

ANNOTATIONS

Program: **COMPUTER SYSTEMS AND TECHNOLOGIES**

Professional orientation: **COMMUNICATIONS AND COMPUTER ENGINEERING**

Professional qualification: **COMPUTER ENGINEERING**

Academic degree: **BACHELOR**

Form of Study: **FULL-TIME**

Term of Study: **4 years / 8 semesters**

Discipline "Basic Mathematics", code (1)

The discipline "Basic Mathematics" provides fundamental preparation for the students of the specialty "CST" at the Technical University - Varna. The aim is to develop students' mathematical knowledge and skills to create correct mathematical models and effective algorithms to solve practical problems in the field of computer engineering.

Main issues of the syllabus content:

- Complex numbers.
- Linear algebra.
- Analytical geometry.
- Number theory.
- Differential calculus of the function of one variable.
- Numerical methods.

The aim of the subject is to introduce the concepts and theoretical facts from the above sections to the students.

The course is to give the students a good theoretical knowledge of the subject and to master the methods of solving problems from the above mentioned fields.

The laboratory classes introduce students to modern computer algebra systems, which are a powerful tool for solving scientific problems related to mathematical research.

The course provides the study of technical disciplines (Electrotechnics, Measurements in Electronics, Computer Electronics, etc.) and most of the specific computer disciplines (Synthesis and Analysis of Algorithms, Discrete Structures, Graphic Design, Software Project Management, Artificial Intelligence etc.). The aim of this subject is to present to the students various concepts and theoretical facts from the above sections.

Discipline "Computer Systems Fundamentals", code (2)

The course introduces the students to:

- the purpose and composition of real computer systems - hardware and software (system and applied);
- the structural elements of the computation process and the ways of its presentation, as well as the synthesis of algorithms for the realization of basic (elementary) computing processes;
- the algebra of the two-sign logic (Boolean algebra), the representation of the logic functions, the synthesis and the study of simple combinational logic circuits.
- the types of data, the ways of their presentation in the computer systems, the transformation of the numerical data into different positional number systems, basic arithmetic operations with numerical data.

Main issues of the syllabus content:

- Main composition of the real computer system - hardware and software part; Devices - types, purpose; Software - system, user; Hierarchical structure of software; Operating systems - types; File systems - types, organization; Virus, virus protection.
- Concept of computation process; Presentation of the computation process; Concept for algorithm; Basic algorithmic structures.
- Algebra of logic. Logical functions and Logic circuits - synthesis and analysis.

- Types of data; Presentation of the data; Numerical data; Concept of number system; Convert numbers from one number system to another; Fundamentals of the arithmetic of binary and binary encoded decimal numbers.

Discipline "Programming Fundamentals", code (3)

The subject is oriented towards the fundamental preparation of the students of the specialty CST. The aim is to give students the knowledge and skills of programming using high-level languages and their applications.

The main tasks are related to the formation of knowledge and skills for:

- Computer software and hardware;
- The organization of operating systems for personal computers;
- Program algorithms and flowcharts;
- Principles of programming and design of application programs;
- Presentation of information and main types and structures of data in high-level programming languages;
- Program structures in high-level languages;
- Principles of structural, modular and object programming;
- Working with libraries from standard subroutines.

Main issues of the syllabus content:

- programming algorithms;
- principles of programming and design of application programs, presentation of information;
- the main types and structures of data in high-level programming languages;
- programming structures in high-level languages;
- Principles of structural and modular design and programming;
- Creating of functions, using libraries from standard functions.

Discipline "Electrical Engineering", code (4)

In the course "Electrical Engineering" the students are acquainted with the methods for exploration of linear electric circuits with constant parameters. The course focuses on the operation of the linear electric circuits in DC regime and AC regime. The basic quantities used to describe the circuits are the integral characteristics – the current and the voltage. The main properties and theorems for linear electrical circuits, as well as some phenomena in the linear circuits such as transmission of maximum power in the load, inductive power transmission, resonance phenomena, etc. are discussed.

Students get acquainted with the basic methods of analysis of linear electric circuits in: a) DC regime; (b) AC regime. The first section discusses DC regimes in linear electric circuits. In the second section the accent is placed on the harmonic regimes in the time domain. The definitions of the effective values of the voltage and the current (the so-called RMS) and for the different types of power are introduced, too. The basic concepts related to the phasor approach (the so-called complex method) are also introduced. A short attention is paid to resonant phenomena (serial and parallel resonance). The third section briefly reviews the transition processes in linear electric circuits of first and second order. The fourth section provides a brief overview of non-linear electrical circuits. The main types of non-linear elements are considered. The DC and AC regimes in non-linear electric circuits are briefly discussed. The fifth section deals with the theory of the electromagnetic devices. Elements of the theory of electromagnetism are presented, and some of the basic laws are introduced. Magnetic circuits are examined, too. The action of the ferromagnetic core transformer is presented. The construction and the operation of some types of electromagnetic devices such as DC motors, asynchronous motors and synchronous micro machines are considered, too.

The course in "Electrical Engineering" is an extension of the course in "Basic Mathematics for Engineers". It provides the next course in "Measurements in Electronics", as well as the courses "Analysis and synthesis of logic circuits", "Computer electronics", "Microprocessor engineering" and others.

Discipline "Foreign Language - English", code (5)

The training in English aims at upgrading students' knowledge achieved at school and at developing their language skills: reading, writing, listening and speaking. Special attention is paid to lexical units and structures of General English, typical for technical literature. The emphasis is on developing students' oral and written communicative skills. The course in English is designed to enhance students' language competence: revision of common grammar and syntax structures, improving functional literacy in English. By the end of the course students will be able to express themselves fluently in a professional environment as well to make short oral presentations.

Main issues of the syllabus content:

- Revising English tenses;
- Revising Conditional Sentences;
- Revising Passive Voice as one of the most important structures in Technical English;
- Improving communicative skills: reading, writing, listening comprehension, speaking;
- Delivering oral presentations.

Discipline "Specialized Sport Activities, part 1", code (6a)

The discipline is connected with swimming training by specific swimming exercises for maintain the health status of the students. The given theoretic and training potential gives students skills on swimming styles and especially freestyle stroke. There is an entrance level provided for physical capabilities of the students educated. The teaching program consists of 30 hours exercises in a swimming pool.

Main parts of content :

- Theoretic and methodic knowledge
- Special physical training
- Technical and tactic training
- Psychological and will training.

Discipline "Sport and Social Adaptation, part 1", code (6b)

The education program on Sport and Social Adaptation Part 2 lays in education plan for Bachelor degree of all subjects. The program is intended for students who are obliged to select in 1-st year of education due to physical deceases and health problems. The lectures material is in two semesters and covers topics of basics of sport as a factor of good psychical and physical health and its influence to effective social adaptation.

Main parts of content :

- Sport
- Social adaptation
- The place of sport for an effective social adaptation.

Discipline "Mathematics for Computing", code (7)

The discipline "Mathematics for computing" provides the fundamental preparation for the students of the specialty "CST" at the Technical University - Varna. The aim is to develop students' mathematical knowledge and skills to create correct mathematical models and effective algorithms to solve practical problems in the field of computer engineering.

Main issues of the syllabus content:

- Analytical geometry (in the plane and in the space).
- Number theory (with algorithms).
- Combinatorics (with algorithms).
- Probability and mathematical statistics (with algorithms).

The course provides all special courses from the curriculum of the specialty and in particular: Data Management, Object Oriented Programming, Operating Systems Principles, Discrete Structures, System Analysis, Graphic Systems, Database Systems, Internet Data Protection, Information Systems, Cryptography and data protection, WEB Design etc., as well as the diploma project.

Discipline "Algorithms and Data Structures", code (8)

The course is created for a first year students on Computer Science and Technology. The course emphasis is on designing and analyzing of algorithms. Also fundamental data structures and its implementations are considered. The course forms knowledge and skills in the fields of correct and efficient programs and algorithms synthesis. It covers a range of important programming techniques and abstract data types (ADT).

At the end of the course, students understand data structures. They know how to use them, how to implement them several ways. The students can reason about efficiency with a big-O analysis and argue for the correctness of their implementations by referring to the invariant of the ADT. Another important effect of the course is the specification, design, and implementation experience.

Main issues of the syllabus content:

- Algorithms and its basic features, definitions, efficiency, correctness and so on.
- Methods and approaches for algorithm's and program's design (such as structure programming, object oriented programming, recursion, backtracking, "divide and conquer" approach and so on).
- Structures of data, static and dynamic, linear and non-linear (such as stack, queues, double ended queues, lists, trees and graphs).
- Well-known classical algorithms. This part of the course includes such topics as algorithms for sorting, searching and hashing, heuristic and greedy algorithms, probabilistic and randomized algorithms, genetic algorithms etc.

Discipline "Algorithms and Synthesis of Digital Logic", code (9)

The course is oriented towards the fundamental preparation of the students of the specialty "CST" at TU - Varna. The aim is to give the students knowledge and skills in the methods of analysis and synthesis of logic circuits and their use in computer systems and technologies. The main objectives of the discipline are related to the formation of knowledge and skills in the students: presentation and minimization of logical functions; methods for analysis and synthesis of combinational logic circuits; methods for analysis and synthesis of sequential logical circuits; microprogramming machines and their applications; programmable logic devices and their use in the synthesis of logic circuits.

Main issues of the syllabus content:

- Presentation and minimization of logic functions
- Methods for analysis and synthesis of combinational logic circuits
- Methods for analysis and synthesis of sequential logic circuits (Finite State Machines)
- Counters and Shift registers
- Microprogramming machines and their applications
- Programmable logic devices and their use in the synthesis of logic circuits

Discipline "Computer Electronics", code (10)

The course project "The course project "Computer Electronics" enables the students to study the methods for selection, design and analysis of the following electronic circuits and devices used in the computer equipment:

1. Voltage stabilizers.
2. Transistor Amplifiers.
3. SMPSs.
4. Devices for tracking and measuring physical quantities.
5. Filters.
6. Control circuits for electronic devices.

The developed course project is presented in an explanatory note, which contains the completed design stages, including the principle diagrams of the projected device as well as a specification of the used electronic elements.

The project is defended in oral presentation with the lecturer. The student answers questions on justification, dimensioning and selection of circuit solutions and electronic elements." enables the

students to study the methods for selection, design and analysis of the following electronic circuits and devices used in the computer equipment:

1. Voltage stabilizers.
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The project is defended in oral presentation with the lecturer. The student answers questions on justification, dimensioning and selection of circuit solutions and electronic elements.

Discipline "Practical Training, part 1", code (11)

The course introduces the students to:

- CAD system Multisim xx - capabilities, working window, tools - purpose, setup; libraries and elements included therein; power supplies and measuring instruments.
- Construction and study of diode arresters, R-C differentiation and integration circuits, sizing of circuits, investigation of rectangular impulse generators.
- Design and research of combinational logic circuits.
- Design and study of logical memory circuits.

Main issues of the syllabus content:

- Introduction to CAD system Multisim xx.
- Power supplies and meters incorporated in the simulation software.
- Diode limiters. R-C differentiating and integrating chain. Generators of rectangular pulses.
- Design and study of combinational logic circuits.
- Design and study of sequential logic circuits.

Discipline "Specialized Sport Activities, part 2", code (12a)

The education program on Sport swimming suggests for specific swimming skills and the theoretical knowledge for health status gives also skills for better swimming capabilities. Special attention is pointed to basis tendentious in different styles when starting and finishing. Training backstroke freestyle.

Main issues of the syllabus content:

- Theoretical and methodical knowledge
- Common physical training
- Special Physical training
- Technical and tactical training
- Psychological and will training.

Discipline "Sport and Social Adaptation, part 2", code (12b)

The education program on Sport and Social Adaptation Part 2 lays in education plan for Bachelor degree of all subjects. The program is intended for students who are obliged to select in 1-st year of education due to physical deceases and health problems. The lectures material is in two semesters and covers topics of basics of sport as a factor of good psychical and physical health and its influence to effective social adaptation.

Main issues of the syllabus content:

- Sport
- Social Adaptation
- The place of sport for an effective social adaptation.

Discipline “Discrete Structures”, code (13)

The content concerns tools for modeling the behavior of discrete systems. Theoretical statements and practical examples are presented, providing the students a suitable basis for presentation and modeling of discrete objects in the field of software. The program includes various language recognition tools such as finite automata, Petri nets, Turing machine. During the seminar exercises, basic tasks are solved to demonstrate the concepts set out.

Main issues of the syllabus content:

- Sets and operations with sets. String sets. Regular sets and expressions.
- Formal languages and grammars
- Language recognition by Petri terminals and marked networks

Turing machines

Discipline “Electronics Measurement”, code (14)

The discipline "Electronics Measurement" examines the fundamentals of metrology, principles of operation, design and practical use of the modern devices for conventional measurements and data acquisition systems (DAQ systems), in the measurement of electrical and non-electrical values by electrical methods and tools. Students will find their advantages: universality, ability for far distanced measurements from the source, ability for automation and visualization of the measurement process, high accuracy, sensitivity, wide mathematical and statistical processing capabilities, transfer and analysis of the measurement data information. It will be given conceptions of metrology, standardization, digital signal processing. It will be created skills not only for proper measurements, but also for metrology, standardization and signal processing as well as representing of the measurement results. In order to consolidate the theoretical knowledge and the formation of practical skills, students are provided with laboratory exercises.

The discipline builds necessary skills for the selection of the proper measuring devices and mechanisms, as well as DAQ systems, their wiring and signal processing of the measurements data in the process of solving specific experimental problems in the practice of the specialists.

Discipline “Object-Oriented Programming Fundamentals (C++)”, code (15)

The course is based on the knowledge acquired by the students through the preceding courses “Programming Fundamentals” and “Algorithms and data Structures”. The latest trends in the appropriate courses from leading universities in Europe and USA as well as the recommendations of the C and C++ users’ association have been taken into consideration for course content’ designing. Presented material introduces the students with contemporary technologies for application development with usage of C++. The course consists of two parts – “Object-oriented programming in C++” and “Standard library of STL template classes”. The basic principles of the object-oriented programming are presented through implementation of algorithms and data structures already studied in previous courses, while the course itself extends the knowledge in algorithms including generalization of the term algorithm and the way of its implementation.

Main issues of the syllabus content:

- Objects and classes.
- Inheritance and polymorphism.
- Instruments for programs’ organization.
- STL library – description.
- Consecutive containers.
- Suggestive containers.
- Adapters of containers.
- Implementation of base structures in STL – stacks, queues, priority queues.
- Object functions and adapters.
- Invertors. Iterative adapters
- . Algorithms and containers.
- General algorithms – creation principles, based on STL

Discipline "WEB Design", code (16)

The subject aims to acquaint students with the principles of designing functional web sites, the methods of publishing on WWW, the use of modern technologies such as HTML, XHTML and Java Script to create dynamic WEB documents.

During the course, the students develop independently the complete design and frontend of a Web site, according to given or selected themes as a course project. Emphasis is placed on writing quality code in line with current standards (HTML5 / CSS3 / JavaScript (ES5, ES6)), cross browser compatibility and good SEO practices.

The subject is based on the students' knowledge of creating documents with the tools of Web Design and Microsoft Office and has initial links with the disciplines in which object programming and WEB technologies are studied.

Main issues of the syllabus content:

- WEB design principles
- HTML. Creation of documents, formatting, forms
- Java Script
- HTML DOM model
- Insert media into web documents
- Information search machines
- Web 2.0.
- Semantic Web

Discipline "Computer Organization", code (17)

The discipline is devoted to the structural organization and functioning of modern computer systems. Types of data and the standards for their presentation are considered. Algorithms of arithmetic with fixed and floating point numbers are studied. Based on the principles of organization and implementation of the computer, the logical structure and functioning of its main devices and systems are considered. The attitude of individual structural elements and primary algorithms to various programmatic problems is elucidated.

Main issues of the syllabus content:

- Data - logical, symbolic, numeric. Number representation - fixed and floating point. Standards for number representation. Features. Accuracy. Machine codes. Formal means for presenting logical structures and language of micro-operations.
- Arithmetic-logic device for a fixed point numbers. Arithmetic-logic floating point device.
- Storage devices and operations in them. RAM-memory - static and dynamic organization. FIFO and LIFO structures. Associative memory - associative operations. Applications.
- Organization of the computation process. Command cycle. Machine command system. Addressing methods. Registers.
- Interruption. Organization of the interruption system. Organization of an I / O system. System bus. Exchange methods.
- Organization of the storage system. Buffer memories, commands, and management algorithms. Organization of virtual memory.
- Principles of organization of control. Logical structures of micro-programming control devices.

Discipline "Practical Training, part 2", code (18)

The discipline provides all special subjects from the curriculum of the specialty. The subject "Learning Practice" (in the second semester) aims at introducing the students from the second course with the main software courses in the subject "Computer Systems and Technologies", their development and perspectives, as well as gave them an idea of some of the disciplines to be taught in the curriculum.

It aims at: acquainting with key programming languages and environments and their practical use;

acquiring knowledge and skills for defining and using classes, objects, functions and templates; compilation of "smart and entertaining" programs and projects by using program libraries for working with different data types and forms for presentation of information (textual, audio and visual).

The discipline provides part of the following laboratory exercises and projects in relevant disciplines from the curriculum of the specialty.

Main issues of the syllabus content:

- Program languages: C ++, C #, Java - features and application.
- Structure, content and applications of C ++ programs. Select a learning project - a practical task for programming.
- Batch processing and memory management programs and functions.
- OOP - classes and objects.
- Programs and functions for work with arrays and pointers.
- Programs and functions for processing text information.
- Input-output streams and manipulators.
- File processing programs.
- Programs and functions for working with audio and audio information.
- Programs and functions for working with graphic primitives and graphics.
- Programs for modeling "logical" games (puzzles, sudoku, chess, etc.) with text, graphics, audio and video effects.
- Programs for console (desktop) video game modeling.

Discipline "Specialized Sport Activities, part 3", code (19a)

Discipline "Sport Management, part 1", code (19b)

Discipline "Advanced Object-Oriented Programming (JAVA)", code (20)

Using the main conceptions and principles of object-oriented programming, the students learn programming language Java and get knowledge and skills on Java programming. The course is considered the basic language statements and constructions. Such topics as Declaring Classes, Declaring Member Variables, Defining Methods, Constructors for Classes Providing, Passing Information to a Method or a Constructor, Creating Objects, Using Objects Inner Class Example and so on are discussed.

Main issues of the syllabus content:

- Abstract classes
- Packages
- Generics
- Interfaces
- Inheritance

Discipline "System Analysis", code (21)

The aim of the discipline "System Analysis" is to examine different real technical, economic, biological, etc. systems for which mathematical models are used, sometimes involving hundreds and thousands of dependencies and numerical parameters. The analysis and synthesis of such systems requires reliable computational algorithms and computer programs.

Expanding the general knowledge of students in the above areas as well as applying the considered theories and methods will help future computing professionals to develop effective applications. No matter how new is the computer technology to be used, it is important to know the object (system) for which the computer program is intended. A qualitative end product cannot be created without knowing the basic principles in the management of different types of objects and systems and without applying mathematical modelling.

Main issues of the syllabus content:

The course "System Analysis" is structured in three parts.

The first part discusses systems whose parameters are not time functions. The description of such systems is usually given by systems of linear and non-linear algebraic equations. The analysis and synthesis of such systems also involves the use of optimization methods. This group can include real economic models for optimization and decision making.

In the second part are presented the basics of methods related to description, modelling, identification and synthesis analysis of automatic control systems.

The third part deals with the modelling of systems with analogue and digital-analogue neural networks. Some models of financial systems are considered.

Discipline "Microprocessors", code (22)

The subject examines the structure of Intel i8086 / i8088 and i8087 microprocessors. The presentation of the data, the structure of the operating devices, the organization of the microprocessor system, the basic methods of data exchange, the machine commands system are studied. The programming models of the CPUs and peripheral circuits are defined. The processor registers, interrupts, I/O system, and addressing modes are considered. During the laboratory exercises Assembler language and the basic programming structures that can be realized and experimented, are studied. The aim is a good understanding of the machine commands action and the organization of the automatic computing process. Skills to create algorithms and to program linear, branched, cyclic program structures, using sub-program technique and the I/O exchange of data are being obtained.

Main issues of the syllabus content:

1. Data – representation, limitations, accuracy.
2. CPU architecture. Main devices. Programming model. Registers.
3. Instructions system. Instructions groups. Addressing modes.
4. Busses and signals of the microprocessor. Address space organization. Storage organization. Kinds of memory.
5. Interrupt. Interrupt system. Sub-program technique.
6. Input/ Output operations and commands. I/O device programming model and instructions. Organization of the parallel and serial data exchange.
7. Types of microprocessors. CPU architecture development.

Output form of the content:

The lectures explain the main topics, the features of the architecture and explain the resulting logical structures of the traditional computer technology. The exercises illustrate in detail the capabilities of the microprocessor by thoroughly studying the machine command system in assembly language. Particular attention is given to the structure of commands, addressing modes, data structures, and techniques of programming using Assembler.

Discipline "Programming Systems", code (23)

The course introduces students to the environment, technology and technology for application programming in the WINDOWS environment. The discipline examines:

- basic programming software under WINDOWS (message processing, menu operations, dialog and graphic elements, etc.), and
- tooling and programming tools for creating complex applications (DLL, COM, MFC, ATL, ActiveX and ODBC interface).

The course provides all special subjects from the curriculum of the specialty, using the knowledge of system programming in high-level languages (C, C++) and forming a user interface in the Windows graphical operating environment: "Computer graphics", "Databases", "Operating Systems", "Technology of Programming", "Programming Technologies on the Internet" and part of the optional courses and the diploma project in creating Windows applications and the Internet.

Main issues of the syllabus content:

- Organization of program components in WINDOWS.
- WINDOWS Window Object Model, Event Programming, Message Exchange.
- Basic WINDOWS concepts, resolving resources, dynamic libraries, program component

interaction, RAM management.

- Create custom dialog, resource editor, dialog elements.
- Manage user dialogs, menus, dialog boxes, dialogs.
- Device Context, Graphics, Keyboard and Mouse Control.
- Principle of operation of complex controls: tree control, tabular control
- Creating and accessing dynamic libraries (DLLs).
- COM-modules, principle of operation, exemplary COM modules
- Libraries and modules for user dialogue management MFC, ATL, ActiveX.
- Access to databases, ODBC interface, database management functions.

Discipline “Digital Systems”, code (24)

By studying the subject "Digital Systems", the future engineer acquires skills for designing modern digital systems applicable to microprocessor engineering, computer equipment, communications, etc. areas of electronics.

The discipline is related to the following disciplines: Microprocessor Engineering, Computer Organization, Microprocessor Systems, as well as specialized disciplines from the curriculum of the specialty CCT

Main issues of the syllabus content:

The course aims to acquaint students with the logical design of digital circuits and systems. The material studied provides fundamental knowledge and experience on:

- working with logical elements and compiling a certain logic.
- use of integral digital systems to generate and generate pulses.
- the basics of the logical design of digital systems;
- familiarity with the languages for describing digital systems

Form of content delivery:

Lectures - include a total of 15 topics.

Laboratory exercises - conducted in computer halls, allowing students to apply the knowledge in practice.

The material is taught in lectures and exercises. Each exercise ends with an individual record made by each student.

Discipline “Object-Oriented Programming Fundamentals (C++)”, project”, code (25a)

This course is based on the theoretic and practical knowledge of the students of the previous courses “Object-oriented programming Fundamentals”, “Programming Fundamentals” and “Synthesis and Analysis of Algorithms”.

Design objects are specific individual assignments related to the development of C ++ applications. Design tools are Microsoft Visual Studio 2010 (Microsoft Visual C ++ .NET).

The course project aims at consolidating and expanding the knowledge of the students from the part of the OOP discipline in the third semester. The material covered covers the application of the accumulated knowledge of classes, objects, inheritance and polymorphism, working with different types of data, abstract classes, algorithms and the principles of their realization.

Acquired knowledge and practical skills can be used in the development of course and diploma design and using C ++ as a design tool.

All knowledge from other previous and current disciplines concerning the methods and technical means of designing applied software is used.

Form of content delivery:

Each student receives an individual assignment for the course design by the lead lecturer.

The consultations are held weekly within the planned hours.

The results of the project implementation are demonstrated on a computer in the form of a working program and are written in the explanatory note.

The final grade of the course project is formed during the last academic week of the semester based on the submitted written material and an oral question on the content of the project.

Main issues of the syllabus content:

- Algorithmization;
- Structuring;
- Logical organization;
- Experimental tests;
- Program documentation.

Discipline “WEB Design, project”, code (25b)

The project aims to acquaint students with the principles of designing functional web sites, the methods of publishing on WWW, the use of modern technologies such as HTML, XHTML and Java Script to create dynamic WEB documents.

During the course, the students develop independently the complete design and frontend of a Web site, according to a given or selected themes as a course project. Emphasis is placed on writing quality code in line with current standards (HTML5 / CSS3 / JavaScript (ES5, ES6)), cross browser compatibility and good SEO practices.

The project is based on the students' knowledge of creating documents with the tools of Web Design and Microsoft Office and has initial links with the disciplines in which object programming and WEB technologies are studied..

Main issues of the syllabus content:

- Web design principles
- HTML. Creation of documents, formatting, forms.
- Java script.
- HTML DOM model
- Insert media into web documents.
- Information search machines.
- Web 2.0.
- Semantic Web.

Discipline “Computer Organization, project”, code (25c)

Course design is a form of individual learning in which the student has to pass creatively through all major stages of engineering design - problem analysis, synthesis of the technical solution, realization of the solution and, if possible, experimental study of the solution. Individual assignments are tasks related to the design of hardware and application software in different ways and with different technical means.

Students expand their knowledge, develop skills and habits for independent work with scientific and technical literature, application of standards requirements, drawing, organization and planning of the experiment, work with measuring equipment and specialized software. They develop a critical attitude towards different organizations and architectural solutions in computer systems.

Main issues of the syllabus content:

- Assignment analysis.
- Block synthesis and specification of tasks and how the core blocks work.
- Synthesis of the technical solution, implementation of the decision and, if possible, experimental study of the solution.
- Design of application software (if necessary)
- Documenting the development.

Discipline “Discrete Structures, project”, code (25d)

The “Discrete Structures” course project is designed for students of the specialty CST. There are practical assignments that clarify the concepts, studied in the previous semester. Tasks are related to the development of analyzers and recognition programs for a simplified input language, composed of string characters, defined on a given alphabet.

The project relies on the knowledge of students from previous disciplines:

- Fundamentals of computer systems
- Basic programming

- Discrete structures
- Synthesis and analysis of algorithms
- Mathematics for Computer Science

The acquired knowledge and skills are necessary for the students in the disciplines "Object-Oriented Programming", "Operating Systems", "Compilers and Interpreters" as well as in the practical work of each student.

Main issues of the syllabus content:

- Main issues of the syllabus content:
- Sets and operations with sets. String sets. Regular sets and expressions
- Formal languages and grammars
- Recognition of regular and context-free languages
- Turing machines

Discipline "Computer Electronics, project", code (25e)

The course project "Computer Electronics" enables the students to study the methods for selection, design and analysis of the following electronic circuits and devices used in the computer equipment:

1. Voltage stabilizers.
2. Transistor Amplifiers.
3. SMPSs.
4. Devices for tracking and measuring physical quantities.
5. Filters.
6. Control circuits for electronic devices.

The developed course project is presented in an explanatory note, which contains the completed design stages, including the principle diagrams of the projected device as well as a specification of the used electronic elements.

The project is defended in oral presentation with the lecturer. The student answers questions on justification, dimensioning and selection of circuit solutions and electronic elements.

Discipline "Specialized Sport Activities, part 4", code (26a)

Discipline "Sport Management, part 2", code (26b)

Discipline "Graphics and Visual Computing", code (27)

The aim of the course is to introduce students to the basic methods of computer graphics and visualization necessary for the construction of different types of graphic systems (GC). Different aspects of graphical applications are discussed as a set of software, hardware, data, manipulation, storage, analysis and visual representation of data in systems with different application areas. The course includes lectures on topics such as the mathematical foundations of computer vision, models, types and specifics of graphical systems. Mathematical tools needed to represent the geometric aspects of graphical objects, especially for modeling of smooth shapes and surfaces, have been specially studied. The themes of computer modeling of light, colors, exposure, reproduction, and composition of the frame, as well as the ways of storing graphic data are discussed. Attention is paid to the methods and means of storing graphic data. Algorithms for visualization of two-dimensional and three-dimensional graphic objects, business, technological and management, geographic and other graphic systems are also explored. The content includes questions about the synthesis of realistic images, the movement of graphics objects, animation systems, and the creation of virtual reality. The course also envisages the development of different types of graphics systems in the OpenGL graphics environment.

Main issues of the syllabus content:

- Graphic program libraries.
- Raster graphics. Two-dimensional graphics
- Business graphics.

- Algorithms for plotting graphic primitives (segment, circle, etc.).
- Algorithms for two-dimensional cutting and filling closed areas.
- Transformations of graphic objects.
- Three-dimensional graphics. Design transformations.
- Algorithms to remove hidden lines
- Coloring 3D objects with realistic color.

Discipline “Software Engineering”, code (28)

The goal of Software Engineering is the construction of complex, maintainable software at reasonable cost. Software engineering applies both computer science and engineering principles and best practices to the design, implementation, testing, maintenance and evolution of software. Today, software engineering, as a discipline, is a cornerstone of the information technology sector and a significant factor in our economy. This course covers not only the technical and practical aspects of building and testing software systems, but also management issues. The course describes the general methods for software design, specification and testing. The course includes also additional topics related with the design for change, configuration management, and software tools.

Main issues of the syllabus content:

- Software Life Cycle and Software Development Processes
- Formal specifications
- Project Management
- Interaction Styles (User interface design)
- Architectural Design
- Testing and Other Verification Methods
- Software change strategies
- Distributed Software Engineering etc.

Discipline “Data Bases”, code (29)

The “Data Bases” aims to deepen students' knowledge of the main structures of up to date databases and systems for their management, based on the common ideology for real-world modeling based on the E-R model and the implementation using the relational data model as a real database via SQL. Students independently perform a task related to creating a DB project, user interface and testing on a DBMS, such as ORACLE. The course project is based on the previous course “Databases”.

Discipline “Computer Architectures”, code (30)

The aim is to unite the knowledge of the students on the hardware and software used in the modern computers, and to show their interaction in the entire computational process. The students are acquainted with concepts such as computer performance and efficiency, which are a direct consequence of the architecture.

Parallel architectures and parallelism as the main trends in the development of the modern computers are stressed. Pipeline instruction processing in the modern CPU, processors with a very long instruction word, vector processors, and processors with shared and distributed memory are covered. Features of the memory architectures (internal and external storage) are examined. The communication network types used in parallel computers are given attention, too.

Main syllabus items:

- Introduction to computer architectures.
- Modern computer architecture features.
- Introduction to parallel processing.
- Pipeline execution of the instructions in the CPU.
- Processors with multiple functional units.
- Vector processors.
- Parallel computers with shared and distributed memory.
- Communication networks.

- Memory architecture of the parallel computers.
- Architecture of the disc subsystem.

Discipline “Computer Communication Fundamentals”, code (31)

The main goal of the course is to provide students with basic knowledge of information transmission through communication environment, coding and signaling. Students receive basic knowledge about current standards and modern terminology related to computer communications. In the context of local networks, methods of coding information, modern modulation schemes, physical interfaces are considered. Initial knowledge is given about the types of physical and logical topologies of computer networks and about the functioning of the devices necessary for their construction. Students get acquainted with different transmission environments and protocols working on the physical and channel layer of the OSI model.

The discipline is related to next subjects "Computer Networks", "Administration of Local and Internet Networks" and "Computer and Network Security".

Main issues of the syllabus content:

- Basic terms related to computer communications. International Organizations for Standardization.
- Theory of information. Entropy. Concepts of quantity of information. Transmission of information. Communication model.
- Coding of the information. Even and uneven coding. Shannon - Fano code and Huffman. Noise-proof coding. Cyclic codes.
- Physical interfaces - RS232, USB, v.35 and others.
- Synchronization in data transmission. Asynchronous and synchronous transmission. Protocols.
- Modulation. Essence. Types.
- Basic terms related to computer networks. PAN, LAN, MAN, WAN. Physical and logical network topology.
- International standards for the design, construction and testing of computer networks.
- Network protocols and communications. Rules of communication. OSI and TCP / IP model.
- Logical and physical topology of the network. Types of topologies, advantages and disadvantages. Hierarchical Network Design.
- Designing the Network. Structured cabling. Testing of copper and fiber optic cable systems.
- OSI physical layer. Media. Presentation of the data. Coding - Manchester, NRZ, 4B / 5B, MLT-3 ...
- OSI Data Link Layer. Frame Format. Access to the network environment (MAC). LLC and MAC.
- Ethernet. Types of Ethernet. Collision and its detection (CSMA / CD). Collision domain.
- ARP protocol. Network segmentation. Switches.

Discipline “Advanced Object-Oriented Programming (JAVA), project”, code (32a)

The aim of the course project is to extend the knowledge gained by students in "Object oriented programming fundamentals I and II". Students must implement a simple system with graphical user interface (GUI) with necessary controls. For implementing of the system must be used different approaches like Model-View-Controller design pattern, Observer-Observable, and etc. The technologies on which is based the project are Java, JDBC and MySQL. The project finishes with final documentation and technical review of the implementation. As a result, students gain practical skills in more advanced implementation.

Main issues of the syllabus content:

- Layer for communication with database
- Creation of database for storing and retrieving data
- Model-View-Controller design pattern

Discipline "Microprocessors, project", code (32b)

The course project "Microprocessors" is provided as an individual form of training. Project assignments are either individual or group-specific and are aimed at creating software by means of the x86 assembly language, based on the resources and architecture of an Intel family microprocessor. The design of the project introduces the students to all stages of editing, compiling, linking, executing, and debugging user programs. Programming assembler language allows for achieving a better understanding of the specifics of using the interrupt system, the I / O system, and the memory system of the corresponding microprocessor. The purpose of design is to conceptually plan the application and acquire practical skills to manage the resources of a microprocessor system in order to implement the specific application.

Main topics:

Topic 1. Algorithms for arithmetic processing

Topic 2. Data transfer algorithms

Topic 3. Bit-wise processing algorithms

Topic 4. Algorithms using transitions

Topic 5. Interruptions

Topic 6. Exploring new systems

Topic 7. Other applications

Content presentation:

The training is carried out individually, or in group consultations. Students are consulted on the overall approach and methods for fulfilling the project assignment.

Discipline "Internet Programming Technologies", code (33)

The subject "Internet Technologies" is based on the previous disciplines like Web design, Object-oriented programming 1&2 and Computer networks and Internet. The purpose is to present the knowledge of different "client" side technologies like HTML, CSS, JavaScript (AJAX, AQuery). Server side technology Java EE and Java Web container – Apache Tomcat. The students will learn how to build advanced web applications with modern technologies and approaches.

Main issues of the syllabus content:

- HTML
- CSS
- JavaScript
- Server side technology Java EE
- Java Web container

Discipline "Microprocessor Systems", code (34)

The subject "Microprocessor Systems" aims at deepening the theoretical and practical knowledge of the students of the specialty "Computer systems and technologies" in the field of architecture and construction of microprocessor systems. The most common families of 32- and 64-bit microprocessors and the means and methods of implementing them into computing systems, are discussed. The training focuses on system architecture, real and virtual memory, interfaces and interaction between the components, the organization and management of inputs and outputs, as well as the means to build multiprocessor systems.

The discipline is based on the preceding disciplines: "Microprocessors", "Computer Organization", "Computer Architectures", "Operating Systems", "Computer Peripheral" and others.

The discipline provides: "Compilers and Interpreters", "Specialized Computer Systems", "Real-Time Operating System" and others.

Main issues of the syllabus content:

1. Architecture of Intel 32-bit and 64-bit microprocessors. Internal structure and organization. Operation modes.
2. P6 microarchitecture. NetBurst, Multi-Thread, Hyper-Threading architecture. Multi-core architecture. Instruction pipeline.
3. Instruction set. Microprocessor programming model. Data types. Addressing modes.

4. Memory organization and management. Segmentation and paging. Address translation. Descriptors and descriptor tables.
5. System architecture. Protected mode. Multitasking. Task management. Exceptions and interrupts.
6. System bus organization. Lines and signals. Timing diagrams.
7. Input-output organization. Programmable parallel and serial interfaces. Direct memory access. DMA controller.
8. Programmable interrupt controller.
9. Architecture and building multiprocessor systems. Advanced programmable interrupt controller.
10. Standard interfaces in PC - organization and capabilities. EISA, PCI interfaces. IC for their support.
11. Other microprocessor families.

Discipline "Computer Networks", code (35)

The main objective of the course is to provide the students with basic knowledge about the purpose and operation of network devices, configuration of end devices and network devices. The students receive a basic knowledge of computer network performance, they differentiate a different types of network devices, and know how to develop network solutions. The course makes the students familiar with current standards and modern terminology related to computer networks. In the context of local and Internet networks, security, performance, reliability and fault-tolerance are considered. They are familiar with the main diagnostic tools for monitoring and troubleshooting networking issues. Initial knowledge for building a physical topology and skills for designing logical topology of computer networks is given.

The discipline is related to next subjects "Administration of Local and Internet Networks" and "Computer and Network Security".

Main issues of the syllabus content:

- OSI and TCP / IP model. Network protocols and communications. Rules of the communication. Collision and Broadcast Domains
- Network layer. Addressing of networks. Types of IP addresses. IPv4 and IPv6 protocols.
- Submitting. Fixed length and variable length subnet masking (VLSM).
- Protocols, running on the network layer. Router architecture.
- Routing table. Access to local and remote network resources (direct and indirect routing).
- Distance Vector Routing Protocols. RiPv1, RIPv2, RIPng.
- Link-state Routing protocols. OSPF
- Transport layer. TCP and UDP protocols.
- Application layer. Application protocols and services - DHCP, NAT, FTP, HTTP, SMTP, DNS.
- Configuring and testing the local network. Selection of devices, protocols. Managing of configuration files.
- Wireless Technology. Home networking technologies. VPN
- Network and Information Security. Types of threats.

Discipline "Computer Peripheral", code (36)

The subject is intended to give some theoretical knowledge about the application of the computer peripheral and the ways and means of its management. It has to form practical habits in the students for its use. For this purpose, the principles, technologies and means of storing, entering and outputting information in computer systems are discussed. Ways to test the performance and device parameters are considered.

The main representatives of a class of peripheral devices and the standard interfaces for connecting them to computer systems are studied. The basic software features are considered to ensure the proper functioning of peripheral devices in the computer configuration.

Main issues of the syllabus content:

1. Computer peripheral. Purpose and basic functions. Classification. Organization of the data

exchange in the computer. Organization of PC input / output.

2. Computer peripheral interfaces. Classification. Parallel interfaces. LPT port on PC. Serial interfaces. COM port. Interfaces USB, IEEE1394.
3. Information media. Input devices. Principle of recording and reading information on the media.
4. Keyboard. Standard PC keyboards. Principle of operation and interfaces.
5. Graphics input devices - digitizers, color scanners. Mouse, trackball, joystick, touch screen.
6. Bar codes. Bar code readers. Digital cameras.
7. Printers. Characteristics. Print engines. Impact printers. Dot-Matrix printer. Inkjet printers.
8. Laser printers. Thermal printers. Color print technologies. Development of the printers.
9. Graphical output devices. Plotters, photo plotters. Principle of operation. Basic blocks and modes of operation.
10. Devices for registration information via visualization. Video Terminals. Principle of operation. Types and parameters.
11. Liquid crystal displays. Technologies and standards. Projection systems.
12. Magnetic media. Digital magnetic recording. Heads. Recording and reading of digital information on a magnetic media. Recording methods. Encoding of information.
13. External storage devices. Hard disk. Basic blocks and principle of operation. Parameters. Standard interfaces ATA, SCSI. Solid-State Drive.
14. Optical storage. Principle of operation, functional blocks and interface. CDs, DVDs and Blu-ray discs and devices. Optical storage development.

Discipline “Operating Systems”, code (37)

The subject acquaints the students with the basic principles of modern operating systems. Structure of operating systems is explained, functions of the individual components are described. Particular attention is paid to the parallel operation of processes, providing multitasking and multiuser work in any modern operating system. The problems that arise with simultaneous access of multiple processes to shared resources are presented. Classical methods and algorithms are addressed to solve these problems.

The laboratory exercises demonstrate the workings of the main components of the operating system - basic commands, work with the command interpreter, the file system. Particular attention is paid to the means and algorithms for solving the problem of competitive access of parallel processes to common resources.

Main issues of the syllabus content:

- Operating systems. Structure and functions of OS
- Processes. States of processes. Work of parallel processes. Mutual exclusion of parallel processes to shared resources
- Organization and management of memory

Discipline “Specialized Practice”, code (38)

The goal of the discipline is to forming for students practical skills for working in a real production environment. Students should be trained within 150 business hours at an IT-related company they choose. The training is in out-of-school time during the summer vacation of the third course.

Main issues of the syllabus content:

- The subject of the training depends on the company's requirements

Discipline “Software Engineering, project”, code (39a)

The course project on Software Engineering aims at deepening the knowledge of the students in the field of modern Software Engineering. The main idea of the project is the practical application of the knowledge about the software life cycle models, the modern software technologies and the organization of the team in the development of a real software product and teamwork.

The students have to develop and document a task assigned by the leading lecturer, related with the realization of a Windows Forms application (using Visual Studio.Net environment and language

C# or VB), going through the stages of product specification, product design and coding.

Main issues of the syllabus content:

- Software Specification
- Software Design
- Software Development

Discipline “Data Bases, project”, code (39b)

The “Data Bases, Project” aims to deepen students' knowledge of the main structures of up to date databases and systems for their management, based on the common ideology for real-world modeling based on the E-R model and the implementation using the relational data model as a real database via SQL. Students independently perform a task related to creating a DB project, user interface and testing on a DBMS, such as ORACLE. The course project is based on the previous course “Databases”.

Main issues of the syllabus content:

- Task 1. Description of subject area
- Task 2. Design and implementation of database
- Task 3. Implementation of a programming system
- Task 4. Testing the project
- Task 5. Project defense

Discipline “Computer Architectures – project”, code (39c)

To deepen the acquired knowledge of the students on computer architectures and so to help them develop a critical attitude to the various computer solutions. The students are offered a choice of two possible forms of the course project:

1. To develop a programme model of a unit of the computer.
2. To write a description of the architecture of various units (processor, memory, chipset and so on) of the computer.

The assignments are done on an individual basis and are changed each year in order to take into account the changes in the computer implementations.

Students who have chosen the first form are offered to develop programme models of different units of the computer and by using them to estimate their parameters. As a rule, the students don't develop the models themselves, but use ready-made ones, paying the main attention to developing a suitable interface and approbation of the results. The so developed programmes-models can find their use in the education of the lower grade students. During the defense, the students present a description of the programme model, example results and the executable file.

Students who have chosen the second for must present a material amounting at least 20 pages that constitutes a compilation of various sources on the assigned problem. What's encouraged is not the literal translation of a given material, but developing one in which a comparative analysis is attempted. As in the first form, here the students also get individual assignments.

Assignments (development tasks):

- Methods to estimate the processor's performance.
- Analysis and estimation of the operation of a pipeline.
- Analysis of an operational pipeline.
- Analysis, test and estimations of the operation of SMP and MPP architectures.
- Analysis, test and estimations of communication networks.
- Vector processors.
- Analysis of disk storage.

Discipline “Computer Communication Fundamentals, project”, code (39d)

The subject aims to make deep students' knowledge in the field of computer communications. In the context of local and Internet networks, the students make a self-study of a particular communication technology based on an individual task sets by the lecturer. They write the study in a paper reviewing the technology standards and existing implementations of aspects such as

security, performance, reliability and fault-tolerance. They are familiar with topical issues related to the implementation and development of selected network technologies. They formulate a conclusion about its applicability, its advantages and disadvantages.

The discipline is related to next subjects "Computer Network", Administration of Local and Internet Networks" and "Computer and Network Security".

Main issues of the syllabus content:

- Description of the subject area. Study the subject area. International and national standards for the chosen technology.
- Exploring the application areas of the technology. Links to previous technologies.
- Consider alternative solutions.
- Comparative analysis of the studied technology with the alternative solutions in terms of technical characteristics. Formulation of advantages and disadvantages of the technology towards alternative solutions.
- Format of the PDU of the selected technology. Specifics concerning the advantages / disadvantages of technology.
- Type of exchanged messages in the selected technology. Specifics concerning the advantages / disadvantages of technology.
- Implementation of QoS (Quality of Service) for the technology under consideration. Comparative analysis of existing solutions
- Documentation.
- Defense of project

Discipline "Graphic and Visual Computing, project", code (39e)

The graphical composition is the basis of all electronic screens, whether animated, video or multimedia. New, modern electronic technologies pose specific problems with color composition and lighting composition. Not knowing this specificity is inconceivable getting quality graphical electronic design. It is necessary to study the techniques and aesthetics of graphic design and related computer programs and technologies.

The lectures and exercises deal with text formatting, creating or entering graphical objects and fitting the materials of a chosen size.

Main issues of the syllabus content:

- Working with Adobe In Design Program
- Working with Adobe After Effect
- Create ad material

Discipline "Compilers and Interpreters", code (40a)

The subject "Compilers and Interpreters" aims at acquainting the students of "Computer Systems and Technologies" specialty with the principles of functioning and the methods for creation of basic language processors - compilers and interpreters. The methods of realization of the basic phases of the compilers - lexical, syntactic, semantic analysis, generation and optimization of the source code are discussed. In addition, the principles of interpretation of different levels of intermediate code are considered. There is also a place for interpreting high-level languages, as well as systems for assemblers, compilers and interpreters. The key role of programming languages in defining requirements to the architecture of computers is emphasized. In the laboratory exercises a high-level language compiler is developed.

Main issues of the syllabus content:

- Introduction to language processors. Formally defining programming languages
- Lexical analysis. Organization of lexical analysis tables
- Syntax analysis. Methods for syntactic analysis
- Semantic analysis. Synthesis and analysis of semantic tables
- Organization of memory during program execution
- Generate and interpret code

Discipline "Multi-User Operating Systems", code (40b)

In this discipline programming and administration in multi-user operating systems are considered. Main principles are considered of development, functioning and usage of modern multi-user and multi-tasking operating systems. The details are presented of the command line interpreters, file systems, synchronization and communication of processes and the functioning of the input-output system. The concepts are considered of the distributed systems and the main functions of the operating system kernel for network applications development.

The discipline is based on the previous disciplines: "Operating systems", "Algorithms and Data Structures", "Computer networks", etc. It provides the basis for "Distributed programming", "Web Applications Development", "Networks Administration" and the graduation work.

Main issues of the syllabus content:

- Details of multi-user operating systems. Users and groups.
- Command line interpreters. Scripts. Script languages.
- File systems
- Management of input-output system. Special files. Management of input-output buffers. Synchronous and asynchronous input-output.
- Management of processes. Synchronization and communication of processes.
- Inter-process communication. Messages, shared memory and semaphores.

Discipline "Network Administration", code (41)

The course "Network Administration" aims to give practical knowledge in the field of operating principles, methods of building, management and protection of local (LAN) and global (WAN) computer networks. Questions related to the use of network features, protocols, and tools on Linux, Cisco IOS, and Windows Server operating systems to build, configure and maintain local and Internet networks are addressed. Serious attention is paid to setting up and maintaining the base services in computer networks (DNS, E-mail, WEB, etc.). Particular attention is paid to the problems associated with network security, network attacks and the protection of network communications.

The discipline is based on its predecessors: "Computer Communications Fundamentals", "Operating Systems", "Computer Networks", "Multiuser Operating Systems" and others. The course has initial links with the diploma project.

Main issues of the syllabus content:

- Network administration. Standards. Network administration models.
- Internet naming system (DNS). Structure. Name Servers. Name resolution process.
- DNS. Resource records. Types. Purpose
- Configuring a DNS server. Zone files.
- Automatic IP configuration. DHCP protocol. Principle of operation. Configuring DHCP server
- HTTP protocol. Types of headers. Basic methods. HTTP Apache server. Architecture
- Control access to Apache directories using the htaccess file. User authentication. Redirecting
- Principle of e-mail. Components. SMTP, POP, IMAP protocols. Principle of operation. Server states
- Control of access to services. Inetd super server. Windows Firewall
- Network security. Risk management. Threats to security. Viruses, worms and Trojans
- Types of network attacks. Protection against attacks.
- Traffic control. Linux packet filtering - Netfilter. IPTables.
- Network protection approaches. Building firewall architectures.
- Intrusion detection and protection systems (IDS, IPS).
- Network addresses translation (NAT).

Discipline "Embedded Systems", code (42)

The aim of the course is to give the students knowledge in the design and use of specialized computer systems (Embedded Systems - ES). The principles of ES organization are discussed. The main sources of information (input data) for ES - sensors, and the main process control systems are studied. The standard hardware and software tools of industrial controllers from industry-leading

companies and the standard interfaces between them are also considered. Issues related to the design of the ES are also included. The devices built into the ES are being studied, as well as development tools designed for application software design, setup and testing, and documenting the project.

Main issues of the syllabus content:

- General principles of the organization of specialized computer systems (Embedded Systems - ES). Classification and application areas.
- Connection of the ES with the environment. Sensors and Sensor Devices. Output mechanisms to control the processes in the facility.
- Standard instrumentation for building a ES Industrial controllers. Twido based configuration. Serial interfaces.
- Inventory built into ES. One-chip controllers, keyboard, LED, LCD indication, real-time clock. Non-volatile memories.
- Standard programming tools for building Programmable Logic Controller programs - TwidoSoft, TwidoSuite. Types of commands. Ways to describe algorithms for PLC.
- Construction of ES for various objects' control. Exemplary variants of technical, program and apparatus solutions.

Discipline “WEB Programming”, code (43a)

The course teaches ways to generate web content and data exchange between web browser and server scripts based on PHP server scripting language; comment the syntax, PHP coding style and documentation; addresses issues related to the PHP database script interaction, ways to recognize web application users, ways to handle exceptions, and more. It also discusses the interaction of PHP with XML as well as the generation of graphics in PHP. The exercises are practice-oriented, the goal is to acquire skills to design and develop dynamic web sites with a link to MySQL database.

Main issues of the syllabus content:

- Architecture of web applications and technologies for their creation
- Design and development of web applications with PHP - characteristics
- Methods for transmitting data from client to server and methods of accessing data in PHP script
- Access external files in web applications
- Object-oriented approach to web application development
- Means for recognizing the web application user
- Processing exceptions in web applications
- Interaction of a PHP script with database (SQLite, MySQL, etc.)
- Interaction of PHP and XML

Discipline “Practical Training, part 3 (IT Entrepreneurship)”, code (44)

The goal of the course is to expand the students' knowledge and skills for start-up and business development. The necessary prerequisites and approaches to identify potential users and analyze the characteristics of their needs are considered. Attention is drawn to the features of competitiveness, the establishment of a business plan, business sales strategies, the need for reporting and accounting. The classes are based on a large number of practical exercises aimed at consolidating and improving the presented theories and tasks.

Main issues of the syllabus content:

- Presentation planning and presentation of ideas
- Identifying business ideas and values
- Financial and material planning
- Definition of target markets and their characteristics
- Starting and developing a business

Discipline “Internet Programming Technologies ,project”, code (45a)

The course project “Internet Technologies” is based on the previous discipline “Internet Technologies”. It consists from individual complex tasks for students in which they must present the knowledge of different “client” side technologies like HTML, CSS, JavaScript (AJAX, AQuery). Server side technology Java EE and Java Web container – Apache Tomcat. The students will learn how to build advanced web applications with modern technologies and approaches.

Main issues of the syllabus content:

- HTML
- CSS
- JavaScript
- Server side technology Java EE
- Java Web container

Discipline “Microprocessor Systems, project”, code (45b)

The course project on "Microprocessor system" is an individual form of training. The course assignments are individual and group assignments.

The subject studies in detail the architecture of the most common 32-bit and 64-bit microprocessors and design of microprocessor system built with them. The methods and means for realization of computing systems are discussed. System architecture, real and virtual memory, interfaces and interaction between the components, the organization and management of the inputs and outputs, as well as the means to support the construction of multiprocessor systems, their components, interfaces and their programming in Assembler.

The course project is based on the preceding disciplines “Microprocessors”, "Microprocessor systems", "Computer Organization", “Computer Architectures” and others.

Main issues of the syllabus content:

The material is studied in the form of individual and group consultations.

The assignments illustrate some applications of the microprocessor systems, building of the microprocessor systems for specific purposes and the practical usage of low-level programming language (Assembler). The students learn and practice construct system structures, memory management, programming in protected mode, in multitasking mode and tasks management, programming the controllers and I/O devices, writing interrupt routines and testing some optimization techniques and specific instructions.

Discipline “Computer Networks, project”, code (45c)

The subject aims to make deep students' knowledge in the field of computer networks. In the context of local and Internet networks, the students make a self-study of a particular network technology based on an individual task sets by the lecturer. They write the study in a paper reviewing the technology standards and existing implementations of aspects such as security, performance, reliability and fault-tolerance. They are familiar with topical issues related to the implementation and development of selected network technologies. They formulate a conclusion about its applicability, its advantages and disadvantages.

The discipline is related to next subjects "Administration of Local and Internet Networks" and "Computer and Network Security".

Main issues of the syllabus content:

- Description of the subject area. Study the subject area. International and national standards for the chosen technology.
- Exploring the application areas of the technology. Links to previous technologies.
- Consider alternative solutions.
- Comparative analysis of the studied technology with the alternative solutions in terms of technical characteristics. Formulation of advantages and disadvantages of the technology towards alternative solutions.
- Format of the PDU of the selected technology. Specifics concerning the advantages / disadvantages of technology.

- Type of exchanged messages in the selected technology. Specifics concerning the advantages / disadvantages of technology.
 - Implementation of QoS (Quality of Service) for the technology under consideration.
- Comparative analysis of existing solutions
- Documentation.
 - Defense of project

Discipline “Computer Peripheral, project”, code (45d)

The course aims at deepening students' knowledge in the field of organization, operation and management of peripheral devices and how to integrate them into a single computing or control system, as well as to ensure diploma project design. It aims at building habits and skills for independent work with scientific and technical literature, working with technical documentation and writing it.

Individual assignments are aimed at systematically reviewing and analyzing a group of peripheral devices, or studying a particular device and developing hardware and software for connecting it to a computer system. This is done through the appropriate use of standard peripherals, interfaces and controllers developed by leading companies. During the design, the student passes through all stages of design - algorithmic, structural, logical, principled, and experimental. This includes studying technical standards, designing plans and technical documentation, planning and organizing experimental research, studying the technical means for conducting it, and other practical skills. An accompanying explanatory note is prepared.

The knowledge of previous and current disciplines on the methods and technical means for application hardware and software design is applied.

Main issues of the syllabus content:

1. Setting and clarifying the individual assignments
2. Synthesis of the block diagram and specification of the tasks of the main blocks
3. Overview and selection of a standard peripheral device, interface, controller
4. Design of the electrical circuits
5. Design of the application software
6. Creating the project documentation
7. Presentation of the project documentation and a quiz

Discipline “Operating Systems, project”, code (45e)

The course project on operating systems aims to deepen students' knowledge in the field of modern operating systems. The aim of the project is to acquire practical skills for working with the command interpreter, development, tracing and testing of functional command scripts. Problems, concerning file system, file and directory access management are solved. Particular attention is paid to the parallel operation of processes using common resources.

Main issues of the syllabus content:

- Commands for working with files and directories
- Manage access to files and directories
- Command scripts
- Parallel processes
- Competitive access of parallel processes to a common resource

Discipline “Office Systems”, code (46/47/48-2)

The course strives to create knowledge and skills in the fields of office technologies.

Student will be competent in the concepts of office systems methodologies and capable of applying these concepts in structured and non-structured problems in an office environment. Students will also integrate technical skills to computer hardware and software applications.

Upon successful completion of the course, the student should be able to apply knowledge of various software packages to a variety of work settings and to solve practical engineering problems arising in the today's office.

Main issues of the syllabus content:

- word processing;
- desk publishing;
- creation of graphical objects using graphic libraries;
- creating forms, tables and structured documents;
- exchange documents with external systems (Dynamic Data Exchange - DDE / Object Linking and Embedding - OLE);
- multimedia: audio comments, video clips;
- automated synthesis of documents.

Discipline “Artificial Intelligence”, code (46/47/48-3)

The Artificial Intelligence (AI) course introduces the fundamental concepts of modern theory and provides knowledge about the practical use of some basic methods in real-world applications. The lectures cover topics, such as: Agents. Intelligent agents. Solving problems by searching. Planning. Logic. Logical agents. Making decisions in fuzzy / uncertain information. The probabilistic approach. Machine Learning theory. Training of probability models. Communication, perception, action. AI Tools. Applications (natural speech processing, emotional intelligence, robotics, data interpretation, expert systems, etc.), as well as Philosophy and Ethics of Artificial Intelligence.

The laboratory exercises address the application of various discriminative and generative methods of machine learning, such as: Probabilistic Neural Networks (PNN), Support vector machines (SVM), Gaussian mixture models (GMMs), Hidden Markov models (HMMs), self-organizing architectures (SOM, LVQ), Bayes Networks, locally recurrent neural networks (LR PNN), convolutional neural networks (CNN), deep neural networks (DNN), hierarchical time memories (HTM), etc. Furthermore, students acquire knowledge about the principles used in regression analysis and numerical values prediction, and the importance of regression analysis. The key principles underlying the modern methods of optimization, incl. evolutionary and genetic methods, and their advantages and disadvantages to traditional gradient optimization methods are discussed. For that purpose, knowledge, and skills related to Python, MATLAB, and AIML programming languages are mastered.

The knowledge acquired within the AI course supports the diploma thesis project as well as the professional profiling towards development of technology with elements of artificial intelligence.

Main topics of the syllabus:

- Agents. Intelligent agents,
- Solving problems by searching,
- Planning,
- Logic. Logical agents,
- Making decisions in fuzzy / uncertain information,
- The probabilistic approach. Training of probability models,
- Machine Learning,
- Communication, perception, action.
- AI Tools and means.
- Applications (natural speech processing, emotional intelligence, robotics, data interpretation, expert systems, etc.),
- Philosophy and Ethics of Artificial Intelligence.

Discipline “Multimedia Systems and Technologies”, code (46/47/48 - 8)

The subject Multimedia Systems and Technologies (MMST) aims to presents of the students the theory and practice of the processes of creating and using different media elements - sound, video, animation, etc. In the theoretical course of the subject are discussed problems such as presentation of sound and video in computer and industrial systems. Different multimedia standards - MPEG-1, MPEG-2, MPEG-4 and others. The course also deals with principles and concepts related to modern computer animation and 3D modelling. Students are also introduced to various techniques and technologies for creating computer animation and special effects. Topics on modern technology

tools for creating and working with animation - OpenGL and DirectX are also presented in the course.

Main issues of the syllabus content:

- Multimedia standards – MPEG-1, MPEG-2, MPEG-4, etc.
- Principles of computer animation
- Principles of 3D modeling
- OpenGL and DirectX

Discipline “E-Commerce”, code (46/47/48-11)

The aims of the E-Commerce course are to give basic practical knowledge on the principles of functioning, methods of building, managing and protecting of the e-commerce systems. The tasks related to the legal framework and the e-business strategies are being considered. Particular attention is paid to the technical aspects of the issues related to the methodology of organizing e-commerce sites, organization and payment technology on the Internet (EasyPay, B-Pay, ePayVoice, Pay.egov.bg, eBG.bg, epay.bg.etc.). The subject is based on the previous courses: "Web Design", "Software Technologies", "Computer Networks", "Software Technologies on the Internet" and others. The subject gives possibilities to prepare the diploma project.

Main issues of the syllabus content:

- E-Business Strategies. Methodological issues. Strategic planning. Strategic alternatives. Elaboration of an e-business strategy.
- Legal aspects of e-commerce. Bulgarian legislation on electronic commerce, electronic payments and contracts on the Internet. Risks and ways to overcome them. Digital copyrights.
- Architecture of e-commerce systems. Types - B2B, B2C, B2G, C2C, m-commerce.
- Organization and Technology of Payments on the Internet. Requirements for electronic payments. Security system.
- National payment systems with electronic cards - ePay.bg, Easypay, B-Pay, ePayVoice, Pay.egov.bg, eBG.bg and others.
- Planning and Designing of Online Business. Methodological issues and solutions in the e-business. Indicators for e-Object Assessment.
- Software for e-commerce systems. WEB- technologies for e-commerce. Application platforms for organizing e-sites.
- Technical support of an e-commerce system. E-commerce servers. Communication networks for e-commerce.
- E-marketing. The role of social networks as a means of marketing and PR tools on the Internet. Blogs. Email Marketing.
- Features of Internet Advertising. Types of advertising formats. Measure advertising performance on the Internet.
- Online Store. Dedicated software tools for creating online stores.
- Online booking systems. Features.
- Security of communications in e-commerce. Privacy of personal data.
- Security and protection of e-banking systems. Protection of transactions in e-commerce.
- Cloud services for e-commerce

Discipline “Preliminary Graduation Work”, code (49)