architecture	2		Zo								15		2	17	33	50	2
		Universal Design I	2		Zo	15						19		2	36	14	50	2	
<b>TOTAL</b>			<b>25</b>	<b>4</b>	<b>-</b>	<b>105</b>	<b>15</b>	<b>60</b>	<b>30</b>	<b>15</b>	<b>0</b>	<b>125</b>	<b>0</b>	<b>22</b>	<b>372</b>	<b>385</b>	<b>757</b>	<b>31</b>	
<b>SEMESTER 3</b>																			
kompetencje społeczne	Social competences	Teamworking		4	Zo		30							2	32	68	100	4	
Podstawowe	Basic	Discrete Mathematics	4		E	15		20						2	37	63	100	4	



kierunkowe	Major courses	Object-Oriented Programming I	4		E	15						30		2	47	53	100	4	
		Basics of Computer Graphics	2		Zo	4	11						30		2	47	3	50	2
		Introduction to Software Engineering	2		Zo	15							30		2	47	3	50	2
specjalnościowe	specialization	Internship 1		15	Zo								375	20	395	0	395	15	
Praktyczne aspekty IT	Study visits	Visits to companies, participation in IT events, guest lectures			Z							16		2	18	0	18	0	
<b>TOTAL</b>			12	19	-	49	41	20	0	0	0	106	375	32	623	190	795	31	
<b>SEMESTER 4</b>																			
WF	Gym	Gym			Z			30						2	32	0	32	0	
Podstawowe	Basic	Probabilistic Methods and Statistics	4		E	15		15						2	32	68	100	4	
		Practical Aspects of Digital Electronics	2		Zo							15		2	17	33	50	2	
kierunkowe	Major courses	Introduction to Computer Networks	3		Zo	15						30		2	47	28	75	3	
		Programming Foundations - Web Services	3		Zo	4	11					30		2	47	28	75	3	
		Signal Processing	3		Zo	15						15		2	32	43	75	3	
		Basics of Desktop Publishing	3		Zo	15						30		2	47	28	75	3	
		WWW Applications	3		Zo	15						30		2	47	28	75	3	
		Artificial Intelligence	5		E	30						30		2	62	63	125	5	
		Object-Oriented Programming II	3		Zo					15		30		2	47	28	75	3	
				Universal Design II	2		Zo	15					15		2	32	0	32	2
<b>TOTAL</b>			31	0	-	124	11	45	0	15	0	225	0	22	442	347	789	31	

SEMESTER 5																		
specjalnościowe	specjalizacja	Internship 2		15	Zo								375	20	395	0	395	15
	Major courses	IT Tools and Techniques in Computer Aided Technology	4		Zo	15					30		2	47	53	100	4	
	specjalizacja	Specialisation Course 1		5	E	15					30		2	47	78	125	5	
		Specialisation Course 2		3	Zo						30		2	32	43	75	3	
		Specialisation Course 3		3	Zo				30				2	32	43	75	3	
<b>TOTAL</b>			4	26	-	30	0	0	30	0	0	90	375	28	553	217	770	30
SEMESTER 6																		
specjalnościowe	specjalizacja	Visits to companies, participation in IT events, guest lectures		2	Zo						20		2	22	28	50	2	
		Specialisation Course 4		4	Zo	15					15		2	32	68	100	4	
		Specialisation Course 5		5	E	15					30		2	47	78	125	5	
		Specialisation Course 6		4	Zo	15					30		2	47	53	100	4	
		Specialisation Course 7		3	Zo				30				2	32	43	75	3	
		Specialisation Course 8		4	Zo					30			2	32	68	100	4	
		Specialisation Course 9		5	E	15						30		2	47	78	125	5
<b>TOTAL</b>			0	27	-	60	0	0	30	0	30	125	0	14	259	416	675	27
SEMESTER 7																		
specjalnościowe	specjalizacja	Specialisation Course 10		3	Zo						30		2	32	43	75	3	
		Specialisation Course 11		5	E	15					30		2	47	78	125	5	
		Specialisation Course 12		15	Zo				30				2	32	343	375	15	
	diploma	Diploma exam		6	Edypl	4							16	20	130	150	6	
<b>TOTAL</b>			0	29	-	19	0	0	0	30	0	60	0	22	131	594	725	29
<b>TOTAL</b>			99	109	E - 17 Zo - 32	477	158	242	120	60	30	747	750	160	274 4	2560	528 6	21 0

Semester	Course	Security of Networks and Teleinformatics Systems	Graphics and Multimedia	Internet Technologies	Software Engineering	E-business
V	Spec. course 1	Telecommunications Systems & Networks	Graphics Design	Web services	Internet Technology	Programming Web Services
	Spec. course 2	Computer Networks Cisco	Programming Web Services	Programming Web Services	Programming in Java I	Computer Networks Cisco
	Spec. course 3	Specialized English I	Specialized English I	Specialized English I	Specialized English I	Specialized English I
VI	Spec. course 4	Security of Computer Systems	Desktop Publishing	Game Development and Design	Programming in C# I	E-business in Tourism
	Spec. course 5	Advanced Network Techniques	Packaging Design	Mobile Technology	Image Processing and Analysis	E-commerce Infrastructure
	Spec. course 6	Virtual Local Area Networks	3D Graphics	Multimedia Presentations	Programming in Java II	E-business Communication
	Spec. course 7	Specialized English II	Specialized English II	Specialized English II	Specialized English II	Specialized English II
	Spec. course 8	Trends in network technology	Trends in Graphics and Multimedia	Trends in Internet Technology	Trends in Software Engineering	Trends in E-business systems
	Spec. course 9	Detecting and preventing attacks using network intrusion detection systems	3D Printing	Web Application Testing - Techniques and Tools	Embedded Systems	Web Application Testing - Techniques and Tools
VII	Spec. course 10	Forensic Science	Graphics and Human-Computer Communication	Advanced Website Designing	Programming in C# II	IT Consulting
	Spec. course 11	Secure Network Management and Computer Networks	UX Design	Front-end and Back-end Technologies	Modelling and Analysis of Information Systems	Modelling and Analysis of Information Systems
	Spec. course 12	Engineering Project	Engineering Project	Engineering Project	Engineering Project	Engineering Project

## 4.2. LIST OF COURSES

COURSE: Logic and Set Theory			
<b>THEMATIC BLOCK: BASIC</b>	<b>COURSE OBJECTIVES:</b>		
	<ol style="list-style-type: none"> <li>1. Acquainting students with basic issues of mathematical logic.</li> <li>2. Drawing conclusions based on obtained information correctly.</li> <li>3. Preparation for permanent learning and improving competences.</li> </ol>		
	<b>LEARNING OUTCOMES:</b>		
	<ol style="list-style-type: none"> <li>1. Knows predicate calculus and basic facts of set theory.</li> <li>2. Has got the basic knowledge about statement calculus and its applications in describing logical systems.</li> <li>3. Is able to draw conclusions based on obtained information and use them in projecting, describing and interpreting logical systems.</li> <li>4. Applies the mathematical induction principle.</li> <li>5. Is aware of the need of permanent learning and improving competences.</li> <li>6. Thinks in a creative way.</li> </ol>		
	<b>COURSE CONTENT</b>		
	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>LECTURE:</b> <ol style="list-style-type: none"> <li>1. Logical statements. Rules of propositional calculus. Tautologies.</li> <li>2. Predicate calculus. Drawing conclusions. A contrario proof.</li> <li>3. Basic facts of set theory.</li> <li>4. The mathematical induction principle.</li> <li>5. Relations. Properties and types of relations.</li> <li>6. Functions. Properties of functions.</li> </ol> </td> <td style="width: 50%; vertical-align: top;"> <b>PRACTICAL FORM - Exercises:</b> <ol style="list-style-type: none"> <li>1. Identifying tautologies with zero-one tables.</li> <li>2. Using rules of propositional calculus. Proving in logic with a contrario way.</li> <li>3. Discussing and proving theorems concerned on sets and illustrating them via Venn diagram.</li> <li>4. Proving with the mathematical induction principle.</li> <li>5. Checking properties of relations.</li> <li>6. Checking properties of functions (injection, surjection, bijection).</li> </ol> </td> </tr> </table>	<b>LECTURE:</b> <ol style="list-style-type: none"> <li>1. Logical statements. Rules of propositional calculus. Tautologies.</li> <li>2. Predicate calculus. Drawing conclusions. A contrario proof.</li> <li>3. Basic facts of set theory.</li> <li>4. The mathematical induction principle.</li> <li>5. Relations. Properties and types of relations.</li> <li>6. Functions. Properties of functions.</li> </ol>	<b>PRACTICAL FORM - Exercises:</b> <ol style="list-style-type: none"> <li>1. Identifying tautologies with zero-one tables.</li> <li>2. Using rules of propositional calculus. Proving in logic with a contrario way.</li> <li>3. Discussing and proving theorems concerned on sets and illustrating them via Venn diagram.</li> <li>4. Proving with the mathematical induction principle.</li> <li>5. Checking properties of relations.</li> <li>6. Checking properties of functions (injection, surjection, bijection).</li> </ol>
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<b>ASSESSMENT:</b> observation of activity during classes, written test			
<b>DIDACTICAL METHODS:</b> Lectures, exercises with solving problems at the blackboard or independently			
<b>COMPULSORY READINGS:</b>			
Mark Zegarelli, Logic for dummies, For Dummies, 2006 Daniel W. Cunningham, Set Theory: A First Course, Cambridge University Press, 2016			

**COURSE: Physics****COURSE OBJECTIVES:**

1. Introduction to physical description of reality with application of mathematical language.
2. Introduction to basic methods of observation and modelling of physical experiment for recognition and description of observed physical system.
3. Introduction to characteristics of observation of physical system for general and detailed conclusion over observed system.
4. Learn how to make a scientific thesis and how to validate its accuracy.
5. Learn to improve knowledge and thrive with ability to apply it.

**LEARNING OUTCOMES:**

1. Define, formulate and explain observation and phenomena of elementary physics.
2. Outline and identify characteristics of physical systems and describe general laws.
3. Understands physical quantities and operates on units.
4. Formulate coherent description of physical phenomena.
5. Is able to use knowledge of physical theories to solve physical problems.
6. Understand need of constant intellectual development and have urge to gain knowledge toward solving problems.

**COURSE CONTENT****LECTURE:**

1. Fundamentals of physics/ what is measurement/ why it is important to normalize and use units in theories/ how to understand vision of physicist.
2. Motion, displacement, distance, various coordinate systems/ velocity and speed in inertial system.
3. Vectors, basis, elementary vectorial calculus in Karthesian coordinate system/ Switch between coordinate systems/ Comparison of vectorial and scalar quantities.
4. Motion in two and three dimentions/ Projectile motion and trajectory/ Circular motion.
5. Forces/ Newton's dynamics and classical dynamics/ Mass and weight/ Motion on surface frictionless and with a friction.
6. Motion of a body on surfaces/ Pulley/ Dynamics.
7. Energy – what is it/ Potential and kinetic energy/ Conversion of energy.
8. Rotation/ Inertia/ Comparison of translation and rotation movement.

**PRACTICAL FORM: LABORATORY**

1. Mathematical pendulum/ Gravity force.
2. Reversed physical pendulum/ Gravity force.
3. Energy conversion and dissipation/ Movement on a rail.
4. Hook's Law/ Spring constant.
5. Hook's Law/ Young modulus.
6. Parallel axis theorem/ Rotation of a rod.
7. Parallel axis theorem/ Rotation of a disc.
8. Introduction to computer simulation in physics.

**ASESMENT: Written exam**

**DIDACTICAL METHODS:** Lecture with examples/active talk with students; Theoretical and practical exercises with use of simple physical setups.

**COMPULSORY READINGS:**

D. Halliday, R. Resnick, J. Walker, 9<sup>th</sup> Edition *Fundamentals of Physics*, Willey 2011  
 R. Feynman *Feynman Lectures on Physics*, Addison-Wesley 2005  
 P. Gnadig *200 Puzzling physics problems*, Cambridge University Press 2001  
 R. M. Oman *How to solve physics problems*, McGraw-Hill Book Company 1997

<b>COURSE: Operating Systems</b>		
<b>THEMATIC BLOCK: MAJOR COURSES</b>	<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. Introducing key concepts regarding operating systems.</li> <li>2. Introducing Operating Systems architectures and generations.</li> <li>3. Working with core system tools, process management, writing shell scripts and basic kernel modules, running and managing different Operating Systems on virtual machines.</li> </ol>	
	<p style="text-align: center;"><b>LEARNING OUTCOMES:</b></p> <ol style="list-style-type: none"> <li>1. Student knows and understands the key concepts of operating systems.</li> <li>2. Student is familiar with command line interface, can write system scripts, can use core system tools, check main system properties and manage system processes.</li> <li>3. Student has knowledge about virtualization, can run and manage different operating systems on virtual machines.</li> <li>4. Student can seek for additional technical information, plan a project, do it on time and write a report (project's documentation).</li> </ol>	
	<b>COURSE CONTENT</b>	
	<p><b>LECTURE:</b></p> <ol style="list-style-type: none"> <li>1. Basic concepts: what is an operating system, process, thread, context switch, traps, input/output, interrupts, concurrency, file systems</li> <li>2. Operating Systems generations. Mainframes. Server Operating Systems. Multiprocessor Operating Systems. Personal Computer Operating Systems. Real-Time Operating Systems.</li> <li>3. Linux terminal. Process management in Linux. Interprocess communication – semaphores, classical problems.</li> <li>4. Zombie and init processes, daemons, system calls, kernel. Process hierarchies and states. Implementing threads in User Space and in the kernel. Scheduling.</li> <li>5. Memory management: address spaces, swapping, virtual memory, virtual address translation, paging, page replacement algorithms, segmentation.</li> <li>6. Virtualization.</li> <li>7. Graphical User Interfaces, pens, AI.</li> <li>8. File systems, input/output, deadlocks.</li> </ol>	<p><b>PRACTICAL FORM - LABORATORY:</b></p> <ol style="list-style-type: none"> <li>1. Windows OS properties. Built in administrative tools. Command prompt.</li> <li>2. Linux OS properties. Terminal. Processes. Exit codes of operations.</li> <li>3. Kernel. System calls. Signal interrupts.</li> <li>4. Shell. Shell scripts.</li> <li>5. Operating systems virtualization. Virtual Box. Host OS, Guest OS, Virtual Machine. Virtual Machine normal start, headless start, detachable start.</li> <li>6. Creation of basic Kernel Module.</li> <li>7. Multimedia and Multimedia Operating Systems.</li> </ol>
	<b>ASSESSMENT:</b> written exam, reports with project codes, active participation during the workshops	
	<b>DIDACTICAL METHODS:</b> Lecture with multimedia presentation; individual project; Case studies, discussion	
	<b>COMPULSORY READINGS:</b>	
	Tanenbaum A., Bos H., <i>Modern Operating Systems 4<sup>th</sup> Edition</i> , Pearson, 2014	
	Booth T., <i>Linux for Beginners: Basic Linux Commands and Shell Scripting</i> , 2019	
	Karamagi R., <i>Operating Systems</i> , 2019	

<b>COURSE: Basics of Computer Graphics</b>	
<b>THEMATIC BLOCK: MAJOR COURSES</b>	<b>COURSE OBJECTIVES:</b> 1. Presentation of concepts and method of analysis in the design of graphic elements. 2. Presentation of basics of layout composition and color selection. 3. Shaping social competencies for the correct setting of goals, the selection of means for marketing tasks, and the control of the organization.
	<b>LEARNING OUTCOMES:</b> 1. A student knows and understands the basic concepts of computer graphics. 2. A student knows how to use the basic tools for creating computer graphics. 3. A student has detailed knowledge of using Adobe Photoshop. 4. A student knows the principles of designing graphic elements.
	<b>COURSE CONTENT</b>
	<b>LECTURE (WITH E-LEARNING):</b> 1. Basic of graphic design: 1) Raster and vector graphics 2) Resolution used in the printing and multimedia 3) CMYK and RGM color management 2. Basic of graphic design: 1) International papier formats and their settings in Adobe Photoshop 2) Rules for setting measures, pixels, millimeters and inches 3) Files formats. 3. Presentation of tools of Adobe Photoshop elements: 1) Selection tool 2) Colors selection 3) Layer management 4. Basic of layout composition 1) Lines 2) Shapes Backgrounds 5. Objects transformation: 1) Rotation 2) Perspective 3) Placing and free transformation
	<b>PRACTICAL FORM - LABORATORY:</b> 1. Exercises in the graphics tools of Photoshop. 2. Adobe Photoshop - Designing basic geometric figures, Using the text input tool. 3. Layers and rules of their application. Creating a layer-based photomontage. 4. Designing of functional elements: logo, business card, letterhead, envelope. 5. Creating graphics for the needs of marketing: print poster, advertising banner.
	<b>ASSESSMENT:</b> presentation, active participation during the workshops
	<b>DIDACTICAL METHODS:</b> Lecture with multimedia presentation; individual project; Case studies, discussion
	<b>COMPULSORY READINGS:</b> Andrew Faulkner, Conrad Chavez, Adobe Photoshop CC Classroom in a Book, Adobe Press 2016 Sherin, Aaris, The Graphic Design Reference & Specification Book, Rockport Publishers Inc. 2013 Tondreau, Beth, Layout Essential, Rockport Publishers Inc. 2019

<b>COURSE: Introduction to Computer Networks</b>		
<b>THEMATIC BLOCK: MAJOR COURSES</b>	<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. Familiarization with OSI Model, internet protocols, network components, network types and topologies, data packets distribution and network wiring.</li> <li>2. Gaining knowledge about commands and operation principles of Windows and Linux networking tools dedicated to analyze network layout, components, parameters, communication. Obtaining knowledge concerning packet addressing and filtering.</li> <li>3. Applying in practice Windows and Linux networking tools to analyze network layout, components, parameters, communication. Applying rules for packet addressing and filtering. Ability of controlling transport protocol port assignments.</li> </ol>	
	<p style="text-align: center;"><b>LEARNING OUTCOMES:</b></p> <ol style="list-style-type: none"> <li>1. Student has knowledge about OSI Model, internet protocols, network components, network types and topologies, data packets distribution and network wiring.</li> <li>2. Student has knowledge about commands and operation principles of Windows and Linux networking tools dedicated to analyze network layout, components, parameters, communication. Student has knowledge regarding packet addressing and filtering.</li> <li>3. Student is able of applying in practice Windows and Linux networking tools to analyze network layout, components, parameters, communication. Student is able of applying rules for packet addressing, filtering and controlling transport protocol port assignments.</li> </ol>	
	<p style="text-align: center;"><b>COURSE CONTENT</b></p>	
	<p><b>LECTURE:</b></p> <ol style="list-style-type: none"> <li>1. Networking fundamentals.</li> <li>2. OSI Model. Internet protocols.</li> <li>3. Network components.</li> <li>4. Routing.</li> <li>5. Firewall policies, iptables, NAT, packet filtering.</li> <li>6. Network types, network layouts, IP addressing.</li> <li>7. Network wiring.</li> </ol>	<p><b>PRACTICAL FORM - LABORATORY:</b></p> <ol style="list-style-type: none"> <li>1. Using key Windows and Linux networking tools to analyze network parameters.</li> <li>2. Diagnostics of key network components.</li> <li>3. Performing network scanning and sniffing, describing network topology.</li> <li>4. Controlling transport protocol port assignments, establishing firewall policies, creating ACL lists.</li> <li>5. IPv4 and IPv6 address assignments, IPv4 public vs private IP addresses, IPv4 network classes, IPv4 subnetting (IPv4 default gateway, IPv4 subnet mask, loopback address), IPv6 network prefixes, DHCP servers, local-link addresses, CIDR notation.</li> <li>6. Network wiring.</li> <li>7. Routing. Working with <i>tracert</i>, <i>pathping</i>, <i>route</i>, <i>netstat</i> Windows tools.</li> </ol>
	<p><b>ASSESSMENT:</b> written exam, reports with project codes, active participation during the workshops</p>	
	<p><b>DIDACTICAL METHODS:</b> Lecture with multimedia presentation; individual project; Case studies, discussion</p>	
	<p><b>COMPULSORY READINGS:</b></p> <p>Meyers M., <i>CompTIA Network+ Certification Exam Guide Seventh Edition (Exam N10-007)</i>, 2018, McGraw-Hill Education</p> <p>Gaber H., <i>Understanding Computer Networks in 2020</i>, 2020, HSM Press, Canada</p> <p>Held G., <i>Windows Networking Tools, The Complete Guide to Management, Troubleshooting, and Security</i>, 2013, CRC Press</p>	



<b>COURSE: Artificial Intelligence</b>		
<b>THEMATIC BLOCK: MAJOR COURSES</b>	<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. To familiarize students with the basic algorithms of artificial intelligence.</li> <li>2. Acquisition by students of the ability to select appropriate methods of artificial intelligence to solve a specific task.</li> <li>3. Acquisition by students of the ability to present and evaluate the results generated by artificial intelligence algorithms.</li> </ol>	
	<p style="text-align: center;"><b>LEARNING OUTCOMES:</b></p> <ol style="list-style-type: none"> <li>1. The student is able to characterize the methods and techniques of artificial intelligence discussed during classes.</li> <li>2. The student can choose the appropriate method of artificial intelligence for the task being carried out.</li> <li>3. The student is able to assess the quality of solutions generated by artificial intelligence algorithms and indicate the advantages and disadvantages of the solutions used.</li> <li>4. The student developed interpersonal competences and team building skills.</li> </ol>	
	<p style="text-align: center;"><b>COURSE CONTENT</b></p>	
	<p><b>LECTURE:</b></p> <ol style="list-style-type: none"> <li>1. The concept of artificial intelligence. Reference to human intelligence. Historical view. Possibilities of artificial intelligence - strong and weak AI. Perspectives for the development of artificial intelligence - hopes and threats.</li> <li>2. Artificial neural networks. Biological inspirations. Structure of an artificial neuron. Differences between basic types of neural networks. Feedforward networks. Training a neural network with a supervised methods.</li> <li>3. Neural networks trained by unsupervised methods. SOM networks. Kohonen networks.</li> <li>4. Evolutionary algorithms. Biological inspiration and idea. Basic genetic algorithm. Evolutionary strategies. Genetic programming.</li> <li>5. Fuzzy logic. Construction and operation of the fuzzy controller.</li> <li>6. Examples of the latest uses of artificial intelligence.</li> </ol>	<p><b>PRACTICAL FORM - Laboratory:</b></p> <ol style="list-style-type: none"> <li>1. Artificial intelligence methods in solving the traveling salesman problem - solution review, implementation of the selected algorithm.</li> <li>2. Application of the neural network trained by means of backpropagation method to solve the regression problem. Preparation of data for network learning and testing. Performing experiments in the Simbrain environment. Processing of obtained results.</li> <li>3. Implementation of the genetic algorithm to solve the selected optimization problem.</li> <li>4. Project of the fuzzy controller.</li> </ol>
	<p><b>ASSESMENT:</b> presentation, active participation during the workshops</p>	
	<p><b>DIDACTICAL METHODS:</b> Lecture with multimedia presentation; Teamwork project; Work in a simulation environment for neural networks.</p>	
	<p><b>COMPULSORY READINGS</b></p> <p>Neural Networks and Deep Learning - a free online book; <a href="http://neuralnetworksanddeeplearning.com/">http://neuralnetworksanddeeplearning.com/</a></p> <p>Z. <a href="#">Michalewicz</a> Genetic Algorithms + Data Structures = Evolution Programs;</p> <p>Springer-Verlag Berlin Heidelberg, 1996</p> <p>H. Nguyen, C. Walker, E. Walker A First Course in Fuzzy Logic; Chapman and Hall/CRC; 4 edition (17 Dec. 2018)</p>	

<b>THEMATIC BLOCK: FOREIGN LANGUAGE</b>	<b>COURSE: Chosen Foreign Language</b>
	<b>COURSE OBJECTIVES:</b>
	<ol style="list-style-type: none"> <li>1. To develop listening and reading comprehension skills.</li> <li>2. To carve out an ability to compose written statements (e-mails, reports, surveys, offers, formal and informal lists, selected financial documents, reports, etc.).</li> <li>3. To develop communications skills in everyday and professional life (meetings, travel, negotiation, presentations, etc.).</li> </ol>
	<b>LEARNING OUTCOMES:</b>
	<ol style="list-style-type: none"> <li>1. Student understands verbal statements in a foreign language (e.g. business commands, communications, telephone conversations, presentations, reports, etc.).</li> <li>2. Student understands general written texts (e.g. e-mails, articles, reports, documents, case studies, etc.).</li> <li>3. Student uses a proper forms, written expressions and can apply them to the given situation.</li> <li>4. Student can participate in conversations on daily and professional basis.</li> </ol>
	<b>COURSE CONTENT</b>
	<b>PRACTICAL FORM - WORKSHOP:</b>
	<ol style="list-style-type: none"> <li>1. Humanities and social sciences.</li> <li>2. Why are we learning?</li> <li>3. University structure.</li> <li>4. The role of work in our lives. Job fairs.</li> <li>5. We are saving - revising numerals.</li> <li>6. Christmas in Poland - customs.</li> <li>7. "How much does the Trojan horse weigh" - screening of the film.</li> <li>8. Threats to the modern world.</li> <li>9. Consolidation of grammar forms learned; Exercises to improve speaking fluency.</li> <li>10. Revision of lexical and grammar structures.</li> </ol>
	<b>ASSESSMENT:</b> exam
	<b>DIDACTICAL METHODS:</b> frontal method, group work, individual work, presentation, case study, text analysis, discussion
	<b>COMPULSORY READINGS:</b>
	Serenty A. (2008) Per aspera ad astra. Podręcznik do nauki języka polskiego. Ćwiczenia rozwijające sprawność czytania (C1). Towarzystwo Autorów i Wydawców Prac Naukowych Universitas
	<b>COURSE: Polish for Foreigners</b>
	<b>COURSE OBJECTIVES:</b>
	<ol style="list-style-type: none"> <li>1. To develop listening and reading comprehension skills.</li> <li>2. To carve out an ability to compose written statements (e-mails, reports, surveys, offers, formal and informal lists, selected financial documents, reports, etc.).</li> <li>3. To develop communications skills in everyday and professional life (telephone conversations, meetings, travel, negotiation, presentations, etc.).</li> </ol>
	<b>LEARNING OUTCOMES:</b>
<ol style="list-style-type: none"> <li>1. Student understands verbal statements in a Polish (e.g. business commands, communications, telephone conversations, presentations, reports, etc.).</li> <li>2. Student understands general written texts (e.g. e-mails, articles, reports, documents, case studies, etc.).</li> <li>3. Student uses a proper forms, written expressions and can apply them to the given situation.</li> <li>3. Student can actively participate in conversations on daily and professional basis.</li> </ol>	
<b>COURSE CONTENT</b>	
<b>PRACTICAL FORM - WORKSHOP:</b>	
<ol style="list-style-type: none"> <li>1. Discussion of the semester work plan. Introducing yourself.</li> <li>2. Freetime. Routine activities.</li> <li>3. Family. Interpersonal relations.</li> <li>4. People. Person description - external appearance and personality traits.</li> <li>5. Job. Professions, official duties.</li> <li>6. Plans for the future. Ways to express the future.</li> <li>7. Travelling and tourism.</li> <li>8. Exercises to improve speaking fluency - student presentations.</li> <li>9. Revision of lexical-grammar material.</li> </ol>	
<b>ASSESSMENT:</b> exam	
<b>DIDACTICAL METHODS:</b> problem-solving discussion, brainstorming, case study, listening to tape recordings, description, talk, work with a book	
<b>COMPULSORY READINGS:</b>	
Madelska, L. (2012) Praktyczna gramatyka języka polskiego. Towarzystwo Autorów i Wydawców Prac Naukowych Universitas	

### 4.3. SPECIALIZATIONS

#### INTERNET TECHNOLOGIES

COURSE: Game Development and Design		
<b>THEMATIC BLOCK: SPECIALIZATION COURSES</b>	<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. Familiarization with ideas, theory, methods and tools used for computer game programming.</li> <li>2. Sharing a knowledge related to C# programming and game theory necessary for understanding and creation of social, economical and non-technical conditions of different activities.</li> <li>3. Utilization of specialized and novel techniques in practical applications of game development.</li> </ol>	
	<p style="text-align: center;"><b>LEARNING OUTCOMES:</b></p> <ol style="list-style-type: none"> <li>1. Has knowledge in fundamental programming techniques and methods necessary for computer game programming.</li> <li>2. Has knowledge of computer science techniques including internet technologies and software interface structure with computer graphics elements.</li> <li>3. Can compare and adjust database solutions, internet applications and computer systems for the sake of created games using a chosen programming environment.</li> <li>4. Can create a specification of implemented information systems and develop test cases for created software.</li> <li>5. The student developed interpersonal competences and team building skills.</li> </ol>	
	<p style="text-align: center;"><b>COURSE CONTENT</b></p>	
	<p><b>LECTURE:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to game development, historical aspects of game programming.</li> <li>2. Vector algebra and introduction to computer graphics.</li> <li>3. Affine transformations.</li> <li>4. Shading and light models.</li> <li>5. Views in computer graphics.</li> <li>6. Solid volumes modeling.</li> <li>7. Graphical algorithms in game development.</li> </ol>	<p><b>PRACTICAL FORM - LABORATORY:</b></p> <ol style="list-style-type: none"> <li>1. Creating simple 3D models in game engine.</li> <li>2. Creating complex 3D models in game engine, adding scripts to objects.</li> <li>3. Level creation with 3D models, game specification.</li> <li>4. Creating 2D games.</li> <li>5. Mini project – programming.</li> </ol>
	<p><b>ASSESSMENT:</b> presentation, active participation during the workshops</p>	
	<p><b>DIDACTICAL METHODS:</b> Lecture with multimedia presentation; teamwork project; Case studies, discussion</p>	
	<p><b>COMPULSORY READINGS:</b></p> <p>J. Doran, <i>Unity 2017 Mobile Game Development: Build, deploy, and monetize games for Android and iOS with Unity</i>, Packt Publishing, 2017</p> <p>A. Brito, <i>Blender Eevee: The guide to real-time rendering with Blender 2.8</i>, 2019</p>	

## COURSE: Mobile Technologies

### COURSE OBJECTIVES:

1. Familiarization with theory, architecture, methods and tools used for mobile application development.
2. Familiarization with and controlling in practice every phase of mobile application lifecycle.
3. Gaining knowledge and practice how to transfer data from and to a mobile application.
4. Utilization of specialized and novel techniques in practical applications of mobile application development.

### LEARNING OUTCOMES:

1. Has knowledge of theory, architecture, methods and tools used for mobile applications development.
2. Has knowledge of mobile application lifecycle.
3. Can design, code, test, build and publish a mobile application with multilayer architecture that has different views, reacts to events and uses user-friendly GUI components.
4. Can control a mobile application on every phase of its lifecycle.
5. Can code a mobile application that handles HTTP communication.
6. Can implement various APIs (as maps, animations) in mobile applications development.
7. Can seek for additional technical information, plan a project, do it on time and write a report (project's documentation).

### COURSE CONTENT

#### LECTURE:

1. Android Studio as an example of Integrated Development Environment for designing mobile applications. First project, APIs, creating virtual devices.
2. Mobile architectures on example of Android architecture (Power Management Layer, Drivers and Kernel Layer, HAL Layer, Native Libraries and Runtime Layer, API Layer, System Apps Layer). MVC pattern. Handling events.
3. Application lifecycle. PWAs.
4. Permissions and GUI components.
5. Handling HTTP communication. RPC, REST APIs. Local storage.
6. Maps and animations APIs.
7. Testing, building and publishing applications on example of Google Play.

#### PRACTICAL FORM - LABORATORY:

1. Creating first project in Android Studio. Using Virtual Device for phone calls, multimedia messaging and maps displaying.
2. Coding an application implementing GUI components and responding to events.
3. Implementation of R class, storing widget texts in variables, creating logs and app debugging.
4. Coding mobile application with HTML, CSS, JS and Bootstrap technology stack.
5. Setting Android permissions, changing views, implementing icons and coding toast messages.
6. Implementing Android Activities and Intents into project. Transferring data as associative tables between Activities.
7. Handling HTTP requests in Android with REST programming interface (Volley library).
8. Coding an application implementing Google Maps and Animation APIs.

**ASSESSMENT:** written exam, reports with project codes, active participation during the workshops

**DIDACTICAL METHODS:** Lecture with multimedia presentation; individual project; Case studies, discussion

#### COMPULSORY READINGS:

Smyth N., *Android Studio 3.5 Development Essentials - Java Edition: Developing Android 10 (Q) Apps Using Android Studio 3.5, Java and Android Jetpack*, 2019  
Perea P., Giner P., *UX Design for mobile*, Packt Publishing, 2017  
<https://developer.android.com/>

## 4.4. INTERNSHIP

### SUBJECT SYLLABUS

SYLLABUS ON THE SUBJECT								
<i>Subject Name</i> <b>INTERNSHIP</b>								
<i>Field of study:</i> <b>Information Technology</b>							<i>Level of study:</i> <b>1st degree</b>	
<i>Language in which classes are conducted:</i> <b>English</b>			<i>Profile:</i> <b>Practical</b>				<i>Program module name:</i> <b>specialization</b>	
<i>Completion of studies:</i> <b>Exam</b>			<i>Year of study:</i> II, III <i>Semester of study:</i> III, V				<i>Number of ECTS credits:</i> <b>2x15</b>	
<i>Study mode</i>	<i>Form of classes</i>							<i>Total hours</i>
	<i>Lecture</i>	<i>Practical</i>	<i>E-learning</i>	<i>Lab.</i>	<i>Foreign language course</i>	<i>Practice</i>	<i>Consultation</i>	
<i>Stationary studies</i>						<b>2x375</b>		<b>750</b>
<i>Extramural studies</i>						<b>2x375</b>		<b>750</b>
<i>Responsible for the Subject (e-mail address):</i> MA Krzysztof Piłat e-mail: <a href="mailto:krzysztof.pilat@handlowa.eu">krzysztof.pilat@handlowa.eu</a> ; <i>phone number.</i> +48 71 333 11 08; +48 71 333 11 03								
<b>OBJECTIVE OF THE SUBJECT:</b>								
C1.	Verification of theoretical knowledge and skills acquired by students during university education, including training the practical capacity to apply knowledge acquired in the course of studies (integration of theoretical and practical knowledge)							
C2.	Students' knowledge regarding the conditions and specificities of work in an environment engaged in professional IT activities.							
C3.	The opportunity to assess the labor market, to understand the expectations of employers for future employees in terms of knowledge, skills and attitudes and to compare them with their own opportunities on the labor market							
<b>PREREQUISITES:</b>								
Participation in a meeting with the trainee's supervisor as part of teaching activities.								

<b>EDUCATIONAL OUTCOMES:</b>		
<b>SG</b>	<b>Effects</b>	<b>Reference of the particular effect to the effects defined and specified for the whole study program</b>
<b>Semester III</b>		
EU1	Applies the principles of occupational safety and ergonomics in the profession of Information technology	K_U22
EU2	Performs tasks related to maintaining the proper functioning of IT devices and systems, for example: takes care of the security of systems, networks, devices of the particular IT product being created; configures their own programming environment; selects appropriate technologies and programming frameworks and manages dependants in the implemented IT task; adds and / or modifies the functions of the created IT product; tests implemented solutions; takes care of the proper functioning of the network infrastructure	K_U08, K_U10, K_U12, K_U13, K_U19, K_U24, K_U27
EU3	Solves practical IT problems embedded in an environment professionally involved in engineering activities in the IT industry, in particular in the field of creating and developing IT products, for example, student searches for and selects the best technologies and solutions to implement a given function of an IT product or those ensuring the proper functioning of the network infrastructure	K_U01, K_U12, K_U13, K_U15, K_U18, K_U20, K_U23, K_U25
EU4	Checks the legality of the use of programs, licenses	K_U21
EU5	Student has the ability, taking into account the given utility and economic criteria (using appropriate methods, techniques and tools), to design, document, implement and check the operation or test an IT solution, e.g. database, application (including internet application), graphics, computer network, system computer	K_U02, K_U03, KU_09, KU_10, KU_14, K_U15
EK1	Has interpersonal skills, communicates with others, works in a team	K_K03

<b>Semester V</b>
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EU1	Applies the principles of occupational safety and ergonomics in the profession of computer science	K_U22
EU2	Performs tasks related to maintaining the proper functioning of IT devices and systems related to the specialization, for example: takes care of the security of the systems, networks, devices, and the IT product being created; student configures their own programming environment; selects appropriate technologies and programming frameworks and manages dependents in the implemented IT task; adds and / or modifies the functions of the created IT product; tests implemented solutions; takes care of the proper functioning of the network infrastructure	K_U08, K_U10, K_U12, K_U13, K_U19, K_U24, K_U27
EU3	Uses norms, standards and good practices applied in IT e.g. current documentation of the IT tools being used, specifications defining an open web platform, specifications describing IT service management (software life-cycle), good UX / UI practices, specifications for encoding and decoding multimedia materials, specifications related to systems and software engineering, network protocol specifications , security related specifications, etc.	K_U26
EU4	Has the ability (taking into account the given utility and economic criteria, using appropriate methods, techniques and tools) to design, document, implement and check the operation or test an IT solution related to the specialization, e.g. database, application (including web application), graphics, computer network, IT system	K_U02, K_U03, KU_09, KU_10, KU_14, K_U15
EU5	Solves practical IT problems embedded in the environment professionally engaged in engineering activities in the IT industry related to the specialization, in particular in the field of creating and developing IT products, for example, looking for and selecting the best technologies and solutions to implement a given function of an IT product or ensuring the proper functioning of the infrastructure network	K_U01, K_U12, K_U13, K_U15, K_U18, K_U20, K_U23, K_U25
EK1	Has interpersonal skills, communicates with others, works in a team	K_K03

**PROGRAM CONTENT:**

SG	<b>Practice</b>
P1	Familiarizing oneself with the Rector's Order and the practice syllabus.
P2	Documentation of the practice and rules of its settlement.
P3	Learning outcomes realized during practice and the way of their achievement.
P4	Settlement of internship documentation and its completion.

**Assessment methods:** MO16 - other - practice report and other documents presented in the annex to the syllabus.

**DIDACTIC METHODS**

1.	Expository method – description.
2.	Problem method – case method.
3.	Practical method - practical exercises in developing intellect

<b>STUDENT WORKLOAD:</b>				
<b>Form of activity</b>		<b>Number of hours required to complete the activity</b>		
		<b>Stationary</b>	<b>extramural</b>	
1.	Contact hours with the lecturer (consultation and design). Preparation of internship documentation	4	4	
2.	Practice and consultation with the internship supervisor	754	754	
<b>TOTAL NUMBER OF HOURS</b>		<b>754</b>	<b>754</b>	
<b>NUMBER OF ECTS CREDITS</b>		<b>30</b>	<b>30</b>	
<b>BASIC LITERATURE:</b>				
1.	Order of the Rector 16/19/20 of 14 November 2019 on the improvement of the Regulations of professional practices at the University of Business in Wrocław			
<b>SUPPLEMENTARY LITERATURE:</b>				
1.	WSH Study Regulations			
<b>EVALUATION CRITERIA:</b>				
<b>Learning outcomes</b>	<b>Grade 2</b>	<b>Grade 3-3.5</b>	<b>Grade 4-4.5</b>	<b>Grade 5</b>
<b>Effects for a given semester</b>	No results achieved (≤50%)	effects achieved in a small range 51÷70%	effects achieved, minor remarks.  71÷89%	achieved without reservation ≥90%
<b>Assessment of the practice based on the Application for credit for professional work regarding compulsory internship</b>	Practice assessment = (0.8 Skills + 0.2 Social competence) of results achieved			
<b>Assessment of internship</b>	Practice rating = 0.7 Guardian + 0.3 Employer  Guardian Rating = 0.8 Skills + 0.2 Social Competence			
<b>OTHER USEFUL INFORMATION ON THE SUBJECT:</b>				
2.	Documentation of internships and guidelines for the subject are made available by the Internship Representative in electronic form to the group's prefect			



3.	The study plan and the assumed learning outcomes for the internship along with the syllabus are made available to students on the e-learning platform and in the Didactics Office.
4.	Dates of consultations with the Internship Plenipotentiary are reported to the Head of the Department and posted in the Virtual Dean's Office
5.	The internship documentation is available to the Dean and the Practice Plenipotentiary.
6.	The results of the internship are given to students immediately after presenting the final documentation for a given semester..
7.	Templates of the practice documents are presented in the annex to this syllabus.

## Internship program for Information Technology

### GENERAL PRINCIPLES OF INTERNSHIP

1. Internship is an integral part of the study plan. Information about the student's internship will be included in the post-graduation supplement for the diploma.
2. Professional practice in the field of information technology is carried out within the framework of the time limits and in the period specified in the study plan for a given type, form and profile of studies.
3. The daily and weekly hours of practice may be tailored to the internal arrangements or capabilities of the institution hosting the student, but in total it must be equal to the dimension specified in the study plan.
4. The practice can be carried out in 24-hour establishments, but the working time must not exceed 8 hours per day and an average of 40 hours during the five-day working week.

### SPECIFIC LEARNING OUTCOMES FOR INTERNSHIP

The detailed learning outcomes of a professional practice include:

- Familiarizing the student with the organization of the IT department in the enterprise;
- ability to characterize the main IT processes in the enterprise;
- knowledge regarding technologies, tools, methods, techniques and equipment used in information technology to learn about the basic principles of occupational safety and ergonomics in the IT profession;
- solving practical IT problems embedded in an engineering professional environment in the IT industry, and in particular in the scope of development of IT products;
- checking the legality of the use of programs, licenses; developing skills in the use of standards and good practices in information technology;
- team-work in an IT project, following the principles of professional ethics;

In addition:

- verification of theoretical knowledge in practice, consisting in shaping practical skills.

### PLACE OF AN INTERNSHIP

Professional internship should be carried out in national and foreign IT organizations, in the IT departments of organizations with any business profile, mainly as:

- Head of an IT department;
- information network administrator;
- website administrator;
- software engineer;
- computer graphic designer;
- programmer;
- multimedia designer;

- computer games' designer;
- UX/UI designer;
- an employee of IT security departments;
- member of project teams preparing interactive solutions.

#### STUDENT'S TASK DURING INTERNSHIP

1. Before starting an internship, the student should:
  - a) familiarize oneself with the organizational and regulation rules and the procedures for the classification of internships, their purpose, as well as the basic provisions of labor law;
  - b) provide documents that are necessary for the pursuit and transfer of an internship, available from the Career Office;
  - c) obtain (on one's own) personal insurance against accidents and civil liability.
2. During internship student is obliged to:
  - a) report to the place of internship on the set date;
  - b) agreeing the rules of its course with the In-House Practice Supervisor;
  - c) get acquainted with the organizational regulations of the institution / organizational unit,
  - d) where the internship takes place;
  - e) listen to information from a person designated by the institution / organizational unit on basic goals, tasks, work plans, programs of implemented projects;
  - f) follow the instructions of the appointed supervisor and superiors at the place of internship;
  - g) compliance with the mode and order of work adopted in the place where the internship is held, and with the applicable provisions on the protection of classified information, as well as provisions regarding health and safety at work place.
3. A student undergoing internship is required to prepare a report on the achievement of the indicated learning outcomes, which should be confirmed by the Company Internship Supervisor.

#### 4.5. END-OF-STUDIES – ENGINEERING PROJECT

<b>COURSE: Engineering Project</b>
<b>COURSE OBJECTIVES:</b>
<ol style="list-style-type: none"> <li>1. To prepare students to prepare Engineering Project, being the final assignment of the engineering's degree studies.</li> <li>2. To formulate scope and aims of the project and specify the procedure of conducting the research.</li> <li>3. To present effects of his/her own work and to critically evaluate his/her own and other scientists' achievements.</li> </ol>
<b>LEARNING OUTCOMES:</b>
<ol style="list-style-type: none"> <li>1. Student knows all formal and substantial rules of preparing an engineering project.</li> <li>2. Student is able to find, understand and analyze different sources of science information</li> <li>3. Student formulates the scientific problem, aims and objectives of the research.</li> <li>4. Student accomplishes single stages of the research according to a logical order and hierarchy worked out earlier by himself.</li> <li>5. Student follows the rules of taking advantage from other scientists' intellectual ownership.</li> <li>6. Student is a critical thinker and is able to formulate the doubts and recommendations for his/her science work.</li> </ol>
<b>COURSE CONTENT</b>

**SEMINAR:**

1. First semester: discussion about the thesis topic, main scientific aims, form and scope of the master's thesis, preparation of a scientific methodology and basic stages of conducting the research.
2. Second semester: presentation of results of scientific literature and materials investigation as well as discussion about the research procedure during preparation of the master's thesis.
3. Third semester: presentation of the results of student's own research, critically presentation of the research outcomes, formulation of recommendations concerning the research.

**ASSESSMENT:** exam**DIDACTICAL METHODS:** lecture with multimedia presentation, case-study, exercises to use Eurostat, stat.gov.pl, maps and plans, Google Forms and webpages**COMPULSORY READINGS:**

According to teachers' recommendation, individually dedicated for every student.

Course is realized on the seventh semester.

It is essential to check and know the effective **Regulation of the Dean of the Faculty of Economics and Management University of Business in Wroclaw with the rules for diploma exam.**

The student has to check and respect:

- ✓ dates of submission of engineering project (for winter and summer semester)
- ✓ planned dates of diploma exam (for winter and summer semester)
- ✓ formal requirements of the project
- ✓ the anti-plagiarism program report
- ✓ the rules of computer edition and completion of diploma project
- ✓ the list of exam issues

## 5. WHY THIS TRAINING?

Student's internship is an integral part of the study program and it is necessary to successfully complete the studies.

### Internship -What is it?

Internship is part of the study program - on the third and fifth semester.

### How many hours of student's internship has to be completed?

Internship 1 and Internship 2 both take 3 months and 375 academic hours. Each of these courses is credited 15 ECTS.

### Carrier office at the University:

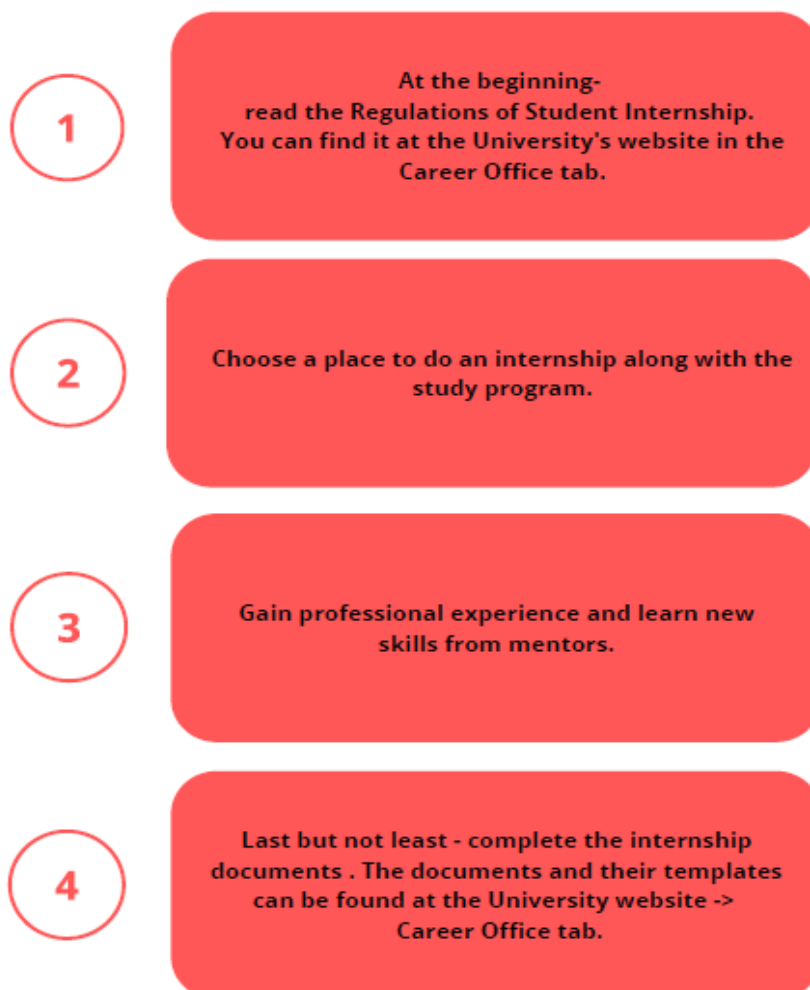
Carrier office can help students with:

- Creating a CV
- Advise on career path
- Choosing courses and training available for students
- Choosing places where students can do internship

For students, we have launched a new career platform that will help you find internship or a job offer: Career Office by JobTeaser. Register and specify your preferences to receive content and offers tailored to your interests. The Career Office will provide you with the necessary support to successfully enter the labor market. Regardless of whether you are just starting university or are already looking for a job, on the platform you will find interesting content. At your disposal there are company profiles, information on events related to career development, as well as job offers from Poland and abroad.

Register and create an account on the site: <https://wsh-wroclaw.jobteaser.com> Download the Career Center by JobTeaser app: for iPhone or Android

### Student's internship - step by step:



**Questions and answers:****Where can students find the information?**

At the University's website, in the tab: Career Office -> student's internship.

At the website: [www.wsh-wroclaw.jobteaser.pl](http://www.wsh-wroclaw.jobteaser.pl) - information about internship and employers.

**Can I include student internships as part of my professional career?**

Yes, if you are already employed, it is possible.

**What happens if I don't finish student's internship?**

Failure to complete the internship on time (by the end of semester III and by the end of semester V) will result in a negative evaluation of the subject.

**Can I do a student internship outside of Poland /EU?**

We recommend to do a student internship in Poland.

**How to fill out student internship documentation?**

All information how to complete internship documents can be found at the University's website in the Career Office tab.

**What does the internship tutor do?**

The internship tutor will help you choose the right place for the internship, answer your questions and show you how to complete the internship documents. The tutor is also responsible

**Contact:**

**Carrier Office WSH**

**Room 2/6,**

**e-mail: [biuro-karier@handlowa.eu](mailto:biuro-karier@handlowa.eu),**

**Phone number: 71 333 11 08**

## 6. WHAT NEXT?

A graduate of IT at the University of Business in Wrocław acquires knowledge about general IT issues, including operating systems, algorithms and data structures, programming languages and techniques. Gains knowledge regarding analog and digital technology, computer architecture and the secrets of IT project management. There shall also be issues and matters related to the legal and ethical aspects of IT. During the studies, the graduate will realize the diversity of its applications in technical, business and economic systems. The graduate shall acquire knowledge regarding the methods of data collection and processing, the basics of decision-making and control, or methods of artificial intelligence.

Information Technology is complemented by knowledge of physics and mathematics, extended with the basics of management, finance and social communication.

Set of skills acquired with University's help allow the graduates to easily find themselves in the extremely demanding labor market. They possess skills to freely use IT tools and systems, deal with databases and data warehouses, computer networks, including their security and internet technologies. Use IT in IT and information systems (web, multimedia) and non-IT systems (including decision-making systems).

Graduates of the first cycle studies ought to know a foreign language at the B2 proficiency level of the European System for the Description of Languages. Graduates should be prepared to undertake second-cycle studies. After graduation they will obtain the professional title of engineer. Graduates are prepared to work as IT specialists and managers / managers of lower and middle management in organizations, as well as to run their own businesses.

**Employment opportunities:**

- IT department manager
- IT network administrator
- software engineer
- computer graphics designer,
- developer
- designer of multimedia services
- computer game designer
- an employee of IT security departments
- member of project teams preparing interactive solutions
- running own business
- middle manager.

Furthermore, you can also advance your career by choosing postgraduate studies or MBA studies at the University of Business in Wrocław as today's labour market requires constant education and improvement of your skills.



# WSH

University  
of Business  
in Wrocław