Akademia Humanistyczno Ekonomiczna w Łodzi

2026-2027

ACADEMIC OFFER

COMPUTER SCIENCE

COMPUTER SCIENCE

Language: **English** | Winter **2026-2027** | **Computer Science Bachelor**

1ST YEAR / 1ST SEMESTER

INFORMATION TECHNOLOGIES	exercises
BASICS OF SOURCE CODE VERSIONING	exercises
ZDW: BASICS OF PHILOSOPHY/HISTORY OF PHILOSOPHY	exercises
ZDW: BASICS OF PHILOSOPHY/HISTORY OF PHILOSOPHY	project
MATHEMATICAL ANALYSIS AND LINEAR ALGEBRA	lecture
MATHEMATICAL ANALYSIS AND LINEAR ALGEBRA	exercises
ALGORITHMS AND DATA STRUCTURES	lecture
ZDW: THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE/ INFORMATION PROCESSING TECHNOLOGIES	lecture
ZDW: THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE/ INFORMATION PROCESSING TECHNOLOGIES	exercises
BASICS OF PROGRAMMING	lecture
BASICS OF PROGRAMMING	exercises
BASICS OF PROGRAMMING	project
ZDW: COMPUTER SYSTEMS ARCHITECTURE/ FUNCTIONALITY, ORGANIZATION, AND IMPLEMENTATION OF COMPUTER SYSTEMS	lecture
ZDW: COMPUTER SYSTEMS ARCHITECTURE/ FUNCTIONALITY, ORGANIZATION, AND IMPLEMENTATION OF COMPUTER SYSTEMS	workshops
OCCUPATIONAL HEALTH AND SAFETY WITH ELEMENTS OF ERGONOMICS	exercises

COMPUTER SCIENCE

Language: **English** | Winter **2026-2027** | **Computer Science Bachelor**

2ND YEAR / 3RD SEMESTER

ZDW: SQL LANGUAGE / DATABASE MANAGEMENT SYSTEM	lecture
ZDW: SQL LANGUAGE / DATABASE MANAGEMENT SYSTEM	workshops
ZDW: SQL LANGUAGE / DATABASE MANAGEMENT SYSTEM	project
DATABASE SYSTEMS	lecture
DATABASE SYSTEMS	workshops
DATABASE SYSTEMS	project
BASICS OF COMPUTER GRAPHICS	lecture
BASICS OF COMPUTER GRAPHICS	workshops
BASICS OF COMPUTER GRAPHICS	project
NEGOTIATION AND CONFLICT RESOLUTION	exercises

3RD YEAR / 5TH SEMESTER

OBJECT-ORIENTED PROGRAMMING 2	lecture
OBJECT-ORIENTED PROGRAMMING 2	workshops
OBJECT-ORIENTED PROGRAMMING 2	project
WEB APPLICATION PROGRAMMING/FRAMEWORK FOR WEB APPLICATIONS	lecture
WEB APPLICATION PROGRAMMING/FRAMEWORK FOR WEB APPLICATIONS	workshops
WEB APPLICATION PROGRAMMING/FRAMEWORK FOR WEB APPLICATIONS	project
SOFTWARE ENGINEERING (GROUP ENGINEERING PROJECT)	lecture
SOFTWARE ENGINEERING (GROUP ENGINEERING PROJECT)	project
XML TECHNOLOGIES	lecture
XML TECHNOLOGIES	project
ONLINE DATABASES	project
WEB TECHNOLOGIES	workshops
AWARENESS OF VALUE OF MADE DECISIONS	workshops

Information Technologies

exercises

1 ECTS

Teaching methods	demonstrations / tutorials / practical exercises / individual work
Method of verifying education	colloquium / assignments / activity during classes

OBJECTIVES

The aim of the course is to is to equip students with fundamental knowledge and practical skills in the effective use of office applications (word processor, spreadsheet, and presentation software), as well as to develop an understanding of the role of information technologies and multimedia in everyday life and professional work.

COURSE CONTENT

- Using IT tools and applications in education. Editing text documents in MS Word: typing, editing, proofreading, autocorrect, formatting, inserting objects into text, creating lists and tables, working with headers, sections, and page numbering, print preview. Working with multi-page documents: footnotes, bookmarks, hyperlinks, tables of contents, bibliographies, indexes, etc.
- Using IT tools and applications in education – creating multimedia presentations (PowerPoint and Prezi): principles of presentation design; using graphics, audio, and animations; adding hyperlinks and charts; slide masters and templates; organizing and running a slideshow; setting up automatic presentations; saving presentations in various formats.
- Using IT tools and applications in education – creating spreadsheets: data types, operators, arithmetic, logical and text expressions, function arguments and function values, extracting parameters in task solutions, referencing methods (including cross-sheet referencing), formulas, built-in functions, autofill, formatting cells and ranges, XY charts. Spreadsheets as simple databases: forms, searching, filtering, and multi-level sorting.
- Protection of intellectual property in IT in education: creating, sharing, and using source materials; types of licenses.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Has advanced knowledge and understanding of selected functionalities of office tools (word processor, spreadsheet, presentation software) and their applications in data analysis and document preparation.
- Has advanced knowledge and understanding of selected concepts and issues related to information technologies, multimedia, and media convergence, as well as the role of IT in work organization. Possesses basic knowledge of different types of licenses and the principles of intellectual property protection in the creation and use of materials in the context of IT.

In terms of skills:

- Is able to independently use advanced features of a word processor to create complex documents (e.g., engineering reports), applying styles, tables of contents, footnotes, and embedded objects.
- Is able to effectively design multimedia presentations, applying principles of visual design, graphics, audio, animations, and hyperlinks, as well as adapting presentations to different formats.
- Is able to consciously select and apply advanced spreadsheet functions (formulas, built-in functions, referencing methods, charts, filtering, sorting) for data analysis, data processing, and problem-solving.
- Is able to independently search for information and expand their knowledge using various sources, including academic publications, online resources (netography), tutorials, and other professional materials.

In terms of social competencies:

- Is ready to critically evaluate their own knowledge and continuously expand it.
- Is prepared to uphold high ethical standards and respects the principles of intellectual property protection when using source materials and applying licenses in work with IT applications.
- Ensures a professional standard in the preparation of digital materials and takes responsibility for the accuracy and quality of their content.

Basics of source code versioning

exercises

1 ECTS

Teaching methods	use of compurer programmes / problem-solving method / team and individual exercises
Method of veryfying education	assignments / activity during classes

OBJECTIVES

To provide students with the knowledge necessary for effective source code management using version control systems, with particular emphasis on Git.

COURSE CONTENT

- Introduction to Git and basic operations.
- Working with branches.
- Working with remote repositories (GitHub/GitLab).
- Advanced operations and history management.
- Team collaboration and Pull Requests.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Has advanced knowledge and understanding of the Git version control system, including its basic operations (commit, branch, merge) and its role in the software development process.

In terms of skills:

- Can effectively use Git's basic operations to manage a local repository (initialization, commit, file ignoring, and history management).
- Can manage branches and synchronize work with a remote repository (push, pull, clone) using platforms such as GitHub or GitLab.
- Is able to independently seek information and apply advanced Git operations (revert, reset, rebase, stash) to manage history and resolve merge conflicts in a team environment.

In terms of social competencies:

- Demonstrates responsibility and professionalism by maintaining a clean commit history and following repository naming conventions.
- Is ready to actively engage in team collaboration, participating in Pull Request/Merge Request processes, code reviews, and conflict resolution to achieve shared project goals.

ZDW: Basics of Philosophy/ History of Philosophy

exercises

1 ECTS

Teaching methods	conversational lecture / didactic discussion / project-based method
Method of veryfying education	exam

OBJECTIVES

Introduction to key concepts and issues in philosophy. Equipping students with knowledge of the history of European philosophy. Enhancing skills related to resolving moral dilemmas encountered in daily life. Fostering a dialogical attitude – developing skills in discussion and teamwork.

COURSE CONTENT

- Fundamentals of Philosophy – Concepts and Major Schools of Thought.
- Key Issues from Various Periods and Branches of Philosophy: Metaphysics, Epistemology, Axiology.
- Discussion of the Most Representative Philosophical Concepts in the History of European Philosophy.
- Preparation for a Philosophical Project using Project-Based Methodology.
- Addressing the Problem of "How to Engage Children, Youth, and Elderly People in Philosophy" – Implementation and Evaluation of a Philosophical Project.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Knows and understands the nature of philosophy and the differences between philosophy and other disciplines and fields of culture. Knows and understands selected concepts and problems of philosophy. Knows and understands major ethical theories.

In terms of skills:

- Critically analyzes both their own beliefs, arguments, and actions as well as those of others. Argues their position in a coherent and logical manner. Recognizes ethical dilemmas and resolves them independently and responsibly.

In terms of social competencies

- Shows respect for others' opinions. Collaborates within a team, completes assigned tasks, and manages their time effectively. Demonstrates openness to new ideas, facts, and challenges.

ZDW: Basics of Philosophy/ History of Philosophy

project

2 ECTS

Teaching methods	conversational lecture / didactic discussion / project-based method
Method of veryfying education	exam

OBJECTIVES

Introduction to key concepts and issues in philosophy. Equipping students with knowledge of the history of European philosophy. Enhancing skills related to resolving moral dilemmas encountered in daily life. Fostering a dialogical attitude – developing skills in discussion and teamwork.

COURSE CONTENT

- Fundamentals of Philosophy – Concepts and Major Schools of Thought.
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- Preparation for a Philosophical Project using Project-Based Methodology.
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In terms of knowledge:

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In terms of skills:

- Critically analyzes both their own beliefs, arguments, and actions as well as those of others. Argues their position in a coherent and logical manner. Recognizes ethical dilemmas and resolves them independently and responsibly.

In terms of social competencies

- Shows respect for others' opinions. Collaborates within a team, completes assigned tasks, and manages their time effectively. Demonstrates openness to new ideas, facts, and challenges.

Mathematical analysis and linear algebra

lecture

2 ECTS

Teaching methods	problem-based lecture
Method of veryfying education	exam

OBJECTIVES

The aim of the course is to present the concept of partial derivative and derivative of functions of several variables and the methods of their determination and application. The students will get acquainted with the concepts of the basics of mathematical analysis and with their properties, and learn the concept of a sequence limit and the techniques of calculating limits, the concept of a limit and a function along with its properties and calculation techniques, the definition of the derivative of a function of one variable and theorems concerning the calculus of derivatives and their applications for optimization purposes.

COURSE CONTENT

- Concept of sequence limit and its properties.
- Concept of function limit and function continuity.
- Basic theorems on function limits and properties of continuous functions.
- Concept of the derivative and its properties.
- Theorems on operations with derivatives, the derivative of composite functions, and the derivative of inverse functions.
- Necessary and sufficient conditions for the existence of local extrema of a single-variable function.
- Geometric properties of single-variable function derivatives.
- Partial derivative of functions of multiple variables, derivative of functions of multiple variables.
- Necessary and sufficient conditions for the existence of extrema of functions of multiple variables.
- Complex numbers and operations with them.
- Exponentiation and root extraction of complex numbers.
- Matrices and operations with matrices. Rank of matrices and determinant of square matrices.
- General systems of linear equations and theorems on solving them.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Knows methods for calculating the limit of a sequence and functions and can use them effectively.
- Lists methods for calculating derivatives of functions (including inverse functions).
- Analyzes methods for using differential calculus to construct function graphs and calculate limits.
- Identifies methods for determining the antiderivative of a given function and methods for calculating definite integrals.
- Lists methods for performing operations with complex numbers, powers, and roots of numbers.

In terms of skills:

- Can calculate sequence and function limits using learned methods and use them effectively.
- Applies learned methods to calculate derivatives of functions, including composite and inverse functions.
- Uses differential calculus to solve optimization problems.
- Determines antiderivatives for a given integrable function and finds definite integrals.
- Performs operations with complex numbers, calculates roots and powers for such numbers, and solves simple equations in the complex domain.
- Performs operations with matrices, calculates determinants of square matrices, examines their ranks, inverts non-singular matrices, and solves general systems of linear equations.

In terms of social competencies:

- Possesses the ability to tackle practical problems based on the acquired knowledge and skills.
- Can make accurate self-assessments of the actions performed.

Mathematical analysis and linear algebra

exercises

3 ECTS

Teaching methods	exercises / classic problem method / case study
Method of veryfying education	activity during classes

OBJECTIVES

The aim of the course is to present the concept of partial derivative and derivative of functions of several variables and the methods of their determination and application. The students will get acquainted with the concepts of the basics of mathematical analysis and with their properties, and learn the concept of a sequence limit and the techniques of calculating limits, the concept of a limit and a function along with its properties and calculation techniques, the definition of the derivative of a function of one variable and theorems concerning the calculus of derivatives and their applications for optimization purposes.

COURSE CONTENT

- Concept of sequence limit and its properties.
- Concept of function limit and function continuity.
- Basic theorems on function limits and properties of continuous functions.
- Concept of the derivative and its properties.
- Theorems on operations with derivatives, the derivative of composite functions, and the derivative of inverse functions.
- Necessary and sufficient conditions for the existence of local extrema of a single-variable function.
- Geometric properties of single-variable function derivatives.
- Partial derivative of functions of multiple variables, derivative of functions of multiple variables.
- Necessary and sufficient conditions for the existence of extrema of functions of multiple variables.
- Complex numbers and operations with them.
- Exponentiation and root extraction of complex numbers.
- Matrices and operations with matrices. Rank of matrices and determinant of square matrices.
- General systems of linear equations and theorems on solving them.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Knows methods for calculating the limit of a sequence and functions and can use them effectively.
- Lists methods for calculating derivatives of functions (including inverse functions).
- Analyzes methods for using differential calculus to construct function graphs and calculate limits.
- Identifies methods for determining the antiderivative of a given function and methods for calculating definite integrals.
- Lists methods for performing operations with complex numbers, powers, and roots of numbers.

In terms of skills:

- Can calculate sequence and function limits using learned methods and use them effectively.
- Applies learned methods to calculate derivatives of functions, including composite and inverse functions.
- Uses differential calculus to solve optimization problems.
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- Performs operations with complex numbers, calculates roots and powers for such numbers, and solves simple equations in the complex domain.
- Performs operations with matrices, calculates determinants of square matrices, examines their ranks, inverts non-singular matrices, and solves general systems of linear equations.

In terms of social competencies:

- Possesses the ability to tackle practical problems based on the acquired knowledge and skills.
- Can make accurate self-assessments of the actions performed.

Algorithms and data structures

lecture

2 ECTS

Teaching methods	problem lecture / discussion / brainstorming / multimedia techniques
Method of veryfying education	exam / activity during classes

OBJECTIVES

The aim of the course is to gain knowledge about the basics of the theory of algorithms (complexity, construction), simple and complex data structures. The students will acquire the ability to plan and construct complex algorithms, as well as learn about the possibility of choosing the optimal data structure for a given problem.

COURSE CONTENT

- Basic concepts of algorithm theory.
- Recursion.
- Algorithm complexity analysis.
- Sorting algorithms.
- Searching algorithms.
- Numerical methods.
- Graph theory.
- Interpolation and approximation.
- Compact linear schemes.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Selects a mathematical method for the presented problem.
- Can design several solutions to a given problem.
- Can propose appropriate data structures.

In terms of skills:

- Conducts complexity analysis of an algorithm.
- Plans the stages of work in constructing complex algorithms.
- Creates a diagram for the given problem.
- Performs a comparative analysis of different algorithms solving the same problem.

In terms of social competencies:

- Creatively develops solutions to unusual problems.
- Has the ability to work in teams.
- Ensures objective analysis and evaluation of alternative solutions to a given problem.

ZDW: Theoretical foundations of computer science/Information processing technologies

lecture

2 ECTS

Teaching methods	lectures
Method of veryfying education	exam

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COURSE CONTENT

- Definition and subject of computer science. Areas of application of computer science. Data representation in computer memory. Information units: bit and byte.
- Structure of the computer system. Central processing unit. Operational memory. Definition and functions of the operating system. Peripheral devices.
- Definition and types of mass storage. Communication model with the computer. Input and output devices: audio/video, monitors, printers, plotters, scanners.
- Typology and applications of software: word processors, spreadsheets, presentation graphics, creating hypertext documents, Internet and global network services, email, web publishing.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Achieves knowledge in the subject area, elements of the computer system, and software typology.
- Knows and understands methods of analyzing the considered issue.
- Knows and understands the complex relationships between the analyzed data.

In terms of skills:

- Achieves the ability to apply computers and software in conducting and presenting socio-economic analyses.
- Can design and program uncomplicated IT tasks.
- Can use available literature sources to formulate and solve IT problems.

In terms of social competencies:

- Demonstrates the ability for continuous education, improvement, and enhancement of professional, personal, and social competences.
- Understands the need for and knows the possibilities of continuously improving their competences.
- Is aware of the importance and understands the non-technical aspects and impacts of an IT engineer's activities.

ZDW: Theoretical foundations of computer science/Information processing technologies

exercises

3 ECTS

Teaching methods	laborastory exercises / workshop method / didactic discussion
Method of veryfying education	activity during classes

OBJECTIVES

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- Is aware of the importance and understands the non-technical aspects and impacts of an IT engineer's activities.

Basics of programming

lecture

2 ECTS

Teaching methods	lectures
Method of veryfying education	exam

OBJECTIVES

The aim of the course is to gain knowledge in the field of the subject. The students will learn to design, design computer programs and create the correct source code, as well as run the created program code using the selected translator.

COURSE CONTENT

- Definition, elements, and examples of programming languages. Language reports. High-level programming languages. Programming techniques – structured vs. object-oriented.
- General structure of a computer program. Source and executable code. Translation methods. Compilation vs. interpretation of code.
- Program construction. Data types. Constants, variables, arrays. Arithmetic and logical operators. Assignment instructions, conditional instructions: single and multiple selection.
- Organizing repetition operations – iteration. Loop iteration counters. Increment vs. decrement. Variations of iterative instructions.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Achieves knowledge in the subject area, including building and developing computer programs.
- Knows and understands methods for analyzing the given problem.
- Knows and understands complex relationships between analyzed data.

In terms of skills:

- Achieves the ability to design correct source code for computer programs.
- Possesses skills in using selected compilers and tools for program development.
- Can design and program uncomplicated IT issues.
- Can use available literature to formulate and solve IT problems.

In terms of social competencies:

- Understands the need and knows the possibilities for continuous improvement of professional, personal, and social qualifications.
- Understands the need and knows the possibilities for continuously enhancing their own competences.
- Is aware of the importance and understands non-technical aspects and 2 consequences of the work of a computer engineer.

Basics of programming

exercises

2 ECTS

Teaching methods	auditory / laboratory exercises
Method of veryfying education	exam / project / activity during classes

OBJECTIVES

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COURSE CONTENT

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- Understands the need and knows the possibilities for continuously enhancing their own competences.
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Basics of programming

project

2 ECTS

Teaching methods	project-based method
Method of veryfying education	project

OBJECTIVES

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COURSE CONTENT

- Definition, elements, and examples of programming languages. Language reports. High-level programming languages. Programming techniques – structured vs. object-oriented.
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- Program construction. Data types. Constants, variables, arrays. Arithmetic and logical operators. Assignment instructions, conditional instructions: single and multiple selection.
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- Can use available literature to formulate and solve IT problems.

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- Understands the need and knows the possibilities for continuous improvement of professional, personal, and social qualifications.
- Understands the need and knows the possibilities for continuously enhancing their own competences.
- Is aware of the importance and understands non-technical aspects and 2 consequences of the work of a computer engineer.

ZDW: Computer Systems Architecture/ Functionality, Organization, and Implementation of Computer Systems

lecture

1 ECTS

Teaching methods	lectures
Method of veryfying education	exam

OBJECTIVES

The aim of the course is to gain knowledge about the construction of computers and methods of data presentation and processing in computer, as well as low level mechanisms of operation, construction and creation of computer programs.

COURSE CONTENT

- History of Counting and Computing Devices: Introduction to the development and history of computational technology.
- Classical Von Neumann Computer Architecture: Understanding the architecture of computers according to the Von Neumann model.
- Number Systems: Learning about the number systems used in computers.
- Information Coding: Understanding methods of information coding in computer systems.
- Basics of Logic Circuits: Learning about the fundamentals of logic circuits used in computers.
- Arithmetic Foundations of Computer Operation: Understanding the basics of computer arithmetic.
- Concept of Microprocessor Systems: Introduction to microprocessor systems and their operation.
- Operational Memory: o Understanding the function and structure of operational memory in computers.
- External Devices: Introduction to various peripheral devices for computers.
- Processors: Understanding the operation and architecture of computer processors.
- Elements of Computer Software: Learning about components of computer software.
- Computer Classification: Understanding different types and classifications of computers.
- Pipelined Architectures: Learning about pipelined architectures in computers.
- Parallel Computers and Supercomputers: o Understanding the operation of parallel computers and supercomputers.
- Theoretical Foundations of Assembly Language Programming: o Introduction to basic principles of programming in assembly language, including sections and data declarations.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Gain knowledge of the history of computing devices and understand computer architecture and construction.
- Understand key concepts related to programming in assembly language (x86 processors).
- Understand how computer programs operate.

In terms of skills:

- Ability to design applications in assembly language, including sections and data declarations.
- Ability to apply knowledge to solve complex and atypical computer science problems.
- Ability to use available literature to formulate and solve computer science problems.

In terms of social competencies:

- Understand the need and opportunities for continuous professional, personal, and social development.
- Recognize the need and opportunities for ongoing improvement of personal competencies.
- Awareness of the importance and understanding of non-technical aspects and consequences of the work of a computer engineer.

ZDW: Computer Systems Architecture/ Functionality, Organization, and Implementation of Computer Systems

workshops

1 ECTS

Teaching methods	multimedia techniques / workshop method
Method of veryfying education	activity during classes

OBJECTIVES

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COURSE CONTENT

- History of Counting and Computing Devices: Introduction to the development and history of computational technology.
- Classical Von Neumann Computer Architecture: Understanding the architecture of computers according to the Von Neumann model.
- Number Systems: Learning about the number systems used in computers.
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- Parallel Computers and Supercomputers: o Understanding the operation of parallel computers and supercomputers.
- Theoretical Foundations of Assembly Language Programming: o Introduction to basic principles of programming in assembly language, including sections and data declarations.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

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In terms of skills:

- Ability to design applications in assembly language, including sections and data declarations.
- Ability to apply knowledge to solve complex and atypical computer science problems.
- Ability to use available literature to formulate and solve computer science problems.

In terms of social competencies:

- Understand the need and opportunities for continuous professional, personal, and social development.
- Recognize the need and opportunities for ongoing improvement of personal competencies.
- Awareness of the importance and understanding of non-technical aspects and consequences of the work of a computer engineer.

Occupational health and safety with elements of ergonomics

exercises

1 ECTS

Teaching methods	lecture / didactic discussion / workshop method
Method of veryfying education	assignments / activity during classes

OBJECTIVES

The aim of the course is to provide students with knowledge with knowledge in the field of occupational health and safety.

COURSE CONTENT

- The role of the subject.
- Workplace safety.
- Work hygiene.
- Ergonomics.
- Physiology.
- Classification of work environment factors: hazardous, harmful, and onerous.
- Types of factors: physical, chemical, biological.
- Analysis and assessment of work environment factors.
- Workplace accidents.
- Legal protection of labor.
- First aid (general issues).

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Knows the factors of the work environment.
- Knows, understands, and appropriately classifies work environment factors, including personal protective equipment and its purpose.
- Knows and understands work hygiene from the perspective of ergonomics and physiology.

In terms of skills:

- Makes accurate assessments of hazards present in the work environment.
- Can estimate occupational risks in various job positions.
- Selects personal protective equipment appropriate to the existing hazards.

In terms of social competencies:

- Is responsible for workplace safety and hygiene.
- Has the ability to make decisions regarding the reduction of occupational risk.

ZDW: SQL Language / Database Management System

lecture

2 ECTS

Teaching methods	lectures / project-based methods / auditorium exercises
Method of veryfying education	exam / activity during classes

OBJECTIVES

The aim of the course is to gain knowledge in the field of the study. The students will learn to process data in a relational database using SQL; to equip students with the ability to define tasks within a database management system.

PROGRAM CONTENT

- Structure of database management systems (DBMS) - characteristics of individual modules, types of inputs.
- Basic functions of DBMS and their implementations. Features of DBMS compared to file management systems.
- Transaction management - properties of transactions (ACID principles), transaction operations and history, concurrent transactions, and their levels.
- The role of the scheduler and data manager. Two-phase locking protocol, transaction deadlock, and locking with various isolation levels.
- The timestamp method. Multiversion algorithms - synchronization mechanisms and popular variants of the method (two-phase locking multiversion and timestamp multiversion algorithms).
- Integrity vs. database consistency. Levels and protection of integrity.
- Types of integrity constraints and their verification.
- Query processing and evaluation - query decomposition, rules for transforming relational algebra operations.
- Estimating the cost of relational algebra operations, database statistics. Query optimization - heuristic methods.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Students will be able to identify areas of application for databases,
- Recognize tools dedicated to designing, collecting, and exploring data,
- Define the benefits of using databases in engineering and business practices,
- Formulate data models that describe objects and processes occuring in practice,
- Apply appropriate techniques for implementing data models.

In terms of skills:

- Students will be able to design database structures and schemas,
- Implement and design databases,
- Create data integrity mechanisms,
- Develop queries for databases,
- Manipulate data effectively.

In terms of social competencies:

- Students will approach data model building, database design, implementation, and exploration with creativity.
- They will actively use databases in engineering and business practices.
- Be oriented towards the effective use of database design and exploration tools.
- Be aware of the limitations of data models and their implementations.

ZDW: SQL Language / Database Management System

workshops

1 ECTS

Teaching methods	lectures / project-based methods / auditorium exercises
Method of veryfying education	exam / activity during classes

OBJECTIVES

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ZDW: SQL Language / Database Management System

project

2 ECTS

Teaching methods	lectures / project-based methods / auditorium exercises
Method of veryfying education	exam / activity during classes / project

OBJECTIVES

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Database systems

lecture

1 ECTS

Teaching methods	lboratory exercises / workshop methods / didactic discussion / demonstrations
Method of veryfying education	exam, activity during classes

OBJECTIVES

The aim of the course is to gain knowledge in the field of advanced software functionalities for data collection and mining. The course will prepare students for the use of IT tools supporting the collection and data mining, and show how to design databases and explore them. The students will develop the ability to use IT tools dedicated to data collection and mining, as well as shape the attitude of professional use of databases in engineering and business practice.

COURSE CONTENT

- Practical overview of database systems – introduction.
- Data models.
- Database languages.
- Relational databases (RBD).
- Creating data structures in RBD.
- Data processing in RBD.
- Data exploration in RBD.
- Data manipulation in relational databases.
- Identifying the functionalities of the database management system used in laboratory sessions.
- Designing database models.
- Designing and creating database structures.
- Data integrity mechanisms.
- Importing data from external sources.
- Simple queries. Data sorting.
- Conditional data selection. Comparison operators.
- Table joins.
- Data grouping.
- Simple and correlated queries.
- Query optimization.
- Data manipulation – insertion, modification, deletion.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Students will be able to identify areas of application for databases,
- Recognize tools dedicated to designing, collecting, and exploring data,
- Define the benefits of using databases in engineering and business practices,
- Formulate data models that describe objects and processes occuring in practice,
- Apply appropriate techniques for implementing data models.

In terms of abilities:

- Students will be able to design database structures and schemas,
- Implement and design databases,
- Create mechanisms for data integrity,
- Develop queries for databases,
- Manipulate data effectively.

In terms of social competencies:

- Students will approach data model building, database design, implementation, and exploration with creativity,
- Actively use databases in engineering and business practices,
- Be oriented towards the effective use of database design and exploration tools,
- Be aware of the limitations of data models and their implementation.

Database systems

workshops

2 ECTS

Teaching methods	laboratory exercises/ workshop methods / didactic discussion / demonstrations
Method of veryfying education	exam, activity during classes

OBJECTIVES

The aim of the course is to gain knowledge in the field of advanced software functionalities for data collection and mining. The course will prepare students for the use of IT tools supporting the collection and data mining, and show how to design databases and explore them. The students will develop the ability to use IT tools dedicated to data collection and mining, as well as shape the attitude of professional use of databases in engineering and business practice.

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Database systems

project

2 ECTS

Teaching methods	laboratory exercises/ workshop methods / didactic discussion / demonstrations
Method of veryfying education	exam, activity during classes

OBJECTIVES

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Basics of computer graphics

lecture

1 ECTS

Teaching methods	laboratory exercises/ workshop methods / didactic discussion / demonstrations
Method of veryfying education	exam, activity during classes

OBJECTIVES

The aim of the course is to familiarize students with the basic elements of computer graphics and their practical application

COURSE CONTENT

- Basics of Courseming raster and vector graphics, both 2D and 3D.
- Color and color theory in computer graphics.
- Basic issues of geometric transformations.
- Methods of processing and editing raster graphics.
- Tools and methods for Courseming graphic editing.
- Analysis of tools and libraries supporting graphic Courseming.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Students will have a basic understanding of the theory related to computer graphics,
- Know programming languages and understand which language to use for solving specific problems,
- Be knowledgeable about the capabilities of programming tools that assist in the creation of computer graphics.

In terms of abilities:

- Students will be able to gain practical skills in programming 2D raster and vector graphics,
- Gain practical skills in programming 3D raster and vector graphics,
- Acquire practical skills in selecting graphical tools and libraries that support graphic programming.

In terms of social competencies:

- Students will demonstrate the ability for continous learning, improvement, and enhancement of professional, personal, and social competencies.

Basics of computer graphics

workshops

2 ECTS

Teaching methods	laboratory exercises/ workshop methods / didactic discussion / demonstrations
Method of veryfying education	exam, activity during classes

OBJECTIVES

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Basics of computer graphics

project

2 ECTS

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Method of veryfying education	exam, activity during classes

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In terms of social competencies:

- Students will demonstrate the ability for continous learning, improvement, and enhancement of professional, personal, and social competencies.

Negotiation and conflict resolution

workshops

1 ECTS

Teaching methods	didactic discussion / brainstorming / drama techniques / workshop method
Method of veryfying education	assignments / activity during class

OBJECTIVES

To familiarize students with the nature of conflict within a group.
Improving the ability to recognize conflict situations.
Demonstrate the influence of the group on the process of conflict formation and resolution.
Improving the ability to stop the escalation of conflict at the earliest possible stage of its development, or to help resolve conflict at any stage.

COURSE CONTENT

- Definition of conflict and types of conflict.
- Stages of constructive conflict resolution. Conflict resolution styles.
- Phases of group conflict.
- The role of emotions in group conflict.
- Group process and conflict situations.
- Conflict resolution styles.
- Constructive ways of resolving conflict in a group.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- The Student distinguishes and describes the stages of constructive conflict resolution, knows conflict resolution styles.

In terms of skills:

- observes and diagnoses conflicts occurring within the group.
- recognizes their emotions and needs in a conflict situation.
- applies the principles and techniques of conflict resolution in a group.

In terms of social competencies:

- demonstrates responsibility for the process taking place within the group.
- ensures constructive conflict resolution.

Object-oriented programming 2

lecture

2 ECTS

Teaching methods	lectures / demonstration
Method of veryfying education	exam, activity during classes

OBJECTIVES

The aim of the course is to transfer knowledge in the field of the subject. The students will improve the ability to design computer programs in the OOP - Object Oriented Programming paradigm, creating effective source code and using the advantages of the object-oriented approach.

COURSE CONTENT

- General characteristics of special-purpose systems.
- Characteristics of selected intelligent embedded systems. Real-life examples.
- Designing an information system in conjunction with a specialized embedded component.
- System installation and analysis of potential implementation errors.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Understands information systems and the process of information management within an organization.
- Identifies tools dedicated to data design, collection, and exploration.
- Defines the benefits of using databases in engineering and business practice.
- Formulates data models that describe objects and processes occurring in practice.
- Applies appropriate techniques for implementing data models.

In terms of abilities:

- Designs databases and their structures.
- Implements and designs databases.
- Creates data integrity mechanisms.
- Writes queries for databases.
- Manipulates data.

In terms of social competencies:

- Approaches data model building, database design, implementation, and exploration creatively.
- Actively utilizes databases in engineering and business practice.
- Focuses on the effective use of database design and exploration tools.
- Is aware of the limitations of data models and their implementation.

Object-oriented programming 2

workshops

2 ECTS

Teaching methods	workshop method / laboratory exercises
Method of veryfying education	assignments / activity during classes

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Object-oriented programming 2

project

2 ECTS

Teaching methods	project-based method / didactic discussion
Method of veryfying education	project / activity during classes

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Web application programming / Framework for web applications

lecture

2 ECTS

Teaching methods	lecture
Method of veryfying education	exam

OBJECTIVES

The aim of the study transferring knowledge in the field of the subject. The students will learn the ability to program and design web applications - run on web pages /The aim of the course is to gain knowledge about the use of Frameworks. The students will be acquainted with the knowledge of the .NET Framework and other technologies, how to create applications using Ruby on Rails Framework, creating scripts, functional programming, creating systems in the cloud.

COURSE CONTENT

- Overview and development of internet programming technologies: HTML, XHTML, Java, PHP, etc.
- Development of HTML as a tool for building web applications. Characteristics of PHP technology – its origins, development, language elements, and applications.
- Characteristics of the Common Gateway Interface (CGI) model.
- Servlet and applet applications. The three-tier model of web application operation in software engineering. Data access layer in the model.
- The significance of object-oriented (OOA/D) approach to building web applications. COM/CORBA models – Component Object Model/Common Object Request Broker Architecture.
- Database management technologies in the web. Development of SQL as a tool for developing web applications for database management.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Acquires knowledge in the subject area, including the ability to design and program web applications.
- Knows programming languages and understands which language to use for solving selected IT problems.
- Knows and understands selected issues in the field, including methods of modeling.

In terms of abilities:

- Can apply appropriate programming languages and development tools for building web applications and web services.
- Can use knowledge to solve complex and unconventional IT problems.
- Can utilize available literature to formulate and solve IT problems.

In terms of social competencies:

- Understands the need for and knows the possibilities of continuous professional, personal, and social development.
- Understands the need for and knows the possibilities of continuous self-improvement.
- Is aware of the importance and understands the non-technical aspects and consequences of the work of an IT engineer.

Web application programming / Framework for web applications

workshops

2 ECTS

Teaching methods	laboratory exercises / didactic discussions
Method of veryfying education	assignments / activity during classes

OBJECTIVES

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Web application programming / Framework for web applications

project

2 ECTS

Teaching methods	project-based method / didactic discussion
Method of veryfying education	project / activity during classes

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Software engineering (group engineering project)

lecture

2 ECTS

Teaching methods	laboratory exercises/ multimedia techniques
Method of veryfying education	exam, activity during classes

OBJECTIVES

Introduce students to issues, models, and stages of software development, including methodologies and supporting tools. Develop skills in specifying and formalizing software requirements, creating software models/designs using various methodologies (both structural and object-oriented) and supporting tools, designing interfaces, and participating in the processes of implementation, testing, validation, and software development.

COURSE CONTENT

- Typical Stages of Software Development and Their Content
- Analysis of Information and Decision Systems
- Types of Requirements
- Software Design/Modeling
- System Architecture Design
- Detailed Techniques for Modeling Processes and Data Structures
- CASE Environments
- Standards and User Interface Design
- Data Coding: o Types and principles. o Code construction. o Check digits.
- Software Testing and Validation: o Objectives, scope, and types of testing methods.
- Software Development During the Maintenance Phase
- Software Quality Assurance Systems

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Understand and select an appropriate software lifecycle model for a given application. o
- Formulate tasks for each stage of the software lifecycle. o
- Describe system requirements using formal techniques. o A
- nalyze the structure of the designed application.
- Choose suitable methods for modeling applications.
- Propose a data coding system.
- Select a software quality assurance system.

In terms of abilities:

- Analyze real-world systems for IT support.
- Formalize the informational content of documents.
- Develop a set of requirements for information systems.
- Design functional and informational structures of information systems using various techniques.
- Create application models using different modeling techniques.
- Apply principles of human-computer interface design and use appropriate application testing techniques.

In terms of social competencies:

- Demonstrate creativity in analyzing and designing applications.
- Identify relationships between different phases of application development.
- Share ideas with others.
- Understand non-technical aspects and consequences of an IT engineer's work, including its impact on the environment and associated responsibilities.

Software engineering (group engineering project)

project

2 ECTS

Teaching methods	project / didactic discussions
Method of veryfying education	project, activity during classes

OBJECTIVES

Introduce students to issues, models, and stages of software development, including methodologies and supporting tools. Develop skills in specifying and formalizing software requirements, creating software models/designs using various methodologies (both structural and object-oriented) and supporting tools, designing interfaces, and participating in the processes of implementation, testing, validation, and software development.

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- Formulate tasks for each stage of the software lifecycle. o
- Describe system requirements using formal techniques. o A
- nalyze the structure of the designed application.
- Choose suitable methods for modeling applications.
- Propose a data coding system.
- Select a software quality assurance system.

In terms of abilities:

- Analyze real-world systems for IT support.
- Formalize the informational content of documents.
- Develop a set of requirements for information systems.
- Design functional and informational structures of information systems using various techniques.
- Create application models using different modeling techniques.
- Apply principles of human-computer interface design and use appropriate application testing techniques.

In terms of social competencies:

- Demonstrate creativity in analyzing and designing applications.
- Identify relationships between different phases of application development.
- Share ideas with others.
- Understand non-technical aspects and consequences of an IT engineer's work, including its impact on the environment and associated responsibilities.

XML Technologies

lecture

1 ECTS

Teaching methods	lectures / online lectures / webinars
Method of veryfying education	exam

OBJECTIVES

Providing knowledge in the field of the subject. Developing the ability to design XML documents. Developing the ability to use XML forms on the web for EDI data transmission.

COURSE CONTENT

- SGML standard – Standard Generalized Markup Language and the XML subset. Definition of an XML electronic document.
- Definition and services of the World Wide Web network. Use of an XML form on a WWW page.
- Use of XML in transmission and Electronic Data Interchange (EDI).
- Advantages and disadvantages of XML in EDI (Electronic Data Interchange).

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Acquiring knowledge within the scope of the course: the use of the XML standard in data transmission on the global Web network.

In terms of abilities:

- Has acquired the ability to design an XML document.

In terms of social competencies:

- Demonstrates the ability for continuous learning, improvement, and development of professional, personal, and social competences.

XML Technologies

project

1 ECTS

Teaching methods	laboratory exercises / project-based method
Method of veryfying education	project

OBJECTIVES

Providing knowledge in the field of the subject. Developing the ability to design XML documents. Developing the ability to use XML forms on the web for EDI data transmission.

COURSE CONTENT

- SGML standard – Standard Generalized Markup Language and the XML subset. Definition of an XML electronic document.
- Definition and services of the World Wide Web network. Use of an XML form on a WWW page.
- Use of XML in transmission and Electronic Data Interchange (EDI).
- Advantages and disadvantages of XML in EDI (Electronic Data Interchange).

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Acquiring knowledge within the scope of the course: the use of the XML standard in data transmission on the global Web network.

In terms of abilities:

- Has acquired the ability to design an XML document.

In terms of social competencies:

- Demonstrates the ability for continuous learning, improvement, and development of professional, personal, and social competences.

Online databases

project

2 ECTS

Teaching methods	conversational lecture / project-based method
Method of veryfying education	project / assignments / activity during classes

OBJECTIVES

Familiarizing students with issues related to web-based databases and developing the ability to create web applications that use databases.

COURSE CONTENT

- Principle of operation and configuration of the PHP environment.
- Structure of a program in PHP.
- Principles of creating PHP functions and variable scope.
- Text processing and regular expressions in PHP.
- Methods of maintaining the state of a web application (cookies, sessions).
- Principle of operation and configuration of the MySQL environment.
- Using SQL resources from within PHP.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Knows the structure and principles of designing web applications using PHP technology.
- Has knowledge of basic methods for designing web databases.
- Knows the tools used for designing web databases.

In terms of abilities:

- Independently designs and builds databases for PHP applications.
- Has practical skills in using MySQL, including its application in PHP-based applications.
- Independently installs and deploys web environments based on Apache, MySQL, and PHP.
- Creates websites containing mechanisms for database access using MySQL and PHP.

In terms of social competencies:

- Can think creatively and innovatively.
- Understands the need for and is aware of ways to continuously develop their own competences.

Web technologies

workshops

1 ECTS

Teaching methods	lectures / project-based method / laboratory exercises
Method of veryfying education	exam / project / activity during classes

OBJECTIVES

Providing knowledge in the field of the subject.
Developing the ability to design the functional structure of a web service.

COURSE CONTENT

- Definition and services of the World Wide Web – Internet. Overview and types of web technologies. Examples of informational, library, and social services; email services; file transfer.
- SGML standard – Standard Generalized Markup Language and its subsets: HTML, VRML, WOML, MathML. Definition of HTML (Hypertext Markup Language), data transmission protocols.
- Functional characteristics of a sample web service. Internet television and radio, browsers, and messaging applications.
- Electronic Data Interchange (EDI). Applications of EDI, e-commerce, e-banking. Programming technologies in the development of web services.

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- Acquiring knowledge within the scope of the subject: the use of World Wide Web services with selected software applications.

In terms of abilities:

- Has acquired the ability to analyze and design the functional and informational structure of a website or web service.

In terms of social competencies:

- Demonstrates the ability for continuous learning, improvement, and development of professional, personal, and social competences.

Awareness of value of made decisions

workshops

1 ECTS

Teaching methods	didactic discussion / brainstorming / drama techniques / workshop method
Method of veryfying education	individual and group work / activity during classes

OBJECTIVES

Preparing students to analyze their own hierarchy of values.
Showing the relationship between choices made and underlying needs and values.
Expanding the ability to make independent and conscious decisions..

COURSE CONTENT

- Perception of values in selected philosophical approaches (relativism, absolutism, objectivism, subjectivism)
- Real values versus declared values
- Perception of good and evil
- Awareness of the current hierarchy of values
- Goals and values versus life planning – the importance of purpose in human life
- Defining the concept of decision and the decision-making process
- The role of emotions in the decision-making process
- Individual versus group decision-making
- Factors influencing decisions made
- Freedom and responsibility in decision-making; decision-making errors and their consequences

DESCRIPTION OF THE EXPECTED LEARNING RESULTS

In terms of knowledge:

- The student defines and lists the stages of decision-making.
- The student explains the specificity of individual and group decision-making.

In terms of skills:

- The student efficiently uses axiological concepts.
- The student analyzes and verifies their own hierarchy of values.
- The student develops the ability to make decisions (both individually and in groups) based on professed values.
- The student analyzes different styles of decision-making.

In terms of social competencies:

- The student justifies their views and arguments.
- The student demonstrates responsibility for the choices made.
- The student remains open to different styles of decision-making.
- The student is oriented towards the needs of others in the decision-making process.