COMPUTER SCIENCE
BACHELOR

1st year, 2nd semester

DISCRETE MATHEMATICS – LECTURE

Subject objectives

The purpose of the course is to familiarize the student with combinatorics along with the necessary elements of algebra and number theory. Introduction to graph theory and its applications.

Description of the intended learning outcomes

In terms of knowledge

- Defines the basic statements of number theory
- Knows and understands the ideas of recursion and induction, is able to use rules of inference and perform simple proofs
- Defines the basic theorems of combinatorics

2 ECTS

In terms of abilities

- Can solve recursive equations
- Can use the principle of mathematical induction
- Can perform calculations in matrix arithmetic
- Formulates and simplifies practical tasks in mathematical language

In terms of social competence

- Can think creatively

- Improves own competence

Program content

- Introductory concepts
- Introduction to graph theory
- Graphs and trees
- Induction and recursion
- Elements of combinatorics
- Basic methods of counting

Educational methods

- Lecture (partly using multimedia tools)
- Didactic discussion
- Classical problem method
- Project method

Individual student work

- Familiarization with the subject literature and additional materials
- Preparation, implementation and evaluation of projects
- Preparation for credit and examination
- Preparation for classes

DISCRETE MATHEMATICS – PROJECT

SUBJECT OBJECTIVES

3 ECTS

The purpose of the course is to familiarize the student with combinatorics along with the necessary elements of algebra and number theory. Introduction to graph theory and its applications.

ZDW: *OPERATING SYSTEMS / **COMPUTER HARDWARE AND APPLICATION MANAGEMENT SYSTEMS-
(LECTURE- 2 ECTS, PROJECT 3 ECTS, WORKSHOP- 2 ECTS)

*Subject objectives

The purpose of the subject is to getting knowledge of the basic concepts related to operating systems, to acquaint students with the role of operating system in the functioning of a computer system, getting to know the most important operating systems

**Subject objectives

The subject is designed to familiarize the student with the basic tasks of the operating system and its role in the operating system. The subject is to show the organization of the computer, a description of the required hardware and a detailed description of the logical operation of the computer (including the functions of the operating system).

Description of the intended learning outcomes

In terms of knowledge

- defines basic concepts related to operating systems
- Student is able to explain the role of an operating system in the functioning of a computer system
- Selects appropriate system solutions for specific purposes

In terms of abilities

- Acquire practical skills for managing different operating systems
- Acquire practical skills for managing operating memory
- Obtain practical skills in file system administration, virtual memory, dynamic library mechanism

In terms of social competence

- Demonstrates the capacity for continuous training, improvement and enhancement of professional, personal and social competence

**Description of the intended learning outcomes

In terms of knowledge

- Student knows information systems and understands what the process of information management is
- Indicates tools dedicated to design, collection and exploration of data

In terms of abilities

- Designs databases and its structures
- Implements and designs databases
- Creates data integrity mechanisms
- Creates database queries

In terms of social competence

- Takes a creative approach to data model building, database design, implementation and exploration
- Actively uses databases in engineering and business practice
- Is oriented towards effective use of database design and exploration tools
- Is aware of the limitations of data models and their implementation

Program content

- Structure and tasks of the operating system
- The concept of process and thread
- Computer science of processor time allocation

- Management of operating memory allocation
- Virtual memory mechanism
- File systems
- Operation of input-output systems
- Networking
- User accounts in operating systems
- Access control
- Dynamic library mechanism
- System services / daemons

**Program content

- Role and tasks of the operating system, classification of operating systems
- Concurrent processing and process synchronization
- Task scheduling, processor allocation scheduling
- The phenomenon of jamming and methods to counteract it
- Methods of memory management
- Characteristics of the file system
- Management of input and output devices
- Management systems for basic computer applications

Educational methods

-lecture
-classic problem method
-project method

**Educational methods
-laboratory exercises
-workshop method

BASICS OF PROGRAMMING 2
LECTURE- 2 ECTS, PROJECT 2 ECTS, EXERCICES 2 ECTS

Subject objectives

The objective of the course is to impart knowledge in the subject area. Improving the ability to design computer programs, creating effective source code.

Description of the intended learning outcomes

In terms of knowledge

- Achieve knowledge in the area covered by the subject; construction and development of computer programs
- Knows and understands the methods of analysis of the issue under consideration

In terms of abilities

- Has achieved and improved the ability to design effective computer program source code
- Is able to apply knowledge to solve complex non-standard computer problems
- Is able to use available literature sources to formulate and solve computer problems

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence
- Is aware of the importance of and understands the non-technical aspects and consequences of the activities of an information engineer

Program content

- Definition and Typology of Programming Languages
- Overview and examples
- General structure and methods of translation of computer program code
- Program construction
- Data types - basic and complex
- Constants, variables, arrays
- Record and file type
- File operations opening, closing a file, writing to disk
- Arithmetic, logical operators
- Assignment and conditional instructions
- Macro substitution
- Perfecting iterative operations in program construction
- Elements of the object-oriented programming paradigm, classes, object - properties, object handling methods

Educational methods
- lectures
- project methods
- auditory / laboratory exercises

Individual student work

- literature research
- implementation of credit and project work
- self-study for the exam

NUMERICAL METHODS IN COMPUTER SCIENCE
LECTURE- 2 ECTS, EXERCICES- 2 ECTS, PROJECT 2 ECTS

Subject objectives

The purpose of the class is to acquire basic knowledge of the effect of floating point arithmetic on the result of numerical calculations, to learn numerically correct algorithms for basic tasks of mathematical analysis and linear algebra.

Description of the intended learning outcomes

In terms of knowledge

- knows and understands algorithmic methods for solving optimization problems
- knows and understands selected basic methods of formulating mathematical models for practical and theoretical optimization problems

In terms of abilities

- Achieve the ability to select the appropriate numerical method to solve the optimization problem
- Is able to use knowledge to solve complex non-standard optimization problems
- Is able to use available literature sources to formulate and solve computer problems

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence
- Is able to establish a professional conversation with users of numerical methods in practice

Program content

- Solving systems of linear equations, Gauss elimination method (repeat), LU decomposition (Doolittle's Algorithm), Cholesky decomposition, numerically ill-conditioned matrix problems
- Sparse matrix techniques, ways to represent sparse matrices, selection of optimal order of equations, Minimum Degree method, elimination tree, super nodes, factorization, interior point method
- Methods of Iterative Solution of Systems of Equations; Breakdown (classical) methods (Jacobi method, Gauss-Seidel method, SOR method), Projection methods (coupled gradients method, Arnoldi method, GMRES method);
- Mathematical formulation of the optimization problem. Special and general criteria of optimization and objective functions. Principles of formulation of optimization problems and their classification, applied formulation and mathematical formulation, examples of optimization problems;
- Methods of optimization of nonlinear static problems, optimality conditions for problems without constraints, and with equality constraints, optimality conditions for a general nonlinear programming problem - Karusha-Kuhn-Tucker conditions, standard form of a nonlinear programming problem

Educational methods
- lecture

- proejct method
- classic problem method

Subject objectives

The purpose of course is to familiarize students with the concepts of creativity. To equip students with knowledge of the language of deliberate creativity. To familiarize students with the subjective concept of man. To develop fluency, flexibility and originality of thinking

Description of the intended learning outcomes

In terms of knowledge

- Lists the differences between the heteronomistic and reductionist and the subjective vision of man
- Distinguishes between creative and standard behavior
- Explains the concepts of human creative development
- Defines creative, intentionally creative and standard activity
- Describes the evolution of the meaning and scope of applicability of the concepts of creativity

In terms of abilities

- He modifies his perception of reality
- Combines different ideas, concepts and ideas
- Argues his attitude and views
- Demonstrates a willingness to break patterns in thinking and acting
- Uses selected methods of creative problem solving

In terms of social competence

- Takes care of his own autonomy in thinking and acting
- Organizes own activities in an innovative way
- Demonstrates flexibility in thinking and acting

Program content

- History of the concept of creativity
- Understanding the concept of creativity - different concepts of creativity
- Techne method and scientism
- Heuristics - thinking by analogy, metaphor, abstraction
- Selected methods of creative problem solving
- Subjective vision of man
- Conscious development of creative dispositions

Educational methods
- didactic discussion
- brainstorming

- workshop method

Individual student work
- Familiarization with the subject literature
- preparation for the credit

PROTECTION OF INTELLECTUAL PROPERTY
<mark>LECTURE- 1 ECTS</mark>

Subject objectives

The purpose of the course is to learn about intellectual property and its protection in Poland and around the world.

Description of the intended learning outcomes

In terms of knowledge

- Knows and understands the concepts of intellectual property, including copyright.
- Knows the typical relationship between intellectual property protection and fair competition, innovation and economic growth.
- Knows the principles of intellectual property protection.
- Knows and understands the differences between personal copyright and property copyright.

In terms of abilities

- Can correctly define a work and other objects of intellectual property in legal and economic terms
- Can evaluate which works are not covered by copyright protection and justify why not
- Can select information, statistical data for the analysis of the economic impact of the area of intellectual property rights

In terms of social competence

- Is aware of his knowledge of the social and economic role of intellectual property protection
- Proceeds in a professional manner with respect for intellectual property
- Is able to create scientific texts and simple information without violating copyright law

Program content

- Development of the protection of intangible property in historical perspective
- International and domestic aspects of intellectual property protection
- The origin and place of modern copyright and related rights
- The relationship of intellectual property protection to competition policy, combating unemployment, innovation and economic growth
- Subject and subjects of copyright law - definitions

- Personal rights of creators to protected works
- The concept and catalog of property rights and fields of exploitation of the work
- Selected issues of licensing
- Forms of infringement of author's personal and property rights - the concept of plagiarism, piracy, database
- The role of collective rights management organizations
- The concept and principles of permitted private and public use from a work
- Rights of libraries and schools
- The right of citation
- Special protection of computer programs, image and correspondence
- Protection of inventions, trademarks and industrial designs
- Community trademark
- Civil and criminal principles of liability for infringement of intellectual property rights

Educational methods
- conversation lecture,
- case study.
Individual student work
- Own work with the subject literature,
- preparation for the credit (colloquium)

2nd year, 4th semester

PROBABILITY CALCULUS AND STATISTICS
LECTURE- 1 ECTS, WORKSHOP- 2 ECTS

Subject objectives

The purpose of the course is to present the possibility of measuring mass events using probability calculus and methods of descriptive and mathematical statistics, to familiarize students with the basic concepts, theorems and models of probability calculus and statistics. The subject is also aimed at presenting the applications of the problems of probability calculus and statistics in the practice of the engineer's work.

Description of the intended learning outcomes

In terms of knowledge

- Achieve knowledge in the basic methods of probability calculus and statistics
- Attain knowledge of the basic concepts of probability calculus and statistics (defines the concepts of random event, random variable, probability distribution, basic distributions and parameters of a random variable)
- Knows the basic problems of parameter estimation and verification of statistical hypotheses, and knows the relationship that occurs between the event space and the sample, as a subset of this space

In terms of abilities

- Formulates research problems in terms of probability calculus and statistics

- Uses probability calculus proficiently
- Calculates the probability of random events and parameters in distributions of random variables, analyzes the relationship between population and statistical sample

In terms of social competence

- Recognizes the basic applicability of probability calculus and statistics in the work of an engineer,
- Independently learns other methods and models of calculus of probability and statistics
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Program content

- Probability calculus and statistics, as a language for describing events
- Population, as a space of events. A statistical sample, as a defined subset
- Empirical distributions, a random event, probabilistic space.
- Concept and definitions of probability. Kolmogorov's axioms
- Probability of sum and product of events
- Conditional probability, integer probability, bayes probability
- One-dimensional random variable: step and continuous. Basic distributions of random variables: two-point, binomial, Poisson, Student's t, normal, standardized normal. Basic parameters: expected value, variance, standard deviation. Distributant and its properties.
- Descriptive statistics: measures of central tendency and dispersion for empirical distributions. Interpretation of statistical measures.
- Statistical inference. Estimators and their properties. Confidence level. Level of significance. Null and alternative hypothesis. Basic confidence intervals and significance tests for structure analysis.
- Multidimensional random variables. Independence of random variables. Correlation analysis. Boundary and conditional distributions. Covariance and correlation coefficients. Verification of the correlation coefficient hypothesis.

Educational methods
-lecture
-laboratory exercises
-didactic discussion
-brainstorming
-project method

ZDW: *DATA PROTECTION / **DATA SECURITY–
LECTURE 1 ECTS, PROJECT 2 ECTS

*Subject objectives

The purpose of the course is to familiarize students with the basic threats to information security in information systems and how to secure them

1 ECTS

Description of the intended learning outcomes

In terms of knowledge

- Attainment of knowledge in the problems of threats to information systems
- Knows and understands the organization of information security system in the organization
- Knows and understands the importance of standards in information security and their content

In terms of abilities

- Achieve the ability to design a database utility structure in a relational model and the ability to select and use a database management system
- Can apply knowledge to solve complex non-standard issues of data access protection (identification, authorization, tariffing)
- Authorization granting
- Is able to use available literature sources to formulate and solve data protection

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence
- Is aware of the importance and understands the non-technical aspects and consequences of the engineer's activities in the problems of ensuring the continuity of equipment operation -identifies and risks

Program content

- Types of threats to information systems and their impact on information systems
- Threat classification methods. CIA method
- Concept of security of systems
- Responsibility for security
- Organizational and legal problems
- Protection: devices, applications and data. Methods and scope
- Issues related to data protection
- Identification of security violators
- Methods of harmful impact. Recording of incidents
- IT methods of protecting access to data (identification, authorization, tarification)
- Assigning privileges
- Methods of protecting data from loss
- Principles of making security copies and storing them
- Emergency procedures. Problems of ensuring continuity of equipment operation
- Causes of failure - identification and threats
- Secure systems: structural aspects, RAID systems
- Antivirus protection. Types of viruses and how they spread. Antivirus programs
- Security in local and wide area networks. Security of transmitted data
- Problems of cryptography, encryption and security cracking
- Steganography. Electronic signature and its infrastructure

Educational methods

- lecture,
- conversation lecture,
- brainstorming,
- project

OBJECT-ORIENTED PROGRAMMING 1–
LECTURE- 1 ECTS, PROJECT- 3 ECTS, WORKSHOP- 2 ECTS

Subject objectives

The purpose of the course is to impart knowledge in the subject area, improve the ability to design computer programs in the OOP - Object Oriented Programming - object-oriented paradigm, create effective source code and exploit the advantages of the object-oriented approach.

Description of the intended learning outcomes

In terms of knowledge

- Achieve knowledge in the area covered by the subject; construction and development of computer programs in object-oriented technique - OOP
- Knows and understands the methods of analysis of the issue under consideration
- Knows programming languages and understands which language to use to solve the selected computer problem

In terms of abilities

- Has achieved and improved the ability to design effective computer program source code in the object-oriented paradigm
- Is able to apply knowledge to solve complex non-standard computer problems
- is able to use available literature sources to formulate and solve computer problems

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence
- Is aware of the importance of and understands the non-technical aspects and consequences of the activities of an information engineer

Program content

- Defining the object-oriented programming paradigm: OOP Basic terms of the OOP object-oriented approach: object - classes, properties, object handling methods
- Properties of object-oriented approach: inheritance, encapsulation/hermetization, polymorphism...
- Development and typology of programming languages predestined for object-oriented approach
- Modeling of real world objects in program construction. Overview and examples
- Improvement of program construction

- Advantages and disadvantages of object-oriented programming OOP

Educational methods
-laboratory exercises
-workshop method
-didactic discussions
-project method
-demonstration

Individual student work
-study of literature
-completion of credit and project work
-self-study for the exam

ZDW: FUNDAMENTALS OF MANAGEMENT INFORMATION SYSTEMS / METHODOLOGY OF INFORMATION MANAGEMENT
LECTURE- 2 ECTS, PROJECT- 2 ECTS

Subject objectives

The purpose of the course is to impart knowledge in the subject, provide information on business management and familiarize with the main management systems.

Description of the intended learning outcomes

In terms of knowledge

- Has a basic understanding of the theory of the IT issue under consideration
- Knows and understands the methods of analysis of the considered issue
- Knows and understands selected issues in the field of knowledge involving methods of analysis of the issue under consideration

2 ECTS

In terms of abilities

- Is able to use the acquired knowledge to solve complex IT issues
- Is able to select tests to verify the correctness of the project's operation
- Is able to use available literature sources to formulate and solve IT problems

In terms of social competence

- Is able to use the acquired knowledge to solve complex IT issues
- Is able to select tests to verify the correctness of the project's operation
- Is able to use available literature sources to formulate and solve IT problems

Program content

- Basic information systems supporting management processes

- Presentations of selected systems, methodology of implementation and software supporting their implementation
- Application of information technology to support e-management
- Implementation of integrated information systems supporting management processes

Educational methods
-laboratory exercises
-workshop method
-didactic discussions
-project method
-demonstration

Individual student work
-literature study
-realization of credit and project work
-self-study for the exam

WEB APPLICATIONS (BASICS)
<mark>LECTURE- 1 ECTS, PROJECT- 2 ECTS</mark>
Spec. programming technologies

Subject objectives

The purpose of the course is to impart knowledge in the subject area and achieve the ability to effectively apply Internet applications in the exploration of global network resources and services.

Description of the intended learning outcomes

In terms of knowledge

- Has a basic knowledge of the theory of the information technology issue under consideration
- Knows and understands the methods of analysis of the considered issue
- Knows and understands selected issues in the field of knowledge involving methods of modeling the issue

1 ECTS

In terms of abilities

- Can apply appropriate Internet tools and applications in the exploration of global network resources and the use of web services
- Can design and program uncomplicated computer issues
- Is able to use available literature sources to formulate and solve computer problems

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills

- Understands the need and knows the possibilities of continuous improvement of own competence
- Is aware of the importance of and understands the non-technical aspects and consequences of the activities of an information engineer

Program content

- Definition and typology of Internet services and applications
- Home banking services, e-mail, file transfer, ...
- Internet service model
- Model of user access to the service using a web browser
- E-mail service applications
- Web services: Wikipedia, information, library, Cloud type repositories, google services audiovideo, music, movie ... etc.
- Applications of teleconference services and conversational telesessions (voice transmission) Applications to support chat type services.
- CMS - Content Management System - definition, elements, functioning
- LMS class system - Learning Management System, origin, development, purpose and applications
- Applications of handling and transmission of video and animation
- MP3, MPEG4 standards... Selected applications and services Google Play, You Tube, Flashplayer

Educational methods
-lectures
-auditory / laboratory exercises,
-seminars / didactic discussions

Individual student work
-study of literature
-completion of credit work
-self-study for the exam

SYSTEM ANALYSIS
<mark>LECTURE- 2 ECTS, WORKSHOP- 1 ECTS</mark>
Spec. programming technologies

Subject objectives

The purpose of the course is to gain competence in systems analysis.

Description of the intended learning outcomes

In terms of knowledge

- Has a basic knowledge of the theory of the information technology issue
- Knows and understands the methods of analysis of the considered issue
- Knows and understands the methods of designing the issue

In terms of abilities

- Is able to use the acquired knowledge to solve complex IT problems
- Is able to design and program uncomplicated IT issues
- Is able to prepare final documentation including a discussion of the obtained results

In terms of social competence

- Is oriented towards professional behavior, observing the principles of professional ethics
- Understands the need for and knows the possibilities of improving qualifications
- Is aware of the responsibility for his own and team work

Program content

- Data modeling
- Integrity conditions
- Relationships between data
- Normalization of relationships
- Entity relationship diagrams
- Data flow diagrams
- Data dictionary
- Process specifications
- Structured polish
- Decision tables
- Environmental and behavioral model

Educational methods
- lecture,
- classic problem method

Individual student work
-familiarization with subject literature and/or additional materials;
-preparation, implementation and evaluation of projects;
-preparation for the credit and/or examination;

ICT NETWORK ARCHITECTURE
Lecture- 1 ECTS, PROJECT- 2 ECTS
Spec. ICT Networks

Subject objectives

The purpose of the subject is to acquainting the student with the basics of wired and wireless telecommunications networks, ICT traffic engineering and services provided to users . To develop the ability to evaluate the selection of the right type of data communications network to meet the requirements of users.

Description of the intended learning outcomes

In terms of knowledge

- For and understands the issues of transmission of information in data communication networks
- Knows and understands the methods of selection and use of ICT networks for the implementation of user services

In terms of abilities

- Is able to use knowledge to plan ICT networks

In terms of social competence

- Solves the tasks independently and in a group

Program content

- ICT network planning methods
- History of the development of telecommunications
- Classifications of data communication networks; topologies, types of transmission (analog, digital), types of transmission media
- Fundamentals of information theory; coding, data compaction, transmission limitations, impact of interference
- Methods of transmitting information in data communication networks; multiplication of transmission, circuit switching and packet switching
- ICT traffic engineering; theory of mass handling, computer simulations of components of ICT networks
- Types of data communications networks; wired, fiber optic, wireless, satellite, global, local, sensor, mobile
- Role and development of the Internet; content distribution, security and threats, impact on the development of society and the digital economy, next-generation Internet

Educational methods
-design exercises
-individual case analysis
-lecture, conversational lecture, classical problem method,
-didactic discussion
-task solving

SWITCHING AND ROUTING IN IP NETWORKS
LECTURE- 2 ECTS, PROJECT- 1 ECTS

Subject objectives

The purpose of the subject is to familiarize the student with the techniques of information transmission in packet switched networks and educating the student on how to configure switches and routers.

Description of the intended learning outcomes

In terms of knowledge

- Knows and understands the issues of packet transmission in IP networks
- Knows and understands the methods of finding the best way to transmit information in an IP network

In terms of abilities

- Is able to use the knowledge learned to manage the functions of switches and routers in an IP network

In terms of social competence

- Solves the tasks independently and in a group

Program content

- Configuration of network layer node devices: switches, routers
- Basic functions of the network layer of the OSI model; services, forwarding, routing
- Datagram and virtual circuit networks
- Functions and design of network layer nodes; switches and routers
- IP protocol; logical addressing and packet forwarding
- Classification of routing methods; principle of optimality
- Routing algorithms; link state, distance vector, hierarchical
- Routing in the Internet; internal: RIP and OSPF protocols, external: BGP protocol
- Routing for broadcasting and group spreading

Educational methods

design exercises
individual case analysis
lecture, conversational lecture, classical problem method,
didactic discussion
task solving

3rd year, 6th semester

EMBEDDED SYSTEMS
LECTURE- 3 ECTS, WORKSHOP- 2 ECTS- PROJECT- 3 ECTS

Subject objectives

The purpose of the course is to familiarize students with the basic technologies related to embedded systems and to form skills in the design and implementation of embedded systems.

3 ECTS

Description of the intended learning outcomes

In terms of knowledge

- Has a basic knowledge of the theory of the IT problem under consideration

- Knows programming languages and understands which language to use to solve the selected problem

In terms of abilities

- Has achieved the ability to design the functional structure of selected embedded systems
- Is able to apply knowledge to solve complex non-standard IT problems related to embedded systems design
- Is able to use available literature sources to formulate and solve computer problems in embedded systems

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence
- Is aware of the importance and understands the non-technical aspects and consequences of the activity of an IT engineer implementing real embedded systems based on available tools

Program content

- General news: Characteristics, organization, design requirements of embedded systems
- Digital systems, microcontrollers. Sequential and concurrent systems
- Design of embedded systems: specification, formal and informal modeling, verification, implementation
- Integrated hardware and software design
- Digital system verification and implementation
- Implementation of digital systems and microcontrollers as an embedded system
- Real-time systems: time requirements, priorities, task scheduling, resources
- Concurrent processes: processes and communication, information transfer
- Prototyping, verification, implementation of concurrent systems
- Interfaces and communication: bus, ports, concept of protocol, interrupts, buses, serial protocols, parallel protocols, wireless protocols
- Implementation of real embedded systems based on available tools
- Embedded systems in smart home solutions, telematics and rapid prototyping from off-the-shelf components

Educational methods
- lecture,
- project

TEAM PROJECT

Subject objectives

The purpose of the course is to prepare and guide students to solve engineering problems independently, to equip the student with theoretical knowledge and practical skills in IT project management using Prince2 and PMI class standards and CASE class IT tools to support effective project preparation and implementation.

Description of the intended learning outcomes

In terms of knowledge

- Knows the various stages of IT project implementation
- Knows the Prince2 and PMI class standards
- Knows IT tools that support the design process

In terms of abilities

- Can plan a project and construct its schedule
- Can determine the organizational structure of the project and monitors project risks
- Creates project documents and reports

In terms of social competence

- Can communicate effectively with the project group
- Is able to prioritize and schedule tasks and optimize project activities
- Can work in a project

Program content

- The concept of a project. Project environment and objectives
- Types of projects. Project context, project stakeholders
- The essence of project management, criteria for evaluating project implementation
- Specificity of IT projects
- The role and importance of audits
- Models of IT project implementation
- Work breakdown structure
- The cascade model
- V model, spiral model
- Requirements management
- Barriers to identifying features of an information system, techniques for obtaining requirements
- Prototyping
- System requirements specification
- Purpose of specification
- Content of the specification
- Attributes of the specification
- Key software metrics: complexity metrics - effort estimation metrics - functionality metrics

- Project feasibility study. Resource planning.
- Constructing the schedule. Critical path. Gantt chart. Project costs and budget. Evaluation report
- Verification, validation and testing of software
- Objectives and verification techniques. Constructing a software verification and validation plan
- Division of responsibility for project implementation - organizational structure
- Project implementation structures: steering committee - advisory committees - project teams - project managers

Educational methods

- project
- didactic discussion

Individual student work

- individual work at computer equipment with selected information systems, group work, case studies, project method.

PROJECT OF YOUR OWN INITIATIVES
PROJECT- 3 ECTS

Subject objectives

The aim of the course is to Stimulate an entrepreneurial attitude in students. To inspire job creation for themselves and others. To develop the ability to independently plan a career path to realize one's own intentions and passions.

Description of the intended learning outcomes

In terms of knowledge

- Knows the definition and the various stages of a project
- Distinguishes between an initiative and other forms of action

In terms of abilities

- Determines own subject goals realized when designing own venture
- Designs his own project
- Critiques his/her own project and the projects of others in the group

In terms of cosial competence

- In terms of social competence
- Open to change
- Demonstrates his/her subjective gain resulting from the project
- Takes responsibility for his/her own project

Program content

- Planning your own initiative
- Schedule of activities
- Characteristics of the entrepreneurial attitude
- Identifying the strengths and weaknesses of the project
- Evaluation of the change
- Passions and interests versus professional work
- Formulation of the goal

Educational methods

- didactic discussion
- brainstorming
- group work
- project method

Individual student work

- familiarization with the literature on the subject
- preparation, implementation and evaluation of projects

ELECTRONIC TRANSACTION SYSTEMS
<mark>LECTURE- 1 ECTS, PROJECT 1 ECTS</mark>
Spec. Programming Technologies

Subject objectives

The purpose of the course is to impart knowledge in the subject, to achieve the ability to identify, use and design transactional information systems.

Description of the intended learning outcomes

In terms of knowledge

- Achieve the scope of knowledge covered in the subject, including knowledge of methods of electronic transactions using information systems
- knows and understands the methods of analysis of the issue under consideration
- knows and understands selected issues in the field of knowledge including methods of modeling the issue

In terms of abilities

- Achieved the ability to describe, use and design a system of transactions using computing devices including mobile devices - tablets, laptops
- Is able to use knowledge to solve complex non-standard IT issues
- Is able to use available literature sources to formulate and solve IT problems

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence
- Is aware of the importance and understands the non-technical aspects and consequences of the activity of an engineer-informatician

Program content

- Definition and typology of transactional information systems, B2B - Business to business and C2C - Consumer to consumer models, B2A and B2G - business to administration / government models....
- Functional and information structure of transactional information system
- Electronic business conduct in the areas of e-business, e-commerce, e-education, e-finance / e-banking, e-payments ... etc.
- Electronic payment system organization model using mobile devices
- Communication tools, security assurance technologies,
- Transaction authorization methods

Educational methods

- lectures
- project methods
- auditorium / laboratory exercises
- seminars / didactic discussions

Individual student work

- study of literature
- completion of credit and project work
- self-study for the exam

ADVANCED PROGRAMMING TECHNOLOGIES
PROJECT- 1 ECTS, LECTURE- 1 ECTS
Spec. Programming Technologies

Subject objectives

Upon completion of the course, the student has the ability and can use the architecture of the ASP.NET platform to design interactive, web-based database applications. In addition, knows and can use software object-oriented and component programming techniques for application servers, knows and understands selected software systems in ASP.NET technology.

Description of the intended learning outcomes

In terms of knowledge

- Knows the capabilities and can use the architecture of the ASP.NET platform to design interactive, web-based database applications;

- Knows and can use software object-oriented and component programming techniques for application servers;
- Knows and understands selected software systems in ASP.NET technology,

In terms of abilities

- Is able to use the knowledge to develop web applications (basics of ASP.NET technology)
- Is able to use knowledge to solve complex non-standard issues of data access protection (identification, authorization, tarification, granting permissions)
- Is able to use available literature sources to ensure transaction security in ASP.NET

In terms of social competence

- Understands the need and knows the possibilities of continuous improvement of professional, personal and social skills
- Understands the need and knows the possibilities of continuous improvement of own competence

Program content

- Microsoft.NET system architecture, .NET Framework, C#, CLS, ASP.NET, ADO.NET, CLR, MSIL.
- Application structure. Fundamentals of ASP.NET technology, web application development.
- C#, J#, VB.NET language.
- HTML web forms, ASP components of .NET forms, server-side processing instructions.
- Application of ASP.NET components in C# language.
- Validation control of forms.
- Using relational databases in an ASP.NET environment, server-side files, session data persistence.
- Security and transactions in ASP.NET.
- Sample ASP.NET web applications: commerce and web services, web games, corporate portal and other applications.

Educational methods

- lecture with visual presentation.
- didactic discussion
- laboratory

Individual student work

- study of literature
- completion of credit and project work
- self-study for the exam

DATA TRANSPORT NETWORKS

Spec. ICT networks

Subject objectives

The purpose of the course is imparting knowledge of network protocols, configuring and administering network devices, and designing data transmission circuits and systems

Description of the intended learning outcomes

In terms of knowledge

- Has a basic understanding of the theory of the IT issue under consideration
- Knows and understands the methods of analysis of the considered issue
- Knows and understands selected issues in the field of knowledge involving methods of analysis of the issue under consideration

In terms of abilities

- Is able to use the acquired knowledge to solve complex IT issues
- Is able to select tests to verify the correctness of the project's operation
- Is able to use available literature sources to formulate and solve IT problems

Program content

- Ethernet Networks
- Switches
- IPc4, IPv6 protocols
- Services in IP networks
- Third layer devices

Educational methods

- lectures
- project methods
- auditorium / laboratory exercises

Individual student work

- study of literature
- realization of credit and project work
- self-study for the exam

DATA TRANSMISSION IN MOBILE NETWORKS

LECTURE- 1 ECTS, PROJECT- 1 ECTS

Spec. ICT networks

Subject objectives

The aim of the subject is to transmission of knowledge in the subject area, imparting knowledge of the construction and organization of the operation of GSM/GPRS,

UMTS/HSPA, LTE/LTE-A, 5G systems. Imparting knowledge of radio access network planning and optimization.

Description of the intended learning outcomes

In terms of knowledge

- Has a basic understanding of the theory of the IT issue under consideration
- Knows and understands the methods of analysis of the considered issue
- Knows and understands selected issues in the field of knowledge involving methods of analysis of the issue under consideration

In terms of abilities

- Is able to use the acquired knowledge to solve complex IT issues
- Is able to select tests to verify the correctness of the project's operation
- Is able to use available literature sources to formulate and solve IT problems

Program content

- Radio transmission in mobile systems, network design and optimization
- 1G and 2G systems
- GSM: selected procedures, speech signal processing, data transmission, services
- 3G systems, UMTS
- 4G systems, LTE, LTE-A
- 5G systems
- Impact of cell phone equipment on people and the environment

Educational methods

- lectures
- project methods
- auditorium / lab exercises

Individual student work

- literature study
- realization of credit and project work
- self-study for exam