FACULTY OF ELECTRICAL ENGINEERING, COMPUTER SCIENCE AND
TELECOMMUNICATIONS

ERASMUS PROGRAMME

FIELDS OF STUDY:

COMPUTER SCIENCE
UNDERGRADUATE PROGRAMME
PROBABILISTIC METHODS

Course code: 11.1-WE-I-MP-PP13_S1S
Type of course: compulsory
Entry requirements: Mathematical analysis, linear algebra with analytical geometry
Language of instruction: Polish
Director of studies: Professor Dariusz Uciński
Name of lecturer: Professor Dariusz Uciński

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Full-time studies

COURSE CONTENTS:


Hypothesis testing. One- and two-sided tests of the mean. Testing the proportion. Testing the variance. Selecting the test procedure.

LEARNING OUTCOMES:
Basic knowledge and competence in practical application of probability theory to construct probabilistic models of phenomena, as well as practical use of statistical methods and techniques to solve various problems encountered in computer science and other areas of engineering.

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Practice – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

RECOMMENDED READING:

OPTIONAL READING:
1. -

REMARKS:
Course code: 11.9-WE-I-PSD-PP15_S1S
Type of course: compulsory
Mathematical analysis, linear algebra and analytic geometry, algorithms and data structures
Entry requirements: Mathematical analysis, linear algebra and analytic geometry, algorithms and data structures
Language of instruction: Polish
Director of studies: Professor Roman Gielerak
Name of lecturer: Professor Roman Gielerak

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COURSE CONTENTS:

Introduction: elementary sets algebra, elementary properties of functions and sequences: terminology and notations used, binary relations versus graphs versus matrices, equivalence relations, ordering relations and theirs properties, asymptotic behaviour: notations \( \Omega(.) \), \( \Xi(.) \), \( o(.) \), \( O(.) \), elementary rules of mathematical reasoning, formal sentences calculus, tautologies, logical equivalence of propositions, Bool's algebra model, predicates and quantifiers.

Induction and recurrence: The mathematical induction concept and their applications, binomial formula, inductive and recursive procedures, algorithms and definitions, recurrence equations, linear recurrence equations and their solutions, characteristic polynomials method, generating functional method, universal recurrences and theirs applications to complexity evaluation of some recursive algorithms.

Combinatorial problems: elementary counting rules, divisions, set theory methods, inclusion-exclusion rules, the pigeonhole rule, the Dirichlet rule, permutations, variations, combinations, generating algorithms, combinatorial algorithms and their complexity, applications in elementary probability calculus.

Graphs theory problems: binary relations and their graphs representation, directed and undirected (multi)-graphs, matrices calculus applications for graphs structure analysis, basic graph theory algorithms: searching, sorting, spanning trees searching, optimal paths searching problems, optimal flow problem: The Salesman problem.

Number theory problems: divisibility relations, modular arithmetics, linear modular equations, Chinese theorem on remainders, the problem of order of element, discrete logarithm problem, Euler theorem and...
little Fermat theorem, fast modular exponentiation algorithm, essence of RSA cryptographic protocol, pseudo-primes tests, Miller-Rabin probabilistic test.

Complements: more on formal relations theory, formal languages, complexity theory foundations, NP class of problems, NP-complete problems: examples and their relevance in Computer Science.

LEARNING OUTCOMES:

The course has been specifically tailored for students of computer science. After passing over this course the average student should be able to estimate the computational complexity of the algorithms used to supply a computer programs to solve a particular problem.

After passing over this course the student will be familiar with topics from logic include truth tables, predicates, quantifiers, and inference rules. Additional mathematical topics include elements of set theory, mathematical induction, relations and functions, number theory, and probability. The student will be able to select and use mathematical technologies which are used in a public cryptographic systems.

ASSESSMENT CRITERIA:

Lecture: The grade will be calculated from a final exam. Approach to final exam is possible after pass a practice.

Practice: The grade will be calculated from four in-class exams and positive grade of activity for in-class time.

RECOMMENDED READING:


OPTIONAL READING:

REMARKS:
# EXPERIMENTAL TECHNIQUES II

**Course code:** 06.0-WE-I-TE2-PP17_S1S  
**Type of course:** compulsory  
**Entry requirements:** Experimental techniques I.  
**Language of instruction:** Polish  
**Director of studies:** Professor Ryszard Rybski  
**Name of lecturer:** Professor Ryszard Rybski

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**COURSE CONTENTS:**

*Principles of planning the instrumental realization of the experiment.* Nature of the research object and assumed objective of the experiment – their influence on the choice of measurement method and procedure, and measurement instruments and systems.

*Basic measurement methods and measuring instruments.* Metrological properties of measuring instruments.Selected analogue electronic instruments.


*Measurements of selected non-electric quantities.* General characteristics of sensors. Principle of operation and properties of selected sensors. Smart sensors.

*General characteristics of measurement systems.* Types and configurations of measurement systems. Basic functional blocks of measurement systems. Converters and system instruments, sub-systems for measuring Signal acquisition, fieldbus, interface, system controller.

**LEARNING OUTCOMES:**

Skills and competences in: basic measurement methods and measuring instruments as means for measurement realisation – a basic element of the experiment methodology; basics in analogue, analogue-digital and digital-analogue measurement signal processing, general knowledge of measurement systems.
ASSESSMENT CRITERIA:
Lecture – the credit is given for obtaining positive grades in written tests carried out at least once a semester.
Laboratory – the credit is given for obtaining positive grades in all laboratory exercises to be carried out according to the laboratory syllabus.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
COMPUTER ARCHITECTURE I

Course code: 06.0-WE-I-AK1-PK18_S1S
Type of course: compulsory
Entry requirements: None
Language of instruction: Polish
Director of studies: Professor Andrzej Pieczyński
Name of lecturer: Professor Andrzej Pieczyński

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COURSE CONTENTS:


Instructions pipelining. Cooperation of many executive units. Branch prognose and implementation. Information processing models.


LEARNING OUTCOMES:
Knowledge of computer structure, conditions of data transfer, storage and processing, basic rules of computer operation. Parallel architectures of computers.

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
**PRINCIPLES OF PROGRAMMING**

Course code: 11.3-WE-I-PP-PK19_S1S

Type of course: compulsory

Entry requirements: None

Language of instruction: English

Director of studies: Wojciech Zając, Ph.D.

Name of lecturer: Wojciech Zając, Ph.D.

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**COURSE CONTENTS:**

- C programming. Program structure, commands syntax. Constants, variables, data types. Operators, expressions and basic instructions of C.
- Complex instructions, expressional instruction, empty instruction, grouping instruction. Control instructions: if-else, switch. Loops: do, while, for.
- Pointers: rules of operation, declaration, using the address and the pointed value. Use of pointers to communicate with other elements.
LEARNING OUTCOMES:
Abilities and competence in computer system operation understanding and programming in C.

ASSESSMENT CRITERIA:
Lecture – written test.
Laboratory – written test.

RECOMMENDED READING:

OPTIONAL READING:
- 

REMARKS:
OBJECT-ORIENTED PROGRAMMING

Course code: 11.3-WE-I-PO-PK20_S1S
Type of course: compulsory
Entry requirements: Principles of programming, algorithms and data structures
Language of instruction: Polish
Director of studies: Dr. Paweł Majdzik
Name of lecturer: Dr. Paweł Majdzik

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**COURSE CONTENTS:**


*Functions overloading:* friend functions and inline functions, constructor and operator conversion.

Inheritance rules.


*Designing of object-oriented programming.*

*Design pattern.* Adapter pattern, facade pattern, bridge pattern, etc.
LEARNING OUTCOMES:
The aim of the subject is to acquaint students with the object programming paradigm. In particular the lectures include: abstract data typing definition with member functions (encapsulation), inheritance, polymorphism and virtual functions, templates of classes and functions. The aim of the laboratory is to teach how to design programs and utilize tools (e.g. tools from Standard Template Library) created to support a programmer’s work.

ASSESSMENT CRITERIA:
Lecture – the condition of passing is obtaining positive grade from written exam.
Laboratory – the condition of passing is obtaining positive grades from all laboratory subjects according to the program of the laboratory.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
Course code: 06.0-WE-I-UC-PK22_S1S
Type of course: compulsory
Entry requirements: Mathematical foundations of engineering, logic for computer science, Experiment methodology I, computer architecture I
Language of instruction: Polish
Director of studies: Professor Marian Adamski
Name of lecturer: Professor Marian Adamski

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COURSE CONTENTS:


*Registers.* Registers with Load Enable and with Parallel Load. Register Transfers. Shift Registers, Shift Registers with Parallel Load, Bidirectional/Universal Shift Registers.


*Introduction to VHDL Language.*
LEARNING OUTCOMES:
Demonstrate knowledge of fundamental Boolean principles and manipulation and their application to digital design. In-depth understanding of combinational and sequential digital/logic circuits, and modular design techniques. Ability to analyze and synthesize logic circuits. Basic understanding of datapath and control unit design and memory basics.

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass is scoring sufficient marks for all laboratory exercises.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
**COMPUTER NETWORKS I**

Course code: 11.3-WE-I-SK1-PK23_S1S  
Type of course: compulsory  
Entry requirements: none  
Language of instruction: Polish  
Director of studies: Dr Marcin Mrugalski  
Name of lecturer: Dr Marcin Mrugalski

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**Course contents:**

*Introduction to computer networks:* Classification of computer networks. Reference models: ISO/OSI and TCP/IP.  
*Transport layer:* Functions and TCP and UDP transports protocols.  
*Session, presentation and application layers:* Functions and protocols. Internet technology components.  
*Introduction to routers:* Router components and operation. User interface and configuration principle. Troubleshooting.

**Learning outcomes:**

Abilities and competence in implementation and configuration of simple local area network connected to Internet, IP address management, switch and router configuration.

**Assessment criteria:**

Faculty of Electrical Engineering, Computer Science and Telecommunication  
Computer Science
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
OPERATING SYSTEMS I

Course code: 11.3-WE-I-SO1-PK25_S1S
Type of course: compulsory

Principles of Programming, computer architecture I and II, algorithms and data structures.

Language of instruction: English

Director of studies: Professor Krzysztof Patan
Name of lecturer: Professor Krzysztof Patan

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COURSE CONTENTS:

Computer system structure: Operating memory, CPU, I/O devices, idea of the interrupt, dual model of system operation.

Operating systems types: Batch systems, multiprogramming systems, time-sharing (multi-tasking) systems, parallel systems, distributed systems, networked systems, real-time operating systems.

Operating systems design. Basic components of operating systems. Operating systems services. Kernel based systems, virtual machines. System calls.


LEARNING OUTCOMES:
Skills and competences in computer systems and operating systems design. To learn about process scheduling, memory management, file system design. Ability to administrate and configure the operating systems Windows XP/Vista/7/8 and Windows Server 2008.

ASSESSMENT CRITERIA:
Lecture – the passing condition is to obtain a positive mark from the final test.
Laboratory – the passing condition is to obtain positive marks from all laboratory exercises to be planned during the semester.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
COMPUTER GRAPHICS

Course code: 11.3-WE-I-GK-PK26_S1S
Type of course: compulsory
Entry requirements: Principles of programming, software tools.
Language of instruction: Polish
Director of studies: Professor Sławomir Nikiel
Name of lecturer: Professor Sławomir Nikiel

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FULL-TIME STUDIES

COURSE CONTENTS:
Introduction to computer graphics and digital imaging. Input/output devices, acquisition and display of digital images. Application cases in education, entertainment, architecture, industry and healthcare.
Textures. Fractals in computer graphics.
Programming form computer graphics. OGL, DirectX, Cg, PYTHON.

LEARNING OUTCOMES:

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
Skills and competences in programming and design for computer graphics, digital image synthesis and image processing. Awareness of the nature of the interface between application software and graphics packages. Modeling two- and three-dimensional geometry and object representation.

ASSESSMENT CRITERIA:
Laboratory – coursework involving design and development of an application that requires graphical input, manipulation and output.

RECOMMENDED READING:
5. Various web-based sources.

OPTIONAL READING:
-

REMARKS:
SOFTWARE ENGINEERING

Course code: 11.9-WE-I-IO-PK27_S1S
Type of course: compulsory
Entry requirements: Principles of programming, high level programming
Language of instruction: Polish
Director of studies: Professor Sławomir Nikiel
Name of lecturer: Professor Sławomir Nikiel

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COURSE CONTENTS:

Introduction to software engineering. Why engineering software is different? Software lifespan and maintenance. Lifecycle models with specified project phases.

Information systems. System and software design. Models for information systems.


Reliability and system security.


CASE. Computer Aided Software Engineering. Upper and Lower CASE, CASE workbenches.  
Configuration and maintenance. Evolution of information systems.

LEARNING OUTCOMES:
To develop students’ attitude that the maintaining the production of software requires an engineering approach. It is done by introducing phases of the software lifecycle and presenting techniques for these phases.

ASSESSMENT CRITERIA:
Lecture – one written test of 1.5 hours (75%) and coursework (25%) involving projects.  
Project – a completed project involving analysis, design and development of an information system

RECOMMENDED READING:

OPTIONAL READING:  
-

REMARKS:
Course code: 11.3-WE-I-BD-PK28_S1S
Type of course: compulsory
Entry requirements: Principles of programming
Language of instruction: Polish
Director of studies: Dr. Agnieszka Węgrzyn
Name of lecturer: Dr. Agnieszka Węgrzyn

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COURSE CONTENTS:

*Introduction to databases:* relational model, hierarchical model, network model, XML model, object-oriented databases

*The relational model:* Relational data objects and SQL; Relational operators and SQL; Relational data integrity, Entity-Relationship Diagram – ERD, normalize relations into normal forms

*Introduction to SQL:* create tables, insert, delete, update data, select statements, subquery, relational operators and constraint, create sequences, create view, create and manage indexes, built-in SQL functions, transactions

*Introduction to PL/SQL:* PL/SQL types and operators, SQL in PL/SQL, cursors, exceptions, procedures, functions, packages, triggers, built-in packages

LEARNING OUTCOMES:

Using of selected relational database management systems (RDBMS); design and implementation of relational database structures / models, SQL language; design of database applications; conceptual, logical, and physical database design
ASSESSMENT CRITERIA:
Lecture - pass exam.
Laboratory - positive marks for all exercises.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
E L E M E N T S  O F  A R T I F I C I A L  I N T E L L I G E N C E

Course code: 11.4-WE-I-ESI-PK29_S1S
Type of course: compulsory
Entry requirements: Programming fundamentals
Language of instruction: Polish
Director of studies: Dr. Marek Kowal
Name of lecturer: Dr. Marek Kowal

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Full-time studies

Course contents:


First-order logic. Syntax and Semantics of first-order logic. Inference in first order logic. Atomic and complex sentences.


Learning outcomes:

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
Skills and competences in: solving problems using searching algorithms, developing heuristic functions, solving problems using local search algorithms, solving adversarial problems using minimax algorithms, using and understanding first-order logic, solving problems of planning and scheduling by search algorithms, applying probabilistic and uncertain reasoning to solve problems, applying learning algorithms to acquire knowledge from observation, applying segmentation and edge detection algorithms to object recognition problems.

ASSESSMENT CRITERIA:
Lectures – Successful completion of the course requires passing the final examination.
Laboratory – Successful completion of the laboratory requires completion of all laboratory activities.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
EXPERIMENTAL TECHNIQUES I

Course code: 11.9-WE-I-TE1-PD34_S1S
Type of course: compulsory
Entry requirements: none
Language of instruction: Polish
Director of studies: Professor Ryszard Rybski
Name of lecturer: Professor Ryszard Rybski

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Full-time studies

COURSE CONTENTS:

Information: acquisition and processing. Information as a basic factor for civilisation development of a contemporary society, information society. Experiment as a basic manner of collection information about an object, phenomenon or process. Basic concepts of the information theory.

Elements of the experiment theory. Designing experiments. General rules and procedures for carry out experiments. The significance of mathematical modelling in the experiment methodology. Measurement as a basic element of the experiment methodology.

General characteristics and basic elements of measurement information acquisition systems. The relations of information acquisition systems with data telecommunication systems of information processing and computer control systems.


LEARNING OUTCOMES:

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
Skills and competences in: basics in designing and conducting experiments; analysing, developing and documenting experiment results.

ASSESSMENT CRITERIA:
Lecture – the credit is given for obtaining positive grades in written tests carried out at least once a semester
Laboratory – the credit is given for obtaining positive grades in all laboratory exercises to be carried out according to the laboratory syllabus.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
COMPUTER NETWORKS II

Course code: 11.3-WE-I-SK2-PD36_S1S

Type of course: compulsory

Entry requirements: Computer networks I

Language of instruction: Polish

Director of studies: Dr. Marcin Mrugalski

Name of lecturer: Dr. Marcin Mrugalski

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COURSE CONTENTS:
IP address management: Sub-netting with the application of VLSM. IP addresses aggregation. Private addressing with NAT and PAT implementation.


Network security: Standard and extended access control list configuration. Dynamic access control list. Reflexive access control list. Context-base access control list. Firewalls, IPS, IDS and DMZ.

Ethernet switches: architecture, futures and configuration of the switches in the hierarchical computer networks. VLANs and their configuration. STP, RSTP and Rapid PVST+ algorithms. VLANs internetworks routing.

WAN technologies: ISDN, xDSL, ATM, FrameRelay, SONET, UMTS.

LEARNING OUTCOMES:
Student is able: to configure switches and routers, to describe distance vector and link state routing protocols, to choose appropriate interior and exterior gateway routing protocols, to manage IP addresses and apply NAT and PAT mechanisms.

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
Student has knowledge about sources of hazards in security of computer networks and he is able to prevent them with the application of the ALC, Firewalls, IPS, IDS and DMZ. Student is able to describe, choose and apply different WAN technologies.

ASSESSMENT CRITERIA:
Lecture – in order to get a credit it is necessary to pass all tests (oral or written) carried on at least once per semester.
Laboratory – in order to get a credit it is necessary to get positive grades for all laboratory works defined by the tutor.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
JAVA AND WEB TECHNOLOGIES

Course code: 11.3-WE-I-SK2-PD37_S1S
Type of course: compulsory
Entry requirements: Object-oriented programming.
Language of instruction: English
Director of studies: Dr. Andrzej Marciniak
Name of lecturer: Dr. Andrzej Marciniak

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Full-time studies

COURSE CONTENTS:

Java fundamentals. Data-types, operators, instructions, objects and classes, packages, interfaces and inner classes, exceptions, inheritance, strings, utilities, streams, serialization.

Java advanced features. Multi-threading, collections, database connections, distributed objects, Java Beans, security, localisation, reflections.

Media and graphics in Java. Graphical user-interface, image processing, MIME formats, AWT and SWING.

Networking. Socket programming, client-server architecture, implementing servers, resource locators and identifiers, harvesting information from the Web.


LEARNING OUTCOMES:
Complete knowledge of the syntax and structure of the Java programming language and how to create Java applications that run on server and desktop systems. An ability to design within Java environment a system, component or process to meet the desired needs. Use of modern engineering tools such as Eclipse and NetBeans for the development and implementation of programs. Being familiar with Java enterprise design patterns and anti-patterns. An ability to design interactive Web applications.

ASSESSMENT CRITERIA:
Lecture – written final and oral (optional) examination.
Laboratory - assessment is continuous during the semester, and consists of individual and group assignments, class participation, short-tests, laboratory reports.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
### Course Code: 11.3-WE-I-PWR-PD38_S1S
### Type of Course: compulsory

**Entry Requirements:** Principles of programming, object-oriented programming, computer architecture

**Language of Instruction:** Polish

**Director of Studies:** Dr Tomasz Gratkowski

**Name of Lecturer:** Dr Tomasz Gratkowski

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### Course Contents:
- Concurrent programming – basic concept: process, shared resources, critical section, mutual exclusion, synchronization, deadlock, starvation.
- Aims of concurrent programming. Advantages and disadvantages of concurrent programming.
- Semaphores: general semaphore, binary semaphore, synchronization of processes with usage of semaphores.
- Concurrent programming in Java. Monitors. Additional methods of threads synchronization: blocking queued, barriers, countdown of latch and exchanger.
- Characterization of Distributed Systems. Inter-process communication. Guidelines for design of inter-process communication.

LEARNING OUTCOMES:
Abilities and competence in design and implementation software consist of many processes and in distributed environment.

ASSESSMENT CRITERIA:
Lecture – in order to get a credit it is necessary to pass all tests (oral or written) carried on at least once per semester.
Laboratory – in order to get a credit it is necessary to earn positive grades for all laboratory works defined by tutor.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
OPERATING SYSTEMS II

Course code: 11.3-WE-I-SO2-PD39_S1S
Type of course: compulsory/optional
Entry requirements: Operating systems I, principles of programming.
Language of instruction: English
Director of studies: Dr Wojciech Zając
Name of lecturer: Dr Wojciech Zając

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COURSE CONTENTS:
Operating system: construction, features, selection for a given purpose.
Displaying the text files. Access rights. FTP. VI editor.
Find command.
Shell programs. Configuration files, variables.
Streams and pipelines. Redirecting data. Filters. Regular expressions.
Advanced processing of test files. sed editor. awk filter.
Element of system administration.

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
LEARNING OUTCOMES:
Abilities and competence in using and administrating UNIX/Linux systems

ASSESSMENT CRITERIA:
Lecture – written test.
Laboratory - written test.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
PROJECT MANAGEMENT

Course code: 11.9-WE-I-ZPG-PD32_S1S
Type of course: compulsory
Language of instruction: English
Director of studies: Dr Anna Pławiak-Mowna
Name of lecturer: Dr Anna Pławiak-Mowna

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COURSE CONTENTS:
LEARNING OUTCOMES:
The aim of this course is to equip the student with the skills and knowledge of a conceptual framework for the discipline of IT project management, engineering project planning, project management, phases of the project life cycle, human resource management, project planning and management control.

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
MANAGEMENT OF SMALL AND MEDIUM ENTERPRISES

Course code: 04.9-WE-I-ZMSP-POW_A_7_S1S
Type of course: compulsory
Entry requirements: None
Language of instruction: Polish
Director of studies: Janusz Szajna, Ph.D., D.Sc.
dr Anna Pławiak-Mowna
Name of lecturer: Janusz Szajna, Ph.D., D.Sc.
dr Anna Pławiak-Mowna

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COURSE CONTENTS:


Development of decision on starting a company. The idea of starting a private company. General concept of creating a company. Significance of following factors: location, area of operation, supply and demand, competition, risk. Sources of financing the company start-up. Estimation of: economic profitability, threats and barriers, opportunities and development chances. Decision on starting a company.
Choice of a business subject. A single entrepreneur and co-partner. A private company run by a natural person. Freelance company. Private family company. Companies: a civil partnership, a general partnership, a partnership, a registered company, a limited liability company, a limited joint-stock company. Legal personality of companies.

Procedure of starting the company (action plan). Administrative, formal and legal procedure. Plan of actions connected with a company start-up, starting a private company by a natural person; starting a freelance company; starting a family business; starting a civil company, a general partnership, a partnership, a registered company, a limited liability company, a limited joint-stock company; obtaining licences or permissions.


Beginning of a company activity. Establishing proper registers and necessary records. Setting organizational structure and workflow. Creating work positions and employing new workers. Assuring proper work conditions as well as material and equipment. Promotion, advertising, marketing, methods of sales and company management.

LEARNING OUTCOMES:
Skills and competences in: starting a company, choosing a business entity, elaboration of a business plan and company management.

ASSESSMENT CRITERIA:
Lecture: to obtain a credit a student has to get positive grades in all written or oral tests carried out at least once a semester.

RECOMMENDED READING:

OPTIONAL READING:

REMARKS:
**IT SYSTEM DESIGN**

Course code: 11.3-WE-I-PSI-PS40_ISM_S1S

Type of course: **optional**

Entry requirements: Databases, principles of programming, computer architecture.

Language of instruction: Polish

Director of studies: Dr. Agnieszka Węgrzyn

Name of lecturer: Dr. Agnieszka Węgrzyn

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**COURSE CONTENTS:**

Basic functionalities of IT systems.

IT system design methodology (system life cycle phases: requirements analysis, design, implementation, testing, installation, maintenance). IT systems design methodologies classification.

Life cycle models for IT system.

Types of system documentation (General - at the stage of analysis, Technical - at the stage of design and implementation, System manuals).

Modeling in UML. CASE tools.

**LEARNING OUTCOMES:**

Skills and competence in: analysis and design of IT systems.

**ASSESSMENT CRITERIA:**

Lecture - pass exam.

Laboratory - positive marks for all exercises.

**RECOMMENDED READING:**

Faculty of Electrical Engineering, Computer Science and Telecommunication

Computer Science


**OPTIONAL READING:**

- 

**REMARKS:**
Course code: 06.0-WE-I-JMSC-PS42_ISM_S1S
Type of course: optional
Entry requirements: Digital system design, principles of programming, computer architecture.
Language of instruction: Polish
Director of studies: Dr. Marek Węgrzyn
Name of lecturer: Dr. Marek Węgrzyn

COURSE CONTENTS:
Introduction to SystemVerilog. Hardware/Software co-simulation.

LEARNING OUTCOMES:
Skills and competence in: modeling, simulation and synthesis of digital systems using Hardware Description Languages (HDLs).

ASSESSMENT CRITERIA:
Lecture - pass test.
Laboratory - positive marks for all exercises.

RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:
DATASAFETYANDCRYPTOGRAPHY

Course code: 11.3-WE-I-BDIEK-PS43_ISM_S1S
Type of course: optional
Entry requirements: Basics of programming (Pascal or C/C++), digital circuits (but not obligatory)
Language of instruction: Polish
Director of studies: Dr. Remigiusz Wiśniewski
Name of lecturer: Dr. Remigiusz Wiśniewski

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COURSE CONTENTS:

Introduction: Fundamentals of cryptography and data safety, cryptosystems, basics of encryption and decryption, classic cryptography (transposition ciphers and substitution ciphers; Caesar cipher, Vigenère cipher, XOR, etc.). Implementation of the basic algorithms in programming languages.

Symmetric-key algorithms: Key management, block ciphers (DES, AES, Blowfish) and stream ciphers (RC4). Implementation in programming languages (C, C++, Java, Assembler, Pascal). Hardware implementation (with programmable devices - FPGAs).

Asymmetric-key algorithms: Public and private keys, hash functions. Main protocols and cryptosystems (Diffie-Hellman, RSA, SHA, MD5, etc.). Implementation in programming languages (C, C++, Assembler, Pascal). Hardware implementation (with programmable devices - FPGAs).


Cryptanalysis: Main goals of cryptanalysis. Weakness of particular cryptosystems. Data safety. Debugging of computer applications and programs.

Data security and protection of applications: Fundamentals of data protection of programs and applications (based on MS Windows operation system). Processes management and debugging. Software debuggers and kernel mode debuggers.
LEARNING OUTCOMES:
Basic knowledge and competence in data safety (data protection, digital signature and smartcards security), basic knowledge of cryptosystems and cryptology (cryptography and cryptanalysis), as well as practical implementation of cryptographic algorithms: software (Pascal, C/C++, Java, etc.) and hardware (FPGAs).

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.
Project – the main condition to get a pass are sufficient marks for all projects conducted during the semester.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
**COMPUTER SCIENCE GROUP PROJECT**

Course code: 11.3-WE-I-GPI-PS44_ISM_S1S
Type of course: **obligatory**
Entry requirements: None
Language of instruction: Polish
Director of studies: dr inż. Anna Plawiak-Mowna
Name of lecturer: dr inż. Anna Plawiak-Mowna

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**COURSE CONTENTS:**
Topics of projects are agreed with entrepreneurs from the regional IT sector. As part of the project, students will learn theoretical and practical aspects of the following issues:
- The roles of project participants
- The implementation stages of the project
- Scheduling and job accounting
- Solving problems and conflicts
- Review and verify the progress of the task
- The implementation of an IT project
- Verification of the results, analysis of mistakes, discussion methods of remedial.

**LEARNING OUTCOMES:**
Skills and competences in: creating student's own work schedule and the team work schedule; evaluating and reviewing the progress of the tasks, analyzing mistakes and corrective methods; applying techniques and tools of project management. Student is aware of the aspect of taking up roles in the project.

**ASSESSMENT CRITERIA:**
Project – the main condition to get a pass are sufficient marks for all exercises conducted during the semester.

---

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
RECOMMENDED READING:

5. Szyjewski Z.: Metodyki zarządzania projektami informatycznymi, Mikom, Warszawa, 2004
6. Wróblewski P.: Zarządzanie projektami informatycznymi dla praktyków, HELION, Gliwice, 2005

OPTIONAL READING:

REMARKS:
DIGITAL PROCESSING OF VISUAL DATA

Course code: 11.3-WE-I-CPIKP_PSW_B41_ISM_S1S
Type of course: optional
Entry requirements: Principles of programming
Language of instruction: English
Director of studies: Wojciech Zając PhD
Name of lecturer: Wojciech Zając PhD

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Full-time studies

COURSE CONTENTS:
Discrete convolution. Fourier series. Fourier transform. Frequency-domain analysis. DCT and DWT transforms
MatLab environment. Features, extension packs
Image processing modelling in Matlab. Simple transformations. Filtering, convolution.
Image processing: filtering, transformations.
Modelling of the image processing system. Decorelation, quantisation.
Discrete Cosine Transform.
Discrete Wavelet Transform.

LEARNING OUTCOMES:
Competence and understanding of principles of digital processing of visual data.

ASSESSMENT CRITERIA:
Lecture and laboratory – written test.
Project - report on a project.
RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:
# Programming of Business Applications

**Course code:** 11.3-WE-I-PAB-PSW_B41_ISM_S1S  
**Type of course:** optional  
**Entry requirements:** Basics of computer programming  
**Language of instruction:** Polish  
**Director of studies:** Dr Jacek Bieganowski  
**Name of lecturer:** Dr Jacek Bieganowski

## COURSE CONTENTS:

## DISCRETE WAVELET TRANSFORM LEARNING OUTCOMES:
Basic knowledge and competence in design of business applications. Application of proper design method, programming environment and language to specific problem. Ability to access data from relational databases.

## ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.
Project – the main condition to get a pass are sufficient marks for all projects conducted during the semester.

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RECOMMENDED READING:


OPTIONAL READING:

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REMARKS:
Course code: 11.3-WE-I-ASI-PSW_C45_ISM_S1S

Type of course: optional

Entry requirements: Databases, Database Management Systems

Language of instruction: Polish

Director of studies: Dr. Artur Gramacki

Name of lecturer: Dr. Artur Gramacki

Form of instruction | Number of teaching hours per semester | Number of teaching hours per week | Semester | Form of receiving a credit for a course | Number of ECTS credits allocated
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Laboratory | 30 | 2 | VI | Grade | |
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Project | 15 | 1 | | Grade | |

COURSE CONTENTS:

Preliminary information. Database management systems (DBMS) as the complex computer /information systems. Hardware and software considerations, versions, patches, technical support, documentation. Four different administration specializations: network administrator, systems administrator, database administrator, application administrator and their coexistence.

Pre installation tasks. Setting up the environment. Overview of the installation process. Installation methods (manual or using response files), software editions and product options. Installing and checking the operating system requirements. Checking the secure network setup. Creating required operating systems groups, users, file systems.

Installation. Accessing the installation software. Extracting the installation files. Mounting appropriate storage systems. Choosing the required options, setting up startup initial parameters, physical data structures, final installation process.


Main administration tasks. Patching and backing up the system. Establishing recovery policies. Controlling the physical and logical database structures. Monitoring users and system activities, auditing. Managing user accounts, user privileges, user and system roles. SQL tuning. RDBMS tuning.
LEARNING OUTCOMES:
Engineering skills in administering of a selected computer database system

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass is scoring sufficient marks for all laboratory exercises.
Project – the main condition to get a pass is scoring sufficient mark for an individual project given (design, implementation, testing).

RECOMMENDED READING:
1. Oracle Linux Guides.
2. Oracle Documentation: Security Guide
3. Oracle Documentation: DBA
4. Oracle Documentation: Performance Tuning Guide
5. Oracle Documentation: Administrator's Guide

OPTIONAL READING:

REMARKS:
DATA WAREHOUSE AND DATA MINING

Course code: 11.3-WE-I-WHDIBW-PSW_C45_ISM_S1S

Type of course: optional

Entry requirements: Databases, Database Management Systems

Language of instruction: Polish

Director of studies: Dr. Artur Gramacki

Name of lecturer: Dr. Artur Gramacki

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COURSE CONTENTS:


LEARNING OUTCOMES:

Engineering skills in design and implementation of data warehouses and data mining structures and algorithms.
ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass is scoring sufficient marks for all laboratory exercises.
Project – the main condition to get a pass is scoring sufficient mark for an individual project given (design, implementation, testing).

RECOMMENDED READING:

OPTIONAL READING: 
-

REMARKS:
DIGITAL SYSTEMS TESTING

Course code: 06.0-WE-I-DSC-PSW_D46_ISM_S1S

Type of course: optional

Entry requirements: Digital circuits, digital systems modeling language

Language of instruction: Polish

Director of studies: Dr Michał Doligalski

Name of lecturer: Dr Michał Doligalski

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COURSE CONTENTS:

LEARNING OUTCOMES:
Skills and competences in diagnostic techniques of the microinformatics systems embedded in FPGA devices. Knowledge of operation and ability to use of digital diagnostic equipment (digital oscilloscope, logic analyzer). Knowledge of the principles for estimating and eliminating measuring error and the ability to choose a diagnostic tool for testing the microinformatic system. Ability to increase the reliability of microinformatics systems in stage of testing. Knowledge of protocols and the ability to serial buses debug (I2C, SPI, RS-232, CAN).

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient mark for test at the end of the semester. Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester. 
Project – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
INFORMATION SYSTEMS TESTING

Course code: 06.0-WE-I-TSI-PSW_D46_ISM_S1S

Type of course: optional

Entry requirements: Digital circuits, digital systems modeling language

Language of instruction: Polish

Director of studies: Michał Doligalski, Ph.D.

Name of lecturer: Michał Doligalski, Ph.D.

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COURSE CONTENTS:
for the analysis of digital systems. Embedding of test cores inside the embedded systems (ChipScope Pro).

LEARNING OUTCOMES:
Skills and competences in diagnostic techniques of the software and embedded systems. Knowledge of operation and ability to use of digital diagnostic equipment. Knowledge of the principles for estimating and eliminating measuring error and the ability to choose a diagnostic tool for testing the microinformatic system. Ability to increase the reliability of microinformatics systems in stage of testing. Knowledge of preparing, performing and monitoring of test.

ASSESSMENT CRITERIA:

Lecture – the main condition to get a pass are sufficient mark for test at the end of the semester.
Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.
Project – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

RECOMMENDED READING:


OPTIONAL READING:

- 

REMARKS:
OPERATIONAL SYSTEM LEVEL PROGRAMMING

Course code: 11.3-WE-I-PPSO-PSW_E47_ISM_S1S

Type of course: optional

Entry requirements: Fundamentals of programming, programming in C/C++ language

Language of instruction: Polish

Director of studies: Dr Grzegorz Łabiak

Name of lecturer: Dr Grzegorz Łabiak

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COURSE CONTENTS:

Windows operational system architecture.
Application Programming Interface – API functions.
Program environment under operational system conditions: application, event, message queue.
Program scheme under operational system conditions: window function, message, message loop.
WM_PAINT message handling, client area, graphic device context.
Graphic device context objects: pen, brush, bitmap, font.
Resources. Creation and using resources: menu, dialog box, writing text strings.
Menu dynamic creation and its handling.
Creation and programming own dialog boxes.
Static libraries (*.lib) and dynamic libraries (*.dll).
OpenGL library.
DirectX technology.
LEARNING OUTCOMES:

After completion of this course students will possess skills in implementing low-level programming using Windows API functions.

ASSESSMENT CRITERIA:

Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.

Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Project – the main condition to get a pass is to carry out a program assignment of moderate complexity.

RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
DESIGN OF MULTITIER WEB SYSTEMS

Course code: 11.3-WE-I-PWSI-PSW_E47ISM_S1S
Type of course: optional
Entry requirements: Principles of programming
Language of instruction: Polish
Director of studies: Dr Tomasz Gratkowski
Name of lecturer: Dr Tomasz Gratkowski

| Form of instruction | Number of teaching hours per semester | Number of teaching hours per week | Semeste r | Form of receiving a credit for a course | Number of ECTS credits allocated |
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| Lecture             | 15                                    | 1                                | VI        | Exam                                  | 6                               |
| Class               |                                       |                                  |           |                                       |                                 |
| Laboratory          | 30                                    | 1                                |           | Grade                                 |                                 |
| Seminar             |                                       |                                  |           |                                       |                                 |
| Project             | 15                                    | 1                                |           | Grade                                 |                                 |

COURSE CONTENTS:
Presentation tier: Getting Started with Web Applications. Technologies for creating dynamic Web sites and rich internet applications (RIA).
Data Tier: Object/relational data mapping. Data model on all tiers in multi-tier system.

LEARNING OUTCOMES:
Design and programming skills in multi-tier systems.
Integration of heterogeneous systems.
Foundational knowledge and skills required to build business application.
ASSESSMENT CRITERIA:

Lecture – in order to get a credit it is necessary to pass all tests (oral or written) carried on at last once per semester
Laboratory – in order to get a credit it is necessary to earn positive grades for all laboratory works defined by tutor

PROJECT – POSITIVE MARK OF THE PROJECT

RECOMMENDED READING:


OPTIONAL READING:


REMARKS:
MOBILE TECHNOLOGIES AND APPLICATIONS

Course code: 11.3-WE-I-TAM-PSW_E47_ISM_S1S

Type of course: optional

Entry requirements: Principles of programming

Language of instruction: Polish

Director of studies: Dr Jacek Tkacz

Name of lecturer: Dr Jacek Tkacz

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Full-time studies

COURSE CONTENTS:

Introduction into designing mobile application Preparation and setup developer environment. Emulation of mobile systems. Developing and debugging mobile applications using the emulators and physical devices.

User interfaces. The design and the implementation of GUI of mobile applications. Rich Internet Applications (RIA) technology for design of mobile user interfaces.


Exchange information between mobile application and external environment. Communications by using wireless technology: Wireless network (WiFi), BLUETOOTH. XML language as universal format of data exchange.. Web services (SOAP) technology for universal data exchange. Data serialization using JSon technology.

Localization. Global Positioning System. Serial communication with internal and external GPS modules. GPS communication protocol NMEA-0183. Positioning by using WiFi and GSM information.

LEARNING OUTCOMES:

Basic knowledge about available mobile technologies and competence in practical mobile application development.
**ASSESSMENT CRITERIA:**

Lecture – the main condition to get a pass are sufficient marks in written exam. Laboratory – the main condition to get a pass are sufficient marks for all laboratory exercises and tests conducted during the semester.

Project – the main condition to get a pass are sufficient marks for individual task conducted during the semester. There is also possible, that larger tasks can be carried out in groups, but each student will be assessed individually.

**RECOMMENDED READING:**

5. Baddeley G. „NMEA sentence information” [link](http://home.mira.net/~gnb/gps/nmea.html)
7. MICROSOFT MSDN [link](http://msdn.microsoft.com/pl-pl/default.aspx)
8. BLUETOOTH [link](http://www.bluetooth.com)
9. CODEGURU [link](http://www.codeguru.com/)

**OPTIONAL READING:**

-

**REMARKS:**
MICROPROCESSOR CIRCUITS AND SYSTEMS

Course code: 06.5-WE-I-USM-PS40_PSI_S1S

Type of course: optional

Entry requirements: Computer architecture, principles of programming, digital system design

Language of instruction: Polish

Director of studies: Dr. Mirosław Kozioł

Name of lecturer: Dr. Mirosław Kozioł

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COURSE CONTENTS:


Instructions. Instruction and machine cycle. Basic addressing modes. Basic groups of instructions in microcontrollers.

Memories in microprocessor systems. Basic memory types. Basic memory parameters. Sample timing charts during read and write operations. Examples of memory chips used in microprocessor systems based on microcontrollers.

Interfacing peripherals to the system bus. Isolated and memory mapped input-output devices. Address decoder design on the basis of middle scale digital circuits and SPLDs with examples.

Handling of peripherals. Polling. Interrupt system. Direct memory access.

Local serial interfaces. I²C, SPI.

MCS-51 family of microcontrollers as an example of single-chip microcomputer. The most significant features of their architecture. Functional blocks. Interfacing of external program and data memory. Embedded peripheral systems i.e. timer-counters and serial interface. Interrupts. Parallel ports. Power-saving modes of operation. Programming examples of embedded peripherals in assembler and C.

**Basic user interface in microprocessor system.** Keyboard. LED and LCD displays. Service of user interface by software.


**LEARNING OUTCOMES:**

Skills and competences: design and programming of microprocessor systems, their peripheral systems, user interfaces and local serial interfaces.

**ASSESSMENT CRITERIA:**

- **Lecture** – to receive a final passing grade student has to receive positive grade from examination.
- **Laboratory** – to receive a final passing grade student has to receive positive grades in all laboratory exercises provided for in the laboratory syllabus.
- **Project** – to receive a final passing grade student has to receive positive grades in all projects in semester.

**RECOMMENDED READING:**


**OPTIONAL READING:**

- **REMARKS:**
MANAGEMENT INFORMATION SYSTEMS

Course code: 11.9-WE-I-SIZP-PS41_PSI_S1S

Type of course: optional

Entry requirements: Databases, software engineering, object-oriented programming

Language of instruction: Polish

Director of studies: Professor Wiesław Miczulski, Dr Marek Florczyk

Name of lecturer: Professor Wiesław Miczulski, Dr Marek Florczyk

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COURSE CONTENTS:


Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science

Customer Relationship Management (CRM): CRM in firm, connections to other systems. CRM structure. CRM implementation.


LEARNING OUTCOMES:

Design and implementation of Management Information Systems and CRM Systems for small business;

ASSESSMENT CRITERIA:

Lectures - Student performance may be assessed by examination.
Laboratory - Student performance may be assessed by quizzes, case studies, oral reports, group discussion, written reports or presentations. The instructor reserves the option to employ one or more of these assessment methods during the course.

RECOMMENDED READING:


OPTIONAL READING:

REMARKS:
COMPUTER-AIDED DESIGN

Course code: 11.9-WE-I-KWP-PS42_PSI_S1S

Type of course: optional

Entry requirements: Principles of programming, algorithms and data structures, computer architecture, experiment methodology I and II

Language of instruction: Polish

Director of studies: Dr. Janusz Kaczmarek

Name of lecturer: Dr. Janusz Kaczmarek

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COURSE CONTENTS:

Basic knowledge of the virtual instruments. Basic definitions. Characteristic of integrated software environments to designing the software for virtual instruments and measurement systems.


Introduction to programming in LabVIEW. Concept of the graphical programming language G. Building a front panel and block diagram. Basic and composite data types. Controlling program execution with loops and structures: for, while, shift-register mechanism, case, sequence, formula node. Operations on arrays and strings. Hierarchical programming. Global and local variables. Polling and event-driven
programming models. Characteristic of library functions for analysis and processing of measurement signals. Express technology.

**LEARNING OUTCOMES:**

Know-how and competences in the field of designing and creating the software for measurement systems with the use of specialized integrated software environments – LabVIEW and LabWindows.

**ASSESSMENT CRITERIA:**

*Lecture* – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.

*Laboratory* – the main condition to get a pass is scoring sufficient marks for all laboratory exercises.

**RECOMMENDED READING:**


**OPTIONAL READING:**

-  

**REMARKS:**
**INTERNET APPLICATIONS**

Course code: 1.3-WE-I-AI-PS43_PSI_S1S

Type of course: optional

Entry requirements: Principles of programming, algorithms and data structures, computer networks, databases

Language of instruction: Polish

Director of studies: Dr. Robert Szulim

Name of lecturer: Dr. Robert Szulim

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**COURSE CONTENTS:**

*Primary protocols and services of Internet.* Description of work of protocols: TCP/IP, HTTP and FTP.

*WWW and FTP servers.* Description of work of servers, configuration and management.

*Client – Server Databases.* Description of work, advanced server objects and designing of structures of databases.

*WWW Technologies.* Static and dynamic technologies of designing WWW pages - review.

*Microsoft .NET technology.* Description of basics of work of the technology.

*WWW forms.* Description of work of mechanisms of sending data through WWW pages.

*Databases and WWW.* Study of possibilities of building WWW pages with the access to databases.

*Security mechanisms.* Description of problem of security of work in WWW network.
LEARNING OUTCOMES:

Skills and competences in: designing of structures of databases, launching and configuring of WWW and FTP Servers, designing WWW portals with the access to databases.

ASSESSMENT CRITERIA:

*Lecture* – the condition of passing is obtaining positive grades from oral or written tests at least once a term.

*Laboratory* – the condition of passing is obtaining positive grades from all laboratory subjects according to the program of the laboratory.

RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:
INDUSTRIAL COMPUTER NETWORK

Course code: 11.9-WE-I-KSP-PS44_PSI_S1S

Type of course: optional

Entry requirements: -

Language of instruction: Polish

Director of studies: Dr Adam Markowski

Name of lecturer: Dr Adam Markowski

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Full-time studies

Grade

VI

COURSE CONTENTS:


*Access methods to a medium in industrial networks:* Master-Slave, Token-Passing, CSMA and TDMA.

*Standard communication protocols.* Characteristics of standard communication protocols: PROFIBUS, MODBUS, CAN, LonWorks, INTERBUS-S, ASI and HART.


*Analysis of communication efficiency and time parameters of selected protocols.* Time determination in industrial networks.

*Industrial network components.* Converters, amplifiers, concentrators, nodes, routers, bridges and gates. Integration of industrial networks with local computer networks.
Utility programs for creating intelligent devices operating in industrial network nodes. Software of serial digital interfaces for data exchange with industrial automation devices.


Industrial network analysers and testers. Properties of industrial networks analysers and testers.

Standards engineering of industrial network environments. Specifics of application areas for particular standards. Elements of industrial network designing.

LEARNING OUTCOMES:

Skills and competences in: creating simple applications for cooperation with measuring converter and executive systems equipped with serial communication interfaces, carrying out an analysis of a given project of a measuring – controlling system with industrial network segments related to the determination of communication properties of such a system, selection of industrial network components for a given industrial facility, the determination of communication properties of a proposed solution.

ASSESSMENT CRITERIA:

Lecture – the credit is given for obtaining a positive grade in written or oral tests carried out at least once in the semester.

Laboratory – the credit is given for positive grades in all laboratory exercises to be carried out according to the laboratory syllabus.

Project – the credit is given for positive grades in project exercises to be carried out according to the syllabus.

RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:
SIGNAL PROCESSING TECHNIQUES

Course code: 06.0-WE-I-TPS-PS45_PSI_S1S

Type of course: optional

Entry requirements: Experiment methodology I and II, microprocessor systems

Language of instruction: Polish

Director of studies: Dr Leszek Furmankiewicz

Name of lecturer: Dr Leszek Furmankiewicz

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COURSE CONTENTS:

- Signal description in the time and in the frequency domain. Basic parameters of deterministic signals. Description of stochastic signals. Fourier series development of periodical signals. Spectrum of periodic and aperiodic signals.
- Static and dynamic properties of measuring transducers. Static parameters. The methods of description the transducer static and dynamic parameters: transmittance, time characteristics and frequency characteristics. Dynamic properties of ideal and real transducers.
- Initial signals conversion Amplifying and filtering. Operational amplifiers in initial signals conversion circuit. Analog filters. Mathematical models of passive and active analog filters.

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science


LEARNING OUTCOMES:

Student can characterize and describe the signals and measuring transducers in the time domain and in the frequency domain. Is able to characterize the properties of a typical blocks of signal processing circuit. Student knows the principle of work of analog to digital converters and digital to analog converters. Student can measure the basic parameters of signals and of components present in analog and digital signal conversion circuit. Is able to do cooperative measuring experiments.

ASSESSMENT CRITERIA:

Lecture - scoring sufficient marks for written examination
Laboratory - scoring sufficient marks for all laboratory exercises

RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:
COURSE CONTENTS:


WLAN physical layer: Structure and parameters of physical layer. Physical layer technologies.


Access Points: Types of access points. Functioning modes of access points. Access point configuration.

Wireless networks WPAN: Bluetooth, ZigBee and UWB networks. Functioning and application areas.

Internet access wireless networks: WiMax networks.


Mobility in wireless networks: Characteristic of roaming. Roaming on layer 2. Roaming on layer 3 – mobile IP.


LEARNING OUTCOMES:

Abilities and competence: configuration of the access points and wireless client stations, design WLAN and WPAN wireless networks, hot-spots design, implementation of security methods in WLAN.

ASSESSMENT CRITERIA:

Lecture – in order to get a credit it is necessary to pass all tests (oral or written) carried on at least once per semester.
Project - in order to get a credit it is necessary to earn positive grades for all project tasks defined by tutor.

RECOMMENDED READING:


OPTIONAL READING:


REMARKS:

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
SOFTWARE FOR MEASUREMENT AND CONTROL EQUIPMENT

Course code: 11.9-WE-I-OSPS-PS47_PSI_S1S

Type of course: optional

Principles of programming, experiment methodology, computer network, internet applications

Entry requirements:
Principles of programming, experiment methodology, computer network, internet applications

Language of instruction: Polish

Director of studies: Dr. Leszek Furmankiewicz

Name of lecturer: Dr. Leszek Furmankiewicz

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COURSE CONTENTS:


*Data acquisition cards*. Classification and basic functional blocks of the data acquisition cards. Data acquisition cards programming, description of the software functions.

*SCPI standard*. SCPI device model, structure of commands, trigger system, status system. Profile of commands for example devices.

Virtual measurement instruments. The definition, structure and basic tags of virtual instruments. Virtual instruments programming. Examples of virtual instruments.

Programmable Automation Controllers (PAC). PAC in measuring and control systems as an example of B&R systems. Hardware and software architecture of PAC. Automation Studio - integrated software development environment. Process visualization in PAC.

Internet technologies in measurement and control systems. Embedded WWW servers. Hardware and software profiles of chosen embedded WWW servers.

**LEARNING OUTCOMES:**

Skills and competences in the range of the: understanding of functioning of the measurement and the control systems, creating software for measuring systems, creating software drivers for measuring instruments, using internet technology in measuring and control systems.

**ASSESSMENT CRITERIA:**

Lecture - scoring sufficient marks for written test
Laboratory - scoring sufficient marks for all laboratory exercises

**RECOMMENDED READING:**


**OPTIONAL READING:**

-

**REMARKS:**
FOUNDATIONS OF SOFTWARE MODELLING

Course code: 11.9-WE-I-PMP-PS40_SSI_S1S

Type of course: optional

Entry requirements: Object-oriented programming, software engineering.

Language of instruction: Polish

Director of studies: Dr Łukasz Hładowski

Name of lecturer: Dr Łukasz Hładowski

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COURSE CONTENTS:


Practical issues. Domain analysis. Work with use cases. General overview on design, deployment and testing. Presentation of dedicated UML-based design tools. Modelling of embedded systems.
LEARNING OUTCOMES:

Skills and competences in: applying object paradigm and related programming environments for solving design, implementation, testing and deployment problems in simple information systems; using UML language for formulation, description and solution of programming problems; using design patterns; design software according to OOP methodology; inspection of software project; proper choose of CASE tools; specification of requirements for software.

ASSESSMENT CRITERIA:

Lecture – the passing condition is to obtain positive mark from the exam; Laboratory – the passing condition is to obtain positive marks from all laboratory exercises to be planned within the laboratory schedule; Project – the passing condition is to obtain positive marks from all individual assignments provided within the project schedule.

RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS:
ADVANCED WEB TECHNOLOGIES

Course code: 11.3-WE-I-ZTUS-PS42_SSI_S1S

Type of course: optional

Entry requirements: Object-oriented programming, Java and Web technologies, computer networks I and II, concurrent and distributed programming

Language of instruction: English

Director of studies: Dr Andrzej Marciniak

Name of lecturer: Dr Andrzej Marciniak

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Full-time studies

COURSE CONTENTS:


LEARNING OUTCOMES:

Upon completion of this course, students will be able to do the following: demonstrate good understanding of J2EE architecture including J2EE design patterns and anti-patterns, demonstrate good understanding of Java server-side technologies, design and implement multitiered enterprise Web applications. Students will have ability to work with Web services including: design and launch, use of services published by others, perform matchmaking, conceptually model services and construct multiagent-based services.

ASSESSMENT CRITERIA:

Lecture – written final and oral (optional) examination.
Laboratory - assessment is continuous during the semester, and consists of individual and group assignments, class participation, short-tests, laboratory reports.

RECOMMENDED READING:


REMARKS:
SYSTEMS AND COMPUTER NETWORKS SECURITY

Course code: 11.3-WE-I-BSSK-PS43_SSI_S1S

Type of course: optional

Entry requirements: Computer networks

Language of instruction: Polish

Director of studies: Dr Bartłomiej Sulikowski

Name of lecturer: Dr Bartłomiej Sulikowski

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COURSE CONTENTS:


Certification of devices and systems.


Access to the system. Controlling user access to the system. Managing user access. Responsibilities of users. AAA systems.

LEARNING OUTCOMES:
Skills and competencies in the following areas: protection of computer networks and their individual components before the hazards, identifying threats and attacks, overseeing the design and operation of secure systems.

ASSESSMENT CRITERIA:
Lecture – sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – passing all exercises.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
GAME PROGRAMMING

Course code: 11.3-WE-I-PG3D-PSW_B44_SSL_S1S

Type of course: optional

Entry requirements: Principles of programming, software tools

Language of instruction: English

Director of studies: Professor Sławomir Nikiel

Name of lecturer: Professor Sławomir Nikiel

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COURSE CONTENTS:

Human factors. Human factors in perception of virtual environments. Developer and client of the three dimensional interactive graphics, models of interaction, ‘presence’ in virtual environments.


I/O devices. Hardware and software for 3D gaming and VR. Visual, aural, multimodal and haptic interfaces. Sensors and BCI (Brain-Computer Interfaces).


3D sound.
CAD tools for game development. Efficiency of the game and the game production process. Scripting games. Game design environments: XNA, Blender, Unreal Development Kit.

LEARNING OUTCOMES:
Skills and competences in programming and design for 3D game programming and interactive computer graphics. Awareness of the nature of the interface between application software and game engine packages. Modeling two- and three-dimensional assets.

ASSESSMENT CRITERIA:
Lecture – one written test of 1.5 hours (70%) and coursework (30%) involving laboratory projects.
Laboratory – coursework involving design and development of an application that requires real-time graphical input, manipulation and output.
Project- design and development of a game prototype application

RECOMMENDED READING:
4. Various web-based sources

OPTIONAL READING:
-

REMARKS:
**DIGITAL VIDEO**

Course code: 11.3-WE-I-FC-PSW_B44_SSI_S1S

Type of course: optional

Entry requirements: Principles of programming, software tools

Language of instruction: English

Director of studies: Professor Sławomir Nikiel

Name of lecturer: Professor Sławomir Nikiel

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**COURSE CONTENTS:**

*Introduction.* Digital media, perceiving motion picture and sound and time-based media. An introduction to multimedia systems and digital cinematography. Installation and configuration of multimedia tools.

*Multimedia devices.* Capturing streams. I/O devices for multimedia. Proper choosing and configuration according to the media standards (DVI, HDMI, FireWire, etc…)


*Digital sound.*
LEARNING OUTCOMES:
Skills and competences in programming and production for digital video and time-based computer graphics. Awareness of the nature of the digital media, digital film production, post-production, editing and distribution.

ASSESSMENT CRITERIA:
Lecture – one written test of 1.5 hours (70%) and coursework (30%) involving laboratory projects.
Laboratory – coursework involving design and development of an application that requires graphical input and manipulation of digital video.
Project- design and development of a digital video

RECOMMENDED READING:
4. Various web-based sources.

OPTIONAL READING:

REMARKS:
Course code: 11.3-WE-I-ZSP-PSW_C45_SSI_S1S
Type of course: optional
Entry requirements: Principles of programming, object-oriented programming
Language of instruction: Polish
Director of studies: Professor Marcin Witczak
Name of lecturer: Dr Marek Sawerwain

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COURSE CONTENTS:


- Database programming. Introduction to BDE. Elementary database programming components. Handling data sets (navigation, filters, searching, etc.) SQL – component TQuery. dbExpress technology. dbGo for ADO. Reports. Introduction to InterBase.

- Component development. VCL, CLX and Fire Monkey architectures. Developing VCL components. Shell applications for Windows. COM technology. COM technology vs Delphi.


LEARNING OUTCOMES:

Skills and competences: programming for Windows with RAD tools, programming database applications – desktop, client-server, multilayer, programming Internet applications.

ASSESSMENT CRITERIA:

Lecture – assessment condition: positive test marks
Laboratory – realisation of the projects related with the subject

RECOMMENDED READING:


OPTIONAL READING:

- 

REMARKS:
.NET PLATFORM

Course code: 11.3-WE-I-PDN-PSW_C45_SSI_S1S
Type of course: optional
Entry requirements: Programming fundamentals, Object oriented programming, Algorithms and Data Structures, Databases
Language of instruction: Polish
Director of studies: Dr Marek Sawerwain
Name of lecturer: Dr Marek Sawerwain

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COURSE CONTENTS:
Common Language Runtime. Elementary functions and services of CLR. Memory and other resources management. Thread management. Structure and configuration of metadata. Integration with Win32 DLL libraries. Methods of interaction between applications. Comparison between CLR and JVM.
Introduction to functional programming in F#: Introduction to F#. Review of functional programming style. Operators and data structures.
Creating components in .NET. Principles of designing, implementing and testing components. COM and COM+ technology overview.


Access data using ADO.NET. Review of ADO.NET objects. Database access methods.

Language Integrated Query – LINQ. Architecture of LINQ technology. LINQ queries to objects, databases, SQL databases and XML data. Parallel and serial LINQ queries.


LEARNING OUTCOMES:

Skills and competences: basic knowledge about the .NET platform structure, practical use of the programming tools from .NET platform, designing and building applications using Microsoft Visual Studio, writing advanced computer programs in C# language, reading and writing programs in F#, creating new components for .NET, usage of XML language in .NET environment, creating applications with the access to databases using ADO.NET, creating queries in LINQ technology, creating Internet services using ASP.NET.

ASSESSMENT CRITERIA:

Lecture – the main condition to get a pass is obtaining a positive grade in written or oral exam.
Laboratory – the main condition to get a pass are sufficient marks for all laboratory exercises and tests conducted during the semester.

RECOMMENDED READING:


OPTIONAL READING:

- 

REMARKS:
CONVERGENT NETWORKS

Course code: 11.3-WE-I-SK-PSW_E47_SSI_S1S

Type of course: optional

Entry requirements: Computer networks

Language of instruction: Polish

Director of studies: Dr Bartłomiej Sulikowski

Name of lecturer: Dr Bartłomiej Sulikowski

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COURSE CONTENTS:


QoS and security for convergent networks.


LEARNING OUTCOMES:

Operation of convergent networks and services integrated.
ASSESSMENT CRITERIA:
Lecture – sufficient marks in written or oral tests conducted at least once per semester.
Project – implementing the integrated services with security in network (group task).

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
DESIGNING COMPUTER NETWORKS

Course code: 06.0-WE-I-PSK-PSW_E47_SSI_S1S

Type of course: Optional

Entry requirements: Computer networks I, Computer networks II

Language of instruction: Polish

Director of studies: Dr Mrugalski Marcin

Name of lecturer: Dr Mrugalski Marcin

### Full-time studies

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**COURSE CONTENTS:**


*Characterizing the existing network.* Documenting the existing network. Updating the existing internetworking operation system software. Upgrading the existing computer devices. Performing a wireless site survey. Documenting network design requirements.


*Creating the network design.* Analyzing the requirements. Selecting the appropriate LAN topology. Designing the WAN and remote worker support. Designing wireless networks. Incorporating security.

Prototyping the campus network. Building a prototype to validate a design. Creating a test plan. Prototyping the LAN. Validating LAN technologies and devices. Testing the redundancy and resiliency of the network. Identifying risks or weaknesses in the design. Prototyping the server farm.

Prototyping the WAN. Prototyping remote connectivity. Simulating WAN connectivity in the simulation software and the laboratory environment. Validating the choice of devices and topologies. Prototyping remote worker support. Prototyping the VPN.

Preparing the proposal. Assembling the existing proposal information. Developing the plan of the implementation of the computer network. Estimating timelines and resources. Creating and presenting the proposal.

LEARNING OUTCOMES:
Developing the skills necessary to design small enterprise LANs and WANs; Introducing customer requirements, translating those requirements into equipment and protocol needs, and creating a network topology which addresses the needs of the customer; Familiarization how to create and implement a design proposal for a customer.

ASSESSMENT CRITERIA:
Lecture – positive mark from written tests or oral exams during semester.
Project – positive mark from a prepared project.

RECOMMENDED READING:

OPTIONAL READING:
-

REMARKS:
SERVICES IN MOBILE NETWORKS

Course code: 11.9-WE-I-USM-PS41_SSI_S1S
Type of course: optional
Entry requirements: Computer networks, Operating systems
Language of instruction: Polish
Director of studies: Dr Przemysław Jacewicz
Name of lecturer: Dr Przemysław Jacewicz

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COURSE CONTENTS:
The principles of operation and construction of the GPS network. Construction of backbone network. Voice calls, Short Message Service (SMS), Enhanced Messaging Service (EMS) and Multimedia Messaging Service (MMS).

LEARNING OUTCOMES:
Basic knowledge and competence in the principles of operation and construction of the GPS network, and UMTS.

ASSESSMENT CRITERIA:
Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.
Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Faculty of Electrical Engineering, Computer Science and Telecommunication
Computer Science
RECOMMENDED READING:

1. J. Kolakowski, J. Cichocki: UMTS System telefonii komórkowej trzeciej generacji, Wydawnictwa
Komunikacji i Łączności WKŁ, 2007 (in polish).
2. Aleksander Simon, Marcin Walczyk: Sieci komórkowe GSM/GPRS. Usługi i bezpieczeństwo, XYLAB,
2004 (in polish).
polish).

OPTIONAL READING:

- 

REMARKS:
Course code: 11.3-WE-I-ASM-PSW_D46_SSI_S1S

Type of course: optional

Entry requirements: Services in mobile networks

Language of instruction: Polish

Director of studies: Dr Przemysław Jacewicz

Name of lecturer: Dr Przemysław Jacewicz

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FULL-TIME STUDIES

COURSE CONTENTS:


LEARNING OUTCOMES:

Basic knowledge and competence in administration of the basic services of the GSM/UMTS network.

ASSESSMENT CRITERIA:

Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.

Practice – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.
RECOMMENDED READING:


OPTIONAL READING:

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REMARKS:
PROGRAMMING MOBILE DEVICES

Course code: 11.3-WE-I-PUM-PSW_D46_SSI_S1S

Type of course: optional
Entry requirements: Java and Web services
Language of instruction: Polish
Director of studies: Dr Przemyslaw Jacewicz
Name of lecturer: Dr Przemyslaw Jacewicz

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Full-time studies

COURSE CONTENTS:

Virtual machines. The types of virtual machines and their limitations. Configurations and profiles. Create midlets. Programming using Sun Wireless Toolkit and NetBeans IDE. Programming user interfaces, support for the display, keyboard, 3D graphics, communication via the Internet, send and receive SMS messages. Starting midlets for mobile phones. J2ME application types and methods of their preparation for selected mobile phones.

LEARNING OUTCOMES:

Basic knowledge and competence in programming mobile devices in Java 2 Micro Edition platform.

ASSESSMENT CRITERIA:

Lecture – the main condition to get a pass are sufficient marks in written or oral tests conducted at least once per semester.

Project – the main condition to get a pass is acquiring sufficient marks for all project tasks as scheduled.
RECOMMENDED READING:


OPTIONAL READING:

-

REMARKS: