



Outline of the Courses for Information Technology

Summer semester

Business Analysis (MA degree - 2 ECTS)	
Lecture	- Definition of basic concepts related to business analysis, its goals and the contexts in which it is used; - Characteristics of basic knowledge areas, which include business analysis, review of techniques, methods and tools as well as required skills; - Planning and monitoring of business analysis; - Strategic analysis; - Requirements extraction and cooperation with stakeholders; - Requirements management life cycle - specification, modeling, analysis, verification, validation and communication of requirements.
Laboratory	- Presentation of the problem area for which analytical activities will be carried out; - Planning business analysis - analytical activities in the context of project activities; - Identifying stakeholders and defining the business need and vision of the solution; - Business modeling - scope modeling, process map, business object modeling; - Business process modeling - introduction to BPMN notation; - Specification of requirements for the solution.
Infrastructure of Electronic Services (MA degree - 1 ECTS)	
Lecture	- Electronic services - history and new trends; - Trust in the field of electronic communication; - Authentication mechanisms, PKI and its services; - Models and mechanisms of trust, Certificates and their management; - Cryptography - encryption algorithms and protocols Scaled computer networks; - Computer systems virtualization; - Data Centers; - Electronic data flow monitoring.
English Language (BA degree 6 ECTS, MA degree - 4 ECTS)	
Foreign language class	- Development of vocabulary resources in accordance with the obligatory textbook at a given level, including vocabulary in the field of learning and disciplines relevant to the field of study. - Grammatical structures in accordance with the obligatory textbook at a given level. - Practical understanding of the written text in accordance with the textbook at a given level, taking into account the field of learning and disciplines relevant to the field of study. - Practice listening comprehension in accordance with the textbook at a given level. - Developing the ability to prepare oral presentations in accordance with the textbook at a given level, taking into account the subject area of learning and disciplines relevant to the field of study. - Development of writing skills in accordance with the textbook at a given level, taking into account the subject area of learning and disciplines relevant to the field of study.

Team Management (MA degree - 1 ECTS)	
E-learning	- Values and strategy of a company; - Management styles; - Motivation and management techniques: supervising, coaching, mentoring and active listening; - Change management and feedback; - Charisma of a leader.
Sociology (MA degree - 1 ECTS)	
E-learning	- Acquainting with the principles of functioning of basic institutions and social structures; - Realizing the role of a human as a subject that constitutes the principles of the functioning of modern society.
Monographic Lecture (MA degree - 1 ECTS)	
Lecture	- Stages of the control procedure; - Risk analysis; - Planning of inspections; - Data sources; - Inspection patterns and criteria; - Control activities - document analysis, direct testing (questionnaires, visual inspections, interviews, etc.); - Documenting the control results; - Editing of audit results and their use; - Collaboration with control institutions.
Algorithms and Data Structures (BA degree - 4 ECTS)	
Lecture	- Mathematical foundations of computational complexity of algorithms; - Introduction to the design of algorithms; - Construction and features of data structures: arrays, lists, queues, stacks, graphs; - Methods of designing algorithms: recursion, divide-and-conquer method, dynamic programming, greedy method, return algorithms. Use of algorithms to solve problems; - Estimating the computational complexity (time and memory) algorithms; - Use of searching and sorting algorithms in data processing problems; - Using of graph algorithms in transport problems; - Design problems of concurrent algorithms.
Laboratory	- Implementation of data structures: arrays, lists, queues, stacks and operations on these structures; - Designing and implementing algorithms for sorting and searching for elements in known data structures. Estimating time and memory complexity of individual algorithms; - Design and implementation of algorithms based on recursion, the divide and conquer method, dynamic programming and greedy algorithms. Estimating time and memory complexity of individual algorithms; - Implementation of graphical representation of graphs and graph searching methods. Estimating time and memory complexity of individual algorithms; - Advanced methods of operations on graphs and their implementation.

Health Education in Lifestyle Diseases (BA degree - 0 ECTS)	
Tutorial	- Legal regulations in the field of labour protection, including those concerning the rights and obligations of students and university employees. - Ergonomics in organizing a safe learning position with a computer and other machines. - Assessment of risks of factors harmful and burdensome to health, occurring in the processes of work and study, and methods of protection against hazards during the teaching classes. - Psychological hints how to learn and organize work (Pareto law in learning, the effect of beginning and end - learning breaks, forgetting curve, the role of repetition, daily intellectual rhythm, conditions of effective mental work, breaking memory blocks. - Rules of conduct in the case of accidents and in situations of danger (fire, breakdowns, etc.), including the rules of providing pre-medical assistance in case of an accident.
Physics (BA degree - 4 ECTS)	
Lecture	- Mathematical description of motion and its characteristics, types of motion; - Newton's laws, conservation of energy, momentum and angular momentum; - Periodic and harmonic motion, artificial Earth satellites, Solar System model; - Electric field, Coulomb's law, electric field of point charges, dipoles; - Electric current, Ohm's law, work and power of an electric current; - Magnetic field and its interaction with electric charge, relation with electrical conductors; - Electromagnetic induction, Faraday's law, mutual inductance, self-inductance; - Alternating current circuits, RLC circuits, generation of electromagnetic waves; - Electromagnetic waves and their spectra, selected applications.
Laboratory	- Introduction to laboratory: preparing a report covering conducted experiment, measurement uncertainty analysis; - Measurement of basic electric quantities (equivalent resistance by various methods, verification of Ohm's law); - Measurement of refractive index of glass with the help of an optical spectrometer; - Measurement of specific heat of water; - Measurement of the speed of sound in air; - Measurement of density of solids; - Measurement of wavelength with the use of diffraction gratings.

Mathematics (BA degree - 4 ECTS)	
Lecture	- Vectors. A linear independence of vectors. Bases; - Matrix algebra; - Determinants. The inverse of a matrix; - Linear equations in linear algebra. Kronecker-Capelli theorem; - Limit of a Function and Limit Laws; - Derivative of a function and its interpretation; - Application of derivatives. Extreme values of function. Monotonic functions. Concavity and curve sketching; - Indefinite integral; - Definite integral. Application of definite integrals; - Functions of several variables. Partial Derivatives.
Recitation class	- Linear combination of vectors. Linear independence of vectors. Bases; - Matrix algebra; - Determinants. Properties of determinants; - The inverse of a matrix. Dimension and rank; - Linear equations in linear algebra. Number of solutions to systems of linear equations; - Limit of a Function and Limit Laws; - Derivatives; - Application of derivatives. Extreme values of function. Monotonic functions. Concavity and curve sketching; - Indefinite integral; - Definite integral. Application of definite integrals (area between curves); - Partial derivatives of a function of two variables.
Fundamentals of Statistics (BA degree - 3 ECTS)	
Lecture	- Random events and probability; - Probability distributions of random variables and their parameters; - Selected probabilistic models; - Parametric description of the distribution in the population; - Assessment of interacting variables in statistical processes.
Laboratory	- Probability distributions of random variables; - Measures of location and scale parameters in the population; - Asymmetry and kurtosis in the population; - Assessment of the dependence of quantitative variables; - Methods of describing the dependencies of qualitative variables.

Programming (BA degree - 4 ECTS)	
Lecture	- Pointers - the role of pointers in the program; - Memory management - dynamic memory allocation; - Using pointers to work with arrays and to pass arguments to functions; - References - using a reference to pass arguments to a function; - Pointers to functions; - Basic concepts of object oriented programming - class, object, encapsulation; - Defining classes and creating objects in an object-oriented programming language, valuable and dynamic objects, structures; - Class components - data fields, methods, constructors; - Containers and algorithms in the STL library; - Stages of the software development process - requirements specification, design, implementation, testing, implementation, cascade model.
Laboratory	- Working with pointers; - Dynamic memory allocation - dynamic one- and multidimensional arrays; - Passing arguments to functions - passing by value, pointer, reference; - Pointers to functions; - Defining classes and creating objects, header files; - Access modifiers, data fields, methods; - Constructors, initialization list, overloading constructors and methods; - Dynamic objects, arrays of objects; - Fundamentals of working with containers and algorithms in the STL library; - Fundamentals of working with the version control system, documenting the code with; - documenting comments.
Project	- Developing project specification; - Program implementation; - Presentation of the result.
Monitoring and Detecting Security Threats (MA degree - 4 ECTS)	
Laboratory	- Processing log data on Linux; - Obtaining information about threats; - Process monitoring in Windows and Linux; - Log management systems; - Interception of network traffic and monitoring for attacks; - Testing the operation of the Snort tool; - Isolation of threat actors with the use of monitoring and threat detection tools.
Project	- The project aims to plan a penetration test experiment in an isolated environment. Implementation stages: • Establishing objectives and goals • Planning a schedule of activities • Preparation of a list of necessary resources • Implementation of a virtual environment • Implementation of the system under test • Implementation of penetration testing tools • Performing the test • Data analysis and drawing conclusions

Cybersecurity Essentials (MA degree - 2 ECTS)	
Lecture	- Cyberspace - security actors, cybercriminals, security professionals , impact of threats on individuals, business, institutions; - Security models and standards. Basic components: confidentiality, integrity, availability; - Threats and vulnerabilities - overview; - Ensuring confidentiality - cryptography. Techniques, tools, protocols; - Ensuring integrity. Integrity control methods, digital signatures, certificates. Integrity in databases; - High availability and reliability. Methods for increasing reliability, incident response, disaster recovery; - Securing devices and systems. Securing servers, networks. Physical security.
Laboratory	- Identification of threats using professional bases. Preparing an environment based on virtualization; - Applying methods of authentication, authorization and accounting in operating systems; - Detecting basic threats in an operating system; - Encryption and password cracking; - Examining digital signatures. Configuring secure remote access; -Securing the operating system.
Introduction to Network Technologies (MA degree - 2 ECTS)	
Laboratory	- Analysis of communication methods - connection / connectionless and their applications; - Network services and the application, presentation and session layers of the OSI model; - TCP and UDP protocol analysis. Assessment of the suitability of both protocols; - Comparison of IPv4 and IPv6 protocols. Analysis of advantages and disadvantages of protocols; - Study of data link layer protocols and multiple access methods on the example of Ethernet, wi-fi, ppp; -Study of transmission paths and analysis of their properties; - The use of remote access in business; - Analysis of security solutions in different layers of the OSI model; - Examination of protocols ensuring safe transmission; - Computer network design methodology; - Analysis of business requirements for a planned or modernized computer network; - Formulating technical requirements for a computer network Planning of logical topology, addressing, selection of communication security solutions; - Selection of network technology (Ethernet, Wi-Fi), devices and types of media. Designing the physical topology of the network and the deployment of cables and devices; - Optimizing the operation of the computer network and services.
Computer System Architecture (BA degree - 5 ECTS)	
Lecture	- Computer logic; - Arithmetic of computers; - Classic computer architecture; - Processors. Command lists. Assembler language basics. Organization of computer on assembler language level; - Hierarchy of memory in computer systems; - Interfaces. Magistralls. External devices; - Modern computer architectures. Multiprocessor architectures; - Architectures and features of embedded systems. Microcontrollers. Microcontrollers programming; - Reliability of computer systems.
Laboratory	- Numerical systems, logic gates, design of combination systems; - Implementation of assembler language programs for a PC; - Implementation of assembler language programs for the microcontroller; - Simulation and testing of the operation of a programmable logic controller (PLC).

Databases (BA degree - 3 ECTS)	
Lecture	- Introduction to the issue of databases. Information models. Data modelling. Database systems; - A great database model - definition, structure and ownership. Relationship Algebra; - Database query languages. Manipulating data with SQL queries. Extending SQL language with procedural programming mechanisms; - Modeling conceptual and implementation diagrams in a relational model. Standardization of logical database schemas. Organization of files used for data storage. Indexing; - Transactions - ownership, transaction diagrams, isolation, seriality, concurrency handling and management; - Database management system: indexing (construction of dense and rare indices, tree structure B-), query optimization; - Scattered databases and client-server architecture. Data warehouses. Non-relational databases
Laboratory	- Constructing simple and complex SQL queries. Verification of results; - Instructions for manipulating data; - Implementation of databases. Data import; - T-SQL language. Declaring variables and constants. Overview of basic control structures of T SQL language; - T-SQL Language: Triggers, stored procedures and functions, perspectives, cursors.
Software Engineering (BA degree - 5 ECTS)	
Lecture	- Genesis, scope and goals of software engineering. The processes that determine the success of a software project; - Requirements engineering and the process of capturing and formalizing business, functional, and non-functional level requirements, as well as system constraints, integration constraints, and business rules for the software being developed; - Models for managing the phases of the software development process. Software development life cycle; - Static validation and verification, and dynamic verification and validation in the IT product delivery process; - Designing software architecture using UML notation; - Use case, class, state and activity diagrams in relation to the "4+1" model perspectives; - API documentation and the process of creating it; - Automation of activities related to the software development process; - Creational design patterns as a concept for solving repeatedly recurring problems; - Structured design patterns as a concept for solving repeatedly recurring problems; - Activity-based design patterns as a solution concept for repeatedly recurring problems.
Laboratory	- Methods of building module tests with the use of dedicated structural unit testing tools; - Verification and validation of the produced software product; - Requirements specification. Construction and modeling of software components with the use of use case diagram notation; - Building and modeling of the software components using the class diagram notation; - Building and modeling of the software components using the activity diagram notation; - Building and modeling of the software components using the state diagram notation; - Creating API code documentation; - Creational design patterns and their implementation; - Structured design patterns and their implementation; - Activity design patterns and their implementation.
Project	- Development of the SRS document, developing a project dictionary and checking its consistency with the requirements specification; developing a diagram of use cases; selection of the functional implementation module and building interaction; designing classes and interfaces for the indicated functionality; compilation and code implementation; building API documentation and module tests.

Programming Languages (BA degree - 7 ECTS)	
Laboratory	- Familiarization with selected environments, compilers and interpreters of programming languages; - Elements of program design in imperative programming; - Elements of the program design in structural programming; - Elements of the program design in functional programming; - Elements of program design in procedural programming; - Elements of program design in event-driven programming; - Elements of program design in declarative programming; - Creating user applications - selected solutions for desktop technologies; - Selected applications of programming languages - internet applications, data science, computer games.
Project	- The subject of the project is to create a small computer application in a chosen language and programming technology. The topic of the implemented application is determined individually with the teacher. The task will be divided into several stages: problem specification, program design, implementation and testing. The completed project must be presented by the realizing team on the group forum.
Postproduction and Special Effects (BA degree - 8 ECTS)	
Laboratory	- Performing advanced graphic compositions using materials prepared in-house, discussing the tools needed to complete the project. Idea creation; - Realization of the project based on prepared materials in 2D raster graphics software, realization of the idea based on the tools learned; - Preparation of film footage for composition with special effect. Idea creation; - Preparation of a fragment of the film using early prepared materials, composition and advanced post-production functions in special effects software.
Project	- Realization of own concept for the composition of a still or film image based on advanced graphic program functions learned during laboratory classes. Idea creation, material preparation, project realization.
Software Development Techniques (BA degree - 8 ECTS)	
Laboratory	- Application development in selected architectures - development techniques and tools; - Application of selected design patterns; - Object-relational model for data access; - Techniques of implementing business logic components; - Mechanisms for maintaining the application status; - Techniques of implementation of the presentation and distribution layer; - Application integration techniques; - Distribution, implementation and maintenance of applications.
Project	- Determining the design assumptions of the application - requirements specification; - Determining the application architecture and technologies used - preparing the application design; - Implementation, launch and testing of applications, Post-development documentation (including instructions for installation / deployment); - Application presentation.