



ВИСОКА ТЕХНИЧКА ШКОЛА
СТРУКОВНИХ СТУДИЈА
у Новом Саду

COURSE CATALOGUE

INFORMATION TECHNOLOGIES

Undergraduate applied studies

**NOVI SAD,
June 2023**

Table 5.2.a – Course catalogue of the INFORMATION TECHNOLOGIES undergraduate study programme

No.	Course code	Course title	Field of Study	Semester	Lecture	Lab	Other Forms of Teaching	Other Hours	ECTS
1	2002	Mathematics	Mathematical Sciences, Technological Engineering	1	2	3			7
2	2010	Fundamentals of computing	Electrical and Computer Engineering, Technological engineering	1	1	1	1		6
3	2006	Fundamentals of electrical engineering 1	Electrical and Computer Engineering	1	2	2			6
4	2053	Fundamentals of programming	Electrical and Computer Engineering	1	3	1	1		7
5	Elective option 1 (select 1 of 2)								
	2001	Business communications	Cultural Studies and Communications, Applied Arts and Design	1	3	1			6
	2068	Introduction to web design	Electrical and Computer Engineering	1	2	2			6
6	2054	Object-oriented programming	Electrical and Computer Engineering	2	3	2			7
7	2055	Computer graphics	Technological Engineering, Mechanical Engineering, Applied Arts and Design	2	1	2	1		6
8	2056	Fundamentals of web technologies	Electrical and Computer Engineering	2	2	3			6
9	2015	English	Philological Sciences	2	2	0			3
10	Elective option 2 (select 1 of 2)								
	2007	Fundamentals of mechanical engineering	Mechanical Engineering	2	2	2			6
	2044	Electrical measurements	Electrical and Computer Engineering, Physical Sciences	2	2	1	1		6
11	2047	Electronics	Electrical and Computer Engineering	3	2	2			6
12	2057	Web design	Electrical and Computer Engineering, Applied Arts and Design	3	2	2	1		7
13	2058	Computer networks	Electrical and Computer Engineering	3	3	2			7
14	2059	Relational databases	Electrical and Computer Engineering	3	2	2			6
15	2018	Specialist English	Philological Sciences	3	2	0			3
16	2060	Client programming	Electrical and Computer Engineering, Математичке науке	4	2	1	1		6
17	2130	Microcomputers	Electrical and Computer Engineering	4	2	2			6

18	2062	Web databases	Electrical and Computer Engineering	4	2	2			6
19	Elective option 3 (select 1 of 2)								
	2035	Engineering communications	Mechanical Engineering	4	2	1	1		6
	2040	Fundamentals of maintenance	Mechanical Engineering	4	2	2			6
20	Elective option 4 (select 1 of 2)								
	2043	Fundamentals of electrical engineering 2	Electrical and Computer Engineering	4	3	2			7
	2069	Audio and video technologies	Electrical and Computer Engineering, Technological Engineering	4	3	3			7
21	2063	Management information systems	Electrical and Computer Engineering	5	2	1			5
22	2064	Development of e-business applications	Electrical and Computer Engineering	5	3	1	1		7
23	2067	Software application design	Electrical and Computer Engineering	5	3	2			6
24	2071	Website optimization	Electrical and Computer Engineering	5	2	1			6
25	Elective option 5 (select 1 of 2)								
	2132	Business law	Legal Sciences	5	3	1			6
	2070	Computer animations	Electrical and Computer Engineering, Mechanical Engineering, Technological Engineering	5	2	1	1		6
26	2106	Work practicum	Legal Sciences, Environmental and Occupational Safety Engineering, Cultural Studies and Communications	6	4	4			7
27	2107	Theoretical and experimental bases of professional work	Electrical and Computer Engineering	6	6	4			9
28	2123	Professional practice	Electrical and Computer Engineering	6	0	0		6/0	4
29	2143	Preliminary thesis	Electrical and Computer Engineering	6	0	0		0/2	2
30	2144	Final thesis	Electrical and Computer Engineering	6	0	0		3/0	8

Table 5.2. – Course Specification

Study programme: Information technologies			
Course title: Mathematics			
Teacher: Tanja Krunić			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective Introduction to and mastery of basic concepts in specific areas of mathematics. Preparing students to apply mathematical methods to solve problems in basic and applied sciences.			
Learning outcomes Students will acquire fundamental knowledge in mathematical logic and algebra, set theory, differential, and integral calculus. Students will be equipped to follow courses in professional fields that apply the concepts and techniques they have mastered, and to recognize problems where they can apply the acquired knowledge.			
Course contents <i>Theoretical teaching</i> Basic concepts of mathematical logic. Sets - basic concepts. Complex numbers: concept, properties, operations. Matrices: Concept of a matrix and matrix operations. Determinants. Inverse matrix. Systems of linear equations. Matrix rank. Real functions of real variables: Domain, zeros, sign of function, boundedness, periodicity, parity. Basic elementary functions: linear, quadratic, power, radical, exponential, logarithmic, trigonometric functions, inverse trigonometric functions. Polynomials. Rational functions. Sequences, limit of a sequence. Continuity of a function. Limits of functions. Asymptotes of functions. Derivatives: Concept of a derivative, differentiation rules, derivatives of basic elementary functions, derivative of composite function, higher-order derivatives. Differential of a function. L'Hôpital's rule. Intervals of monotonicity and extreme values. Convex and concavity intervals, inflection points. Curve sketching and function analysis. Indefinite integral: Concept, table of integrals and basic integration methods. Definite integral. Application of the definite integral. <i>Practical teaching</i> Solving problems that illustrate the concepts and their interrelationships covered in the theoretical part of the course. Formulating and solving practical mathematical problems.			
Literature Krunić T., Skripta iz matematike u elektronskom obliku, 2017 Petrić M., Herceg D., Matematika, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2010 Prentović B., Matematika – zbirka zadataka, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2016			
Active teaching classes: 75		Theoretical teaching: 30	Practical teaching: 45
Teaching methods Monologic, dialogic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Fundamentals of computing			
Teacher: Lazo Manojlović			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To enable students to learn the fundamental concepts of information technology related to computer components, hardware, software, the concepts of primary memory (RAM) and external storage, information networks, and internet security. Additionally, students should learn to use word processing software such as Word, spreadsheet software such as Excel, raster graphics editing software such as Photoshop, and presentation software such as PowerPoint, or similar applications, in their daily work.			
Learning outcomes Proficient use of Word, Excel, Photoshop, PowerPoint, or similar applications in daily life, further education, and future career. Students are equipped to use the Windows operating system and to properly and safely utilize the internet and its services. By understanding the basic functions and services of computers, students will be able to further develop more detailed, specific knowledge depending on their future profession.			
Course contents <i>Theoretical teaching</i> Computer development to date and future development directions. Number systems. Binary number system and arithmetic operations. Data encoding in a computer. Code pages. Boolean algebra and its application. Logic gates in a computer. Computer organization and architecture. Computer hardware components. Processor (CPU). Motherboard. Primary memory (RAM). Types of external storage. Input devices. Output devices. Video system. The role and importance of the internet. Internet services. Types of computer software. The role of the operating system. The concept of an information system. Types of computer applications. Safe computer operation. <i>Practical teaching</i> Basics of using the Windows operating system. Basics of using the Internet. Working with software applications: word processing (Word or similar), spreadsheets (Excel or similar), photo editing (Photoshop or similar), and presentations (PowerPoint or similar).			
Literature Ružić Dimitrijević, Lj., Lovreković, Z., Subić, N.: Računari i praktikum, VTŠ, Novi Sad, 2015 Zoranović, T.: Informatika, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Novi Sad, 2021 Jovanović, P.: Računajte na računare (digitalna edicija), Računajte na računare, 2010 Eremić, Ž.: Računari - udžbenik, Visoka tehnička škola strukovnih studija u Zrenjaninu, Zrenjanin, 2021 Frye C.: Microsoft Office Excel 2019: korak po korak, CET, 2019			
Active teaching classes: 45		Theoretical teaching: 15	Practical teaching: 30
Teaching methods Monologic, interactive, laboratory.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes	5	Written exam	50
Practical work	45	Oral exam	
Interim exam/s			
Seminar paper/s			

Study programme: Information technologies			
Course title: Fundamentals of electrical engineering 1			
Teacher: Branislav Santrač			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To introduce students to the fundamental concepts and laws of electrostatics, direct current (DC) circuits, electromagnetism, and alternating current (AC) circuits.			
Learning outcomes Students will understand the fundamental concepts and laws of electrostatics, direct current (DC) circuits, electromagnetism, and alternating current (AC) circuits. Furthermore, they will be capable of solving theoretical and practical problems within these subject areas.			
Course contents <i>Theoretical teaching</i> Electrostatics: Concepts of static electricity, electrostatic field, behavior of materials in an electrostatic field, capacitors. Direct Current (DC): Concept of electric current, electric circuit and its elements, resistance and conductivity of materials, voltage, current intensity and their magnitudes, Ohm's law, open-circuit, operating mode, and short-circuit, complex electrical circuits, Kirchhoff's laws, power and work of electric current, Joule's law, effects of electric current: thermal effect, heating of conductors by electric current, thermoelectricity. Electromagnetism: Magnetic field of a permanent magnet and electric current, current-carrying conductor in a magnetic field, mutual interaction of current-carrying conductors, behavior of materials in a magnetic field, ferromagnetic materials, magnetic hysteresis, magnetic materials, magnetic circuit, electromagnetic induction, self-induction, mutual induction, eddy currents. Alternating Current (AC): Vector representation of alternating quantities, phasor and vector diagrams, impedance in alternating current circuits, alternating current power, power factor, three-phase alternating current systems, power of a three-phase system. <i>Practical teaching</i> Solving numerical problems from all covered subject areas, working through problems on the blackboard, and group problem-solving exercises.			
Literature B. Santrač, S. Skoko: Elektrotehnika, VTŠ, Novi Sad, 2014 B. Popović: Osnovi elektrotehnike 2, Građevinska knjiga, Beograd N. Pekarić-Nadž, V. Bajović: Zbirka rešenih ispitnih zadataka iz osnova elektrotehnike, Građevinska knjiga, Beograd, 1998 A. Torbica: Osnovi elektrotehnike, VTŠ, Novi Sad, 2003 A. Torbica: Elektroenergetika, VTŠ, Novi Sad, 2002 Grupa autora: Bezbednost i zdravlje na radu - knjiga 3, Elektroenergetika, VTŠ Novi Sad, 2011			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods Monologic, dialogic, interactive, demonstrative, practical, as well as group and independent student work on solving problems.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Fundamentals of programming			
Teacher: Ninoslava Tihi			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective The objective of the course is for students to master the basics of procedural programming and to become capable of solving concrete problems by designing appropriate algorithms and creating console applications in the C# programming language.			
Learning outcomes Students are capable of independently creating console applications in the C# programming language to solve concrete problems by applying the universal principles of procedural programming.			
Course contents <i>Theoretical teaching</i> Algorithms: Properties of algorithms – finiteness, definiteness, effectiveness, and generality. Representing algorithms using flowcharts. Input/output blocks, computational blocks, and decision blocks. Sequential, branching, and cyclic algorithms. Application of mathematical logic in programming. Logical operations and their role in decision blocks. Basics of the C# Programming Language: Downloading, installing, and using the Microsoft Visual Studio Integrated Development Environment (IDE). Creating a console application. Writing and compiling code. Using the debugger. Variables: initialization, declaration, and value assignment. Operators: arithmetic, logical, and comparison operators. Variable type conversion. Enabling data input via the console window using the Console.ReadLine() statement. Displaying data on the screen using the Console.Write() and Console.WriteLine() methods. Control structures: if(), if()-else, else if(), and switch(). Application of logical operators within control structures. User input validation. The role of try and catch blocks in error handling. Loops: for(), while(), and do-while(). Counters. Arrays and array manipulation: array declaration, array creation, array elements, and array length. Methods: Methods without input parameters and return values (applying the void keyword). Methods with input parameters and methods with return values. Preparing a program for standalone execution: Creating .exe files. <i>Practical teaching</i> Application of sequential, branching, and cyclic algorithms in problem-solving. Application of mathematical logic in problem-solving. Working within the Microsoft Visual Studio development environment. Creating applications with user input. Applying control structures, data type conversions and try/catch blocks in processing user input data. Developing programs using loops and working with arrays. Utilizing methods for code organisation. Implementing methods with and without input parameters. Implementing methods with and without return values. Creating executable versions of programs (.exe files).			
Literature Krunić, T.; Osnovi programiranja, VTŠSS, Novi Sad, 2017 Miles R.: C# osnove programiranja, Računarski fakultet Beograd, 2017 Kraus L., Rešeni zadaci iz programskog jezika C#, Akademska misao, Beograd, 2017 Krunić, T.; Uvod u programiranje, VTŠSS, Novi Sad, 2010 Gocić M., Programski jezik C#: pitanja, odgovori i rešeni zadaci, Mikroknjiga, 2013			
Active teaching classes: 75		Theoretical teaching: 45	Practical teaching: 30
Teaching methods Monologic, interactive, laboratory.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Project presentation	20		

Study programme: Information technologies			
Course title: Business communications			
Teacher: Jovana Kopanja			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To equip students for written and oral communication within the organization and with its environment under contemporary business conditions, and to provide them with insights into the relevant social, cultural, sociological, economic, and political factors.			
Learning outcomes Based on the mastered material, the student will understand the process, functions, models, forms, and channels of business communications, as well as their strategic importance and role in creating the enterprise's identity, reputation, and value. The student will be able to communicate successfully within and outside the enterprise while understanding an interconnected yet culturally, religiously, and socio-politically diverse world. The student will master basic grammatical rules, know how to select adequate vocabulary, and independently write a business letter and email, respecting the rules of business correspondence.			
Course contents <i>Theoretical teaching</i> Language in communication: Defining the terms language and communication. Elements and phases of communication. Language and speech. Language and script. Oral and written speech. Speech culture. Cultivated speech. Attributes of good speech. Orthography: Basic spelling rules. Sound changes: Sound change rules and examples of deviations. Communicative competence: The concept of linguistic culture. Levels of speech culture. Grammatical norm. Use of foreign words. Social and individual language stratification. Speech constants. Criteria for assessing communicative competence. Personal appearance in business communication: Business communication. Verbal and non-verbal communication. Paralinguistic cues. Distance between interlocutors. Pauses in speech. The importance of active listening in communication. Business conversation. Telephone conversation. Elements of business presentation. Forms of personal appearance. The concept of empathy. Public relations: Manipulation in mass communication. Disinformation. Advertising. Propaganda. Defining the concept of public relations and its role. Communication procedures in public relations. Public relations tools. Advantages and disadvantages of public relations. Written business communication: Written business communication. Advantages and disadvantages of written business communication. Electronic communication. Visual communication. Culture and language culture: Culture as thinking and process. The relationship between culture and language culture. Creativity and communication - techniques of creative thinking: The concept of creativity. Intelligence and creativity. Negotiation: Motives for negotiations. Approaches to negotiation. Methods of negotiation. Preparation for negotiations. The negotiation process. Conclusion and implementation of agreements. Society, state and nation: Explanation of the concepts of society, state and nation. Man and organization, organizational culture: Formal and informal communication. The concept of bureaucracy. Bureaucratic style. Vertical and horizontal forms of formal communication. Types of organizations. Socio-cultural and psychological barriers to communication and their overcoming. Communication between cultures and communication strategies. Communication and cultural context. Cultural differences. Business communication contexts: Idea formation. Oral presentation. Business meetings and negotiation strategy. Types of power in communication. Business communication contexts: Marketing communications. Stakeholder philosophy. Problem-solving and decision-making. <i>Practical teaching</i> In practical classes, students will master the principles of good written and oral communication through practical examples, written and listening exercises. Using examples and exercises, students will become familiar with grammatical rules at the levels of phonology, morphology, syntax, and vocabulary. Students will write a business letter and email and prepare for a business conversation and meeting.			
Literature Šipka, M.: Pravopisni rečnik srpskog jezika, Novi Sad, Prometej, 2010 Čokorolo R.: Poslovne komunikacije, Novi Sad, Alfagraf, 2008 Pešikan, M., Pižurica, M., Jerković, J.: Pravopis srpskog jezika, Novi Sad, Matica Srpska, 2017 Pavić, Ž.: Etika i poslovne komunikacije, Beograd, Univerzitet Singidunum, (elektronska verzija), 2011 Šulc fon Tun, F.: Kako razgovaramo? Problemi i rešenja, Beograd, Laguna, 2020 Šulc fon Tun, F.: Kako razgovaramo 2: Stilovi, vrednosti i razvoj ličnosti, Beograd, Laguna, 2020			
Active teaching classes: 60		Theoretical teaching: 45	Practical teaching: 15
Teaching methods: Oral presentation, conversation, discussion and demonstration.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Introduction to web design			
Teacher: Željko Eremić			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective			
Introduction to the basic principles and current trends of web design and their practical application. Mastering the techniques of designing website mockups and developing responsive websites using a development environment based on a grid system.			
Learning outcomes			
Upon successful completion of the course, students will be able to independently create a mockup and develop a responsive website based on it, utilizing a grid system development environment. Throughout the process, students will successfully apply contemporary web design trends to the final product.			
Course contents			
<i>Theoretical teaching</i>			
Basic principles of web design. Usability and accessibility of a website. Methods for checking the accessibility and usability of websites. W3C organization and standards in web design. Structure and elements of a website. Navigation menus, headers, footers, sidebars. Trends in web design: Parallax effect (applied to photos and web pages), one-page website, hero-image, giant typography, ghost button, card layout, animated backgrounds, motion animation, etc. The concept of responsive web design: Planning web page content that will be adaptable to various devices and screen sizes. Grid system and its role in responsive web design. Planning the layout of web page content on a grid system. Technical aspects of optimizing web page elements for mobile phones. Optimization of images and video materials. Mobile-first and Desktop-first approaches to website planning. Website planning models. Mockups and working environments for creating website mockups: Balsamiq Mockups and Pencil. Creating desktop, tablet, and mobile versions of mockups. Inserting content: placeholders for images, video, and text, contact form elements, etc. Connecting pages with links. Importing and exporting mockups to HTML and PDF. Introduction to application programs for creating websites: Wix.			
<i>Practical teaching</i>			
Developing a mockup of a responsive website that follows the aforementioned web design principles and contemporary trends, while respecting the element layout on a grid system. Building a responsive website using the appropriate software application (Wix). The newly developed website must align with the core principles of web design, as well as the modern trends presented to students throughout the course.			
Literature			
Krunić T., Uvod u veb dizajn, Materijal sa predavanja u elektronskoj formi, 2017			
Grant W.: 101 princip za dobar UX dizajn, Kompjuter biblioteka, Beograd, 2018			
Dimitrijević Ružić Lj.: Uvod u veb dizajn, Visoka tehnička škola strukovnih studija, Beograd, 2010			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s			
Seminar paper/s			
Project tasks*	50		

Study programme: Information technologies			
Course title: Object-oriented programming			
Teacher: Lazar Kopanja, Goran Savić			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective To introduce students to the core concepts of object-oriented programming and to enable them to acquire the skills necessary for creating object-oriented applications in the C# programming language.			
Learning outcomes Students master the core concepts of object-oriented programming. They are capable of independently creating object-oriented applications in the C# programming language.			
Course contents <i>Theoretical teaching</i> Lists and their application in programming. Declaration, initialization, and creation of lists. Adding new elements to a list, deleting elements, inserting elements at a specific position, sorting lists, checking if an element exists in a list, etc. Application of the foreach loop when working with lists. Application of dictionaries. Core concepts of object-oriented programming. Differences between procedural and object-oriented programming. Differences between value types and reference types. Defining classes and instantiating objects. Core elements of an object – state and behavior. The concept of scope – local variables, object fields, and class fields. Using constructors during class instantiation. Constructor structure and constructor overloading. Static versus non-static methods and their applications. Method overloading. The principle of encapsulation. Using different access modifiers. Differences between public, private, and protected class members. Implementing getter and setter methods and properties to access and modify attributes. Class relationships: Composition, aggregation, and association relations between classes and their implementation methods. Using inheritance to design specialized classes. Inheritance types in the C# programming language. Method overriding during class inheritance. Calling base class constructors in derived classes using the base keyword. Abstract methods, abstract classes, and interfaces. Polymorphism, virtual methods, and overriding. Nested classes and their applications. <i>Practical teaching</i> Developing object-oriented applications using the C# programming language that feature base and derived classes through the principle of inheritance, along with constructors, properties, and methods. Creating applications containing classes interconnected by association, aggregation, or composition relationships. Creating applications that incorporate abstract classes, abstract methods, interfaces, and nested classes.			
Literature Krunić T: Objektno orijentisano programiranje na jeziku C#, VTŠNS, 2021 Miles R: C# osnove programiranja, Računarski fakultet Beograd, Beograd, 2017 Vajsfeld M.: Objektno orijentisani način mišljenja-priznato rešenje, CET, Beograd, 2003 Popović J.: Moderni dizajn šablona – kroz realne C# primere, CET i Računarski fakultet, Beograd, 2020 Baptista G.: C# 9 i .Net 5: arhitektura softvera, Kompjuter biblioteka, 2021 Craig I.: Object-oriented Programming Languages, Springer, 2007			
Active teaching classes: 75		Theoretical teaching: 45	Practical teaching: 30
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Project presentation*	20		

Study programme: Information technologies			
Course title: Computer graphics			
Teacher: Biljana Gemović			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective			
Introduction to displaying and creating graphics on a computer and mastering relevant software in accordance with current advances in information technology.			
Learning outcomes			
Ability to professionally perform jobs and tasks that are functionally and content-wise related to the use of computers (graphic designers, television designers, animators, graphic interface designers, web programmers, graphic software engineers), and mastering current programs related to computer graphics.			
Course contents			
<i>Theoretical teaching</i> Introduction: Visual communications. Computer graphics. Interactive computer graphics. Dynamics in interactive computer graphics. History: Development of computer graphics. First applications of computer graphics. Emergence of personal computers and computer graphics systems. Graphics output technology: Vector technology, display method, advantages and disadvantages. Raster technology, display method, advantages and disadvantages. Raster and colors. Printers. Plotters. Video technologies. Panel technologies. Graphics input technology: Keyboard, mouse, light pen, digitizer, panels, trackball, scanner, camera. Graphics software: Development of graphics software. Types of graphics software. Graphics systems: Parts of graphics systems. Graphics transformations. Interaction processing. Image processing. Application of computer graphics: Design; Business application; Publishing; Image processing; Science; Education; Web graphics; Advertising.			
<i>Practical teaching</i> Computer-based exercises. Practicing training in relevant current computer programs (CorelDraw, InDesign, Adobe Photoshop and AutoCad) and preparing for practical computer lab assignments.			
Literature Gemović, B. Kompjuterska grafika, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2020 Kovačević S., Gemović B. CAD, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2009 Kelby S., Photoshop CC knjiga za digitalne fotografije, Mikroknjiga, Beograd, 2017 Cvetković D., Računarska grafika, Mikroknjiga, Beograd, 2006 Aleksić Z., Coreldraw 12, Čačak, 2005			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods Monologic, interactive, and demonstrative.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes	10	Written exam	50
Practical work		Oral exam	
Interim exam/s	40		
Seminar paper/s			

Study programme: Information technologies			
Course title: Fundamentals of web technologies			
Teacher: Lazar Kopanja, Goran Savić			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To introduce students to the three core elements that make up the technological architecture of the web: Uniform Resource Locators (URL), Hypertext Transfer Protocol (HTTP), Hypertext Markup Language (HTML), as well as to master the HTML language and acquire practical skills reflected in applying this knowledge to create simple websites.			
Learning outcomes Students understand the core elements that make up the technological architecture of the web and are capable of independently creating web pages with appropriate content using HTML.			
Course contents <i>Theoretical teaching</i> Basic elements of web technological architecture: Uniform Resource Locators (URL), Hypertext Transfer Protocol (HTTP), Hypertext Markup Language (HTML). HTML development environments. Fundamentals of the HTML4 hypertext markup language. HTML4 tags and attributes. Web page structure: Header (<head>) and body (<body>) of the page. Working with text on the page: paragraphs, headings, heading levels, special characters and character entities, text styling. Ordered and unordered lists. Creating tables and working with tables (table title, table structure, types, cells, merging multiple rows or multiple columns into one). Creating hyperlinks to other pages and to sections of a page on the same or another page. Working with images: Inserting an image into a web page, and adjusting its dimensions using absolute and relative units, adding alternative text for the image using the alt attribute. Creating contact forms: single-line and multi-line text input fields, password input field, check boxes and radio buttons, drop-down menus, multi-purpose button, buttons for sending and resetting data entered into the form, action and method attributes, disabling certain fields using the disabled and readonly attributes, using the value, selected, checked attributes, etc. Using the size attribute to determine the size of the input field and the maxlength attribute to determine the maximum number of characters that can be entered into the input field. HTML5 basics: New structural tags <header>, <footer>, <section>, <article>, <aside>, <nav> and their application on a web page. Using the new HTML5 <figure> and <figcaption> tags to add image captions. Using the <picture> tag to create responsive images. Creating SVG graphics: lines, polylines, circle, ellipse, polygon, rectangle and their application in creating more complex graphics. New form elements in HTML5: <fieldset>, <legend>, <datalist>, etc. New input field types: color, date, number, range, search. Attributes of new input fields: min, max, etc. Implementation of new attributes for input validation: required, placeholder, email, url, etc. HTML5 tags for inserting multimedia content directly into a web page using the <audio> and <video> tags. Implementation of the src, muted, loop, autoplay, poster, preload, etc. attributes for managing video content. Placing multimedia content on YouTube and including it on a page using the <iframe> tag. Embedding Google Maps on a web page. <i>Practical teaching</i> Fundamentals of working with HTML. Successive development of all the web page elements mentioned above (text, links, images, tables, lists, and forms). Application of SVG graphics on web pages.			
Literature Krunić T.: Osnove veb tehnologija, materijal sa predavanja u elektronskoj formi, 2017 Gauchat J.D.: HTML5, CSS i JavaScript, Mikro knjiga, Beograd, 2014 Lemay, L.: HTML5, CSS3 i JavaScript za razvoj veb strana, Kompjuter biblioteka, Beograd, 2016 Frain B.: HTML5 i CSS3 – Prilagodljiv veb dizajn, Kompjuter biblioteka, Beograd, 2014 Robbins J. N.: Naučite veb dizajn - vodič kroz HTML, CSS, Javascript i veb grafiku, Mikro knjiga, Beograd, 2014 Loson B.: Uvod u HTML za programere, Mikro knjiga, Beograd, 2012 Hil J.: Briljantno HTML5 i CSS3, CET, Beograd, 2011			
Active teaching classes: 75		Theoretical teaching: 30	Practical teaching: 45
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Project presentation	20		

Study programme: Information technologies			
Course title: English			
Teacher: Branka Petrović			
Course status: Compulsory			
Number of ECTS: 3			
Prerequisite course: None			
Course objective Mastering the basic structures and functions of the English language through everyday life situations, while developing speaking, reading, writing, and listening comprehension skills, as well as gaining familiarity with the culture and lifestyle of English-speaking countries.			
Learning outcomes Communication at an elementary level of English language proficiency (CEFR level A2).			
Course contents <i>Theoretical teaching</i> <u>Phonetic system and orthography</u> : introduction to the sound system of the English language; the alphabet; spelling; phonetic transcription symbols. <u>Language functions</u> : asking for and giving personal information; filling out forms; greetings; introducing oneself and others; expressing possession, desires, likes/dislikes, and opinions; orientation in space; telling the time; giving directions; inviting and accepting or declining invitations; telephone conversations; ordering in a restaurant; shopping; describing objects and people; conversations about family, habits, daily activities, the past, and the future. <u>Grammatical structures</u> : personal and demonstrative pronouns; articles; nouns (regular and irregular plural, word formation, and Saxon genitive); possessive and indefinite adjectives; cardinal and ordinal numbers; quantifiers; prepositions; comparison of short adjectives; existential there; adverbs of frequency and definite time; modal verbs can, may, and must; the imperative; Present Simple, Present Continuous, Past Simple (regular and irregular verbs), and Future Simple tenses, and the going to construction. <u>Vocabulary</u> : words and expressions necessary for communication at an elementary level of English proficiency. <i>Practical teaching</i> Although separate practical classes are not explicitly scheduled, due to the nature of the course, to a certain extent – depending on the specific teaching units – lectures include activities that involve the practical oral and written application of the English language by the students.			
Literature Kovačević, J: Engleski jezik, drugi strani jezik – prva godina učenja, za gimnazije, Zavod za udžbenike i nastavna sredstva, Beograd, 2006 Nastavni materijal predmetnog nastavnika, 2023 Dimitrijević, N., Radovanović, K: Your first English tests, zbirka testova za engleski jezik, Zavod za udžbenike i nastavna sredstva, Beograd, 2007			
Active teaching classes: 30		Theoretical teaching: 30	Practical teaching:
Teaching methods Combined method (monologue, dialogue, demonstration, illustration, and text-based method along with appropriate organizational forms: frontal, individual, group, pair, and team/interactive work).			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Fundamentals of mechanical engineering			
Teacher: Nenad Janjić, Branko Savić			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To introduce students to the fundamental components of machines and devices (machine elements) and parts from various branches and fields of engineering, including their standard shapes and dimensions, principles of operation and functioning, as well as to achieve mastery of modern and generally accepted methods for the calculation and dimensioning of standard machine elements and parts.			
Learning outcomes In technical practice, students will be capable to: • apply engineering thinking and decision-making by connecting theoretical knowledge acquired from related engineering disciplines, thereby demonstrating an interdisciplinary approach to their work; • evaluate multiple options for performing an elementary working function and make an informed choice to select the option that executes the given function in the most optimal manner from technical, economic, and occupational and environmental safety perspectives.			
Course contents <i>Theoretical teaching</i> Planar Statics: Fundamental concepts, axioms, forces, systems of forces, moment of a force about a point, reduction of a force system to a given point, equilibrium conditions of a planar force system, centers of gravity, beams (types and calculation), sliding and rolling friction forces. Kinematics: Fundamental concepts, types of motion: translational, rotational, and complex motion. Dynamics: Fundamental concepts, mass, concept of force, work, energy, power. Strength of Materials: Fundamental concepts, types of loading, stresses and stress states, and safety factor verification for various stress states. Machine Elements: Fundamental concepts, standardization, tolerances, classification of machine elements, fasteners and joining elements: detachable (threaded fasteners, pin, key, and spring connections) and non-detachable (riveted, welded, and brazed/soldered joints), elements for rotational motion and power transmission (shafts, axles, pins, sliding and rolling bearings, couplings, transmission pairs: types and characteristics, including friction, belt, chain, and gear drives). Mechanisms: Fundamental concepts, kinematic pairs and chains, types and applications of linkage, cam, and slotted mechanisms. Elements for Fluid Storage and Transmission: Pressure vessels, piping elements, and valves/fittings. <i>Practical teaching</i> Solving problems in planar statics (planar beams and supports) and 3D statics. Tolerances.			
Literature V. Savić: Osnovi mašinstva - elektronski materijal za predavanja i vežbe, VTŠ, Novi Sad, 2016 S. Velikić: Statika, Viša tehnička škola, Novi Sad, 1987 S. Kovačević: Mašinski elementi, Viša tehnička škola, Novi Sad, 2009 V. Miltenović: Mašinski elementi – oblici, proračun primena. Univerzitet u Nišu, Mašinski fakultet Niš, 2009			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	
Practical work		Oral exam	50
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Electrical measurements			
Teacher: Vesna Petrović, Branislav Santrač			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To introduce students to instruments and methods for measuring electrical quantities, types of measurement errors, and measurement accuracy. Also, to introduce them to the functioning of measuring bridges, analog and digital devices, as well as complex amplifier and power circuit systems. Additionally, the course provides students with understanding of active and passive measuring transducers and methods for the electrical measurement of non-			
Learning outcomes Students will be able to perform measurements of electrical quantities using analog and digital instruments, measuring bridges, and software simulations. Based on the instrument's accuracy class, they will determine the measurement error. In addition, students will conduct measurements using WorkBench software simulations, distinguish between active and passive measuring transducers, and understand their operating principles.			
Course contents <i>Theoretical teaching</i> Measurement: SI system. Measurement uncertainty. Presentation of experimental results. Parameters of probability distribution for single and multiple random variables. Electrical measuring instruments: Scales and pointers of measuring instruments. Torque and counter-torque. Damping. Housings of electrical measuring instruments. Standards and regulations for electrical measuring instruments. Oscilloscope. Resistors, coils and capacitors: Measuring resistors. Resistor time constant. Resistance standards. Types of resistors. Measuring capacitors. Capacitance standards. Measuring coils. Self-inductance standards. Measuring bridges and compensators: Wheatstone bridge for direct current (DC) and alternating current (AC). Thomson bridge. DC compensators. Digital measuring instruments: Analog-to-digital conversion. Conversion of DC voltage to time and frequency. Step converters. Measuring non-electrical quantities electrically: Passive measuring transducers. Active measuring transducers. Methods for measuring current, voltage, and power. Measuring instruments: Moving coil instruments. Moving iron instruments. Electrodynamical instruments. Electrostatic instruments. Electrical measuring devices: Electricity meters. Measuring bridges. Compensators. Instrument transformers. Measuring methods and calculations: Power measurement. Power measurement in three-phase systems. Resistance measurement. Inductance measurement. Capacitance measurement. Occupational safety and health: Effects of electric current on the human body. Protective measures. First aid. <i>Practical teaching</i> Practical application and laboratory exercises based on the covered theoretical areas. Verification of Ohm's law for DC and AC circuits, including the determination of resistance (R), inductance (L), and capacitance (C). Measurement of electrical resistance and its temperature coefficient using a Wheatstone bridge. Measurement of active power using the three-ammeter and three-voltmeter methods. Calibration of thermocouples. Measurement of resistance using the indirect voltmeter-ammeter method. Study of permanent magnet moving-coil (PMMC) instruments equipped with half-wave and full-wave rectifiers. Influence of waveforms on the instrument's indication. Extension of the operating range of an ammeter and a voltmeter.			
Literature Bego V.: Mjerenja u elektrotehnici, Tehnička knjiga, Zagreb, 2003 Golubović, Lj: Električna merenja, Elektrotehnički fakultet, Banja Luka, 2001 Petrović, V., Santrač B., Električna merenja 1 - Praktikum laboratorijskih vežbi, VTŠSS Novi Sad, 2019 B. Santrač: Elektrometrologija 1, VTŠ, Novi Sad, 2011			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods Lectures, classroom and laboratory exercises. Demonstration methods, practical work, research, workshops, learning through discovery.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Electronics			
Teacher: Branislav Santrač			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective Introducing students to fundamental concepts and laws in electronics, the operating principles of analog and digital devices, complex amplifier systems, and power circuits.			
Learning outcomes Students will understand the basic concepts and laws in electronics, the operating principles of analog and digital devices, complex amplifier systems, and power circuits. Additionally, they will be able to solve practical problems in these areas.			
Course contents <i>Theoretical teaching</i> Introductory Lecture – Course organization and content, grading and examination methods. Semiconductor physics: Atom, crystal lattices, charge carriers, P-type and N-type semiconductors, PN junction. Diode, transistors, unipolar devices, FET, CMOS, switching elements, simpler semiconductor element circuits. Basic configurations of amplifier circuits, operational amplifiers, feedback: Configurations of single-stage amplifiers with common emitter, common collector, or common base. Darlington amplifier pair as an example of a multi-transistor amplifier. Introduction to the theory and basic circuits with operational amplifiers. Introduction to the principles and application of feedback in electronic circuits. Linear power supplies and pulse circuits: Block diagram of DC power supplies, power supply circuit design. Non-linear circuits and their application in digital electronics. Configurations of basic logic gates (AND, OR, NOT, EX-OR). CMOS and TTL technology in the design of digital electronic circuits. Sequential networks and timing circuits: Four basic types of flip-flops (S-R, J-K, T, D), basic sequential networks. Astable, monostable circuits, and harmonic oscillators. Phase-Locked Loop (PLL). Concept of digital signals, numerical systems and codes, switching algebra and logic networks. Combinational networks. Sequential networks. Power supplies: Linear and non-linear. <i>Practical teaching</i> Practicing on relevant assignments from all core areas, alongside student group work in performing lab exercises and problem-solving.			
Literature: Cvekić B.: Poluprovodnički elementi, Naučna knjiga, Beograd, 1987 Tešić, Č., Vasiljević, D.: Osnovi elektronike, Građevinska knjiga, Beograd, 2000 B. Santrač, S. Skoko: Elektrotehnika, VTŠ, Novi Sad, 2014 B. Popović: Osnovi elektrotehnike 2, Akademska misao, Beograd, 2004 Vasiljević V.: Mikroračunari, VETŠ, Beograd, 1998			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Lectures, tutorials and laboratory exercises. Monologue, dialogue, interactive, and demonstrative methods.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Web design			
Teacher: Ninoslava Tihi, Tanja Krunić, Nenad Badovinac			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective Introducing students to methods of styling web pages and adapting them to different screen sizes, as well as acquiring practical skills in this area in order to enable them to independently create a styled and responsive website using the CSS language, as well as the Bootstrap class library.			
Learning outcomes The student masters the methods of styling web pages and their adaptation to different screen sizes, and has acquired practical skills in this area in terms of the ability to independently create a stylized and responsive website using the CSS language, as well as the Bootstrap class library.			
Course contents <i>Theoretical teaching</i> Cascading Style Sheets (CSS) and their application in website styling. Built-in styles, inline styles and external styles, their import and linking to a web page. Applying CSS to edit text, lists, tables, creating background images and watermarks. Styling contact forms and their elements. Frames: setting line thickness, frame color, and frame line style. Styling links, navigation buttons and menus, applying the hover and active pseudo-classes. Horizontal and vertical navigation menus. Creating more complex navigation menus. Creating fixed navigation menus. Managing margins and internal space of web page elements – Box Model. Relative and absolute arrangement of HTML elements on a page. Z-index and overlapping elements. Floating elements. Styling image galleries. Application of CSS classes for styling HTML elements of a specific type. Application of id in styling individual elements. Role of the <div> tag in grouping elements and their styling. Class hierarchy. Selectors and their application in styling web page elements. Styling tables. Advanced techniques: element transformations, edge rounding, shadows, gradients, transitions, animations. Use of fonts applying the @font-face property. Application of Font Awesome icons. Introduction to responsive web design. Role of display, min-width, max-width, etc. properties in responsive design. Application of CSS3 media queries for adapting web page content to different devices (mobile phones, tablets) and screen dimensions. Viewport configuration. Application of media print queries for creating a special style for editing a web page intended for printing. Application of Flexbox in arranging web page elements. Application of various pseudo-classes such as :nth-child, :first-child, :last-child, :checked, :disabled, :focus, :not and others. Grid system, application of Bootstrap framework in creating a responsive web page. Using CDN for downloading styles. Working with columns. Using ready-made web components: panel, carousel, modal, card, Font Awesome, etc. Bootstrap Studio framework and its application in creating responsive websites. <i>Practical teaching</i> Successive styling of various parts of web pages (navigation menus, headers, footers, sidebars, images, forms, etc.). Creation, editing (stylization) and adaptation of complete web pages to different devices and screen sizes using the above techniques.			
Literature Krunić T.: Tehnike stilizovanja veb stranica, materijal sa predavanja u elektronskoj formi, 2017 Lemay L.: HTML5, CSS3 i JavaScript za razvoj veb srtana, Kompjuter biblioteka, Beograd, 2016. Frain V.: HTML5 i CSS3 prilagodljiv veb dizajn, Kompjuter biblioteka, Beograd, 2014 Jakobus B.: Naučite Bootstrap 4 i gradite prilagodljive, dinamičke i mobile-first aplikacije na vebu pomoću Bootstrap 4, Kompjuter biblioteka, Beograd, 2018 Hil J. Briljantno HTML5 i CSS3, CET, Beograd, 2011			
Active teaching classes: 75		Theoretical teaching: 30	Practical teaching: 45
Teaching methods: Monologic, interactive, laboratory.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	20	Oral exam	
Interim exam/s	30		
Seminar paper/s			

Study programme: Information technologies			
Course title: Computer networks			
Teacher: Dragan Rastovac, Lazar Kopanja, Nebojša Jovanović			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective To acquire theoretical and practical knowledge regarding network hardware and software, computer networking methods, computer network topologies, configuration and operation of computer networks, as well as network protocols and applications.			
Learning outcomes Students are capable of designing, maintaining, and operating computer networks, as well as utilizing network protocols and applications.			
Course contents <i>Theoretical teaching</i> Reasons for networking. Historical development. The concept of a protocol. Standardization in computer networks. Network hardware. Cables, bridges, repeaters, hubs, switches, routers, gateways. Network software. Topologies and types of computer networks. Reference models (OSI, TCP/IP). Comparison of reference models. Encapsulation and packets. Horizontal and vertical communication. Protocol convergence. The importance of layering. Data link layer. Network layer services - types of data transfer Datagrams. Network adapters. Frames. Marking the beginning and end of a frame. Sources of errors. Error control. Error detection. Hamming distance. Parity check. LRC. Checksum and CRC. Basic data link layer protocols. Medium access control. Channel assignment problem. Multi-user access protocols. ALOHA. CSMA/CD. Ethernet. Network layer. Network layer design. Packet routing algorithms. Datagram subnet. Packet routing. Virtual circuit subnet. Static and dynamic routing. Distance vector protocol and Link state protocol. Optimality principle. Shortest path routing. Distance vector routing. Link state routing. Hierarchical routing. Congestion management. Routing protocols. IGP and EGP protocols. RIP, OSPF, BGP Quality of service. IP protocol. IP addresses. IPv6 protocol. Transport layer. Role of the transport layer. Segments and transport address. Ports and sockets. Multiplexing and demultiplexing. Elements of transport protocols. UDP protocol. TCP protocol. Application layer Telnet, SSH, DNS. Electronic mail. FTP. MIME. WWW. Overview of web architecture. HTTP protocol. Multimedia. VOIP. Security and protection in computer networks. Introduction to cryptography. Encryption algorithms. Digital signatures. Email security. Web security. <i>Practical teaching</i> Cabling and network device connection techniques. Introduction to the Cisco Packet Tracer software package. Designing network topology using Packet Tracer. Configuring DNS and Web servers alongside client workstations. Configuring active network devices (routers, workstations and switches). Simulation and analysis of HTTP and ICMP traffic. Simulation of HTTP and DNS traffic. NAT/PAT network address translation and DNS integration. Using TCP and UDP protocols. Installing and configuring a Windows network server. Installing and configuring a Linux network server. Network security – encryption algorithms. Digital signatures.			
Literature Tanenbaum, S., A., Računarske mreže, prevod V izdanja, Mikro knjiga, Beograd, 2012 Bigelow, S., J.: Računarske mreže – instaliranje, održavanje i popravljjanje, Mikro knjiga, Beograd, 2004 Gajin S.: Principi konfigurisanja računarskih mreža, Akademska misao, 2018 Kurose J.: Umrežavanje računara. CET Computer, Beograd, 2018 Stojanović M.: Savremene IP mreže, arhitekture, tehnologije i protokoli, Akademska misao, Beograd, 2012 Ciampa M.: Security + guide to network security fundamentals, Microsoft Press, 2012			
Active teaching classes: 75		Theoretical teaching: 45	Practical teaching: 30
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Relational databases			
Teacher: Lazar Kopanja, Nenad Badovinac			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To acquire the skills necessary for the design, development, and application of relational databases at the SQL query level.			
Learning outcomes Students are capable of independently designing and implementing relational databases, as well as executing SQL queries on databases.			
Course contents <i>Theoretical teaching</i> The concept of a database and the application of databases in information systems. The concept of a data model. The concept of entities, attributes and relationships in a database model (<i>Entity-Relationship model</i>). Types of relationships: 1:1, 1:N (one-to-many), and M:N (many-to-many). Unary relationships. Examples of relationships. Designing Entity-Relationship diagrams. Weak entities. Identifying keys: candidate keys, primary keys, and foreign keys. Criteria for selecting a primary key. The concept of a relational data model. Tables, fields (columns), and records (rows). Rules for mapping an Entity-Relationship model into a relational schema. Database normalization: First (1NF), Second (2NF), and Third (3NF) normal forms. Advanced normalization and denormalization. Practical examples of justified database denormalization. Principles of database management systems. Specifics of web databases. Multi-user and multi-tasking database management systems. The MySQL database management system. Data types and field characteristics in MySQL tables. Storage engines and their specific features. Using the phpMyAdmin application for database administration. Basics of the relational query language SQL. Utilizing SQL for Database Definition (DDL) to create and modify relational table structures. Syntax and implementation of SQL for data retrieval, insertion, updates, and deletion (SELECT, INSERT, UPDATE, and DELETE). Joining tables in SELECT queries using the JOIN clause. Types of table joins (inner, left, right). Other essential SQL commands: SHOW, DROP, DESCRIBE, and ALTER. <i>Practical teaching</i> Designing Entity-Relationship (ER) diagrams based on a given problem description. Selecting primary keys according to the specific problem. Mapping Entity-Relationship diagrams into relational database schemas. Normalizing source data tables. Utilizing software tools for database management and structure modification (phpMyAdmin). Practicing data manipulation using SELECT, INSERT, UPDATE, and DELETE statements on created databases. Using the WHERE clause and SQL functions (SUM, AVERAGE, MIN, MAX, etc.). Practicing table joins using the JOIN clause within SELECT queries. Applying other essential SQL commands such as SHOW, DROP, DESCRIBE, and ALTER.			
Literature Riordan, R.: Projektovanje baza podataka, Mikroknjiga, Beograd, 2006 Lovreković, Z.: Osnove PHP i MySQL, samostalno izdanje autora, Novi Sad, 2020 Prettyman S., Naučite PHP 7: Objektno-orijentisano modularno programiranje korišćenjem HTML5, CSS3, Javascript, XML, JSON i MySQL, Kompjuter biblioteka, Beograd, 2016 Meloni J. C.: Samostalno naučite PHP7, MySQL i Javascript u jednoj knjizi, Kompjuter biblioteka, Beograd, 2018 Welling L., Thomson L.: PHP i MySQL: razvoj aplikacija za veb, prevod 5. izdanja, Mikro knjiga, Beograd, 2017			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Frontal, interactive			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	25	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Study programme: Information technologies			
Course title: Specialist English			
Teacher: Branka Petrović			
Course status: Compulsory			
Number of ECTS: 3			
Prerequisite course: None			
Course objective Mastering the structures and functions of the English language at an intermediate level and expanding professional vocabulary through field-specific topics and situations, alongside further development of speaking, reading, writing, and listening comprehension skills.			
Learning outcomes Communication at an intermediate level of English language proficiency (CEFR level B1).			
Course contents <i>Theoretical teaching</i> <u>Language functions</u> : writing emails; interpreting technical data; professional telephone conversations; ordering and purchasing devices; writing a curriculum vitae (CV); applying for a job. <u>Grammatical structures</u> : comparison of long and irregular adjectives; relative, possessive, indefinite, and reflexive pronouns; adverbs of manner; the gerund; Past Continuous, Present Perfect, Present Perfect Continuous, and Past Perfect tenses; the passive voice; reported speech (commands, as well as declarative and interrogative sentences without backshift of tenses); the three basic types of conditionals; question tags. <u>Vocabulary</u> : words and expressions necessary for communication at an intermediate level of English proficiency, with an emphasis on field-specific situations and topics arising from the profession as presented in the textbook. <i>Practical teaching</i> Although separate practical classes are not explicitly scheduled, due to the nature of the course, to a certain extent – depending on the specific teaching units – lectures include activities that involve the practical oral and written application of the English language by the students.			
Literature Evans V., Dooley J., Wright S., Career Paths: Information Technology, Express Publishing, Newbury, UK, 2013 Lloyd Ch., Frazier J.A., Career Paths: Engineering, Express Publishing, Newbury, UK, 2011 Evans V., Dooley J., Rogers H.P., Career Paths: Art & Design, Express Publishing, Newbury, UK, 2013 Nastavni materijal predmetnog nastavnika Dimitrijević N., Radovanović K.: Test Your English, zbirka testova za engleski jezik, Zavod za udžbenike i nastavna sredstva, Beograd, 1992			
Active teaching classes: 30		Theoretical teaching: 30	Practical teaching:
Teaching methods Combined method (monologue, dialogue, demonstration, illustration, and text-based method along with appropriate organizational forms: frontal, individual, group, pair, and team/interactive work).			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Client programming			
Teacher: Tanja Krunić, Aleksandar Stoisavljević			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To introduce students to the fundamentals of client-side web programming using JavaScript and related technologies, such as XML, JSON, and AJAX, which are used to create interactive web pages.			
Learning outcomes Students are capable of independently adding interactivity to web pages using the JavaScript scripting language and related technologies, such as XML, JSON, and AJAX.			
Course contents <i>Theoretical teaching</i> JavaScript basics. Variables, declaration, and initialization. Dynamically typed data and primitive types. Data type conversion (type casting). Arrays, objects, control structures, loops, and functions. Date() object and its application. Dynamic generation of HTML elements. Dynamically changing web page styles based on user actions or date and time constraints. Domain object model (DOM). Selecting specific elements on a page (by ID, name, tag, or class name) and modifying their content. Utilizing the innerHTML property to inject dynamically generated content into HTML elements. Creating, modifying, and deleting elements, attributes, and classes. Windows. Dialog boxes: prompt(), alert(), and confirm(). Creating popup windows with dynamically generated content and setting their dimensions. Redirecting web browsers. Event handling (e.g., onclick, onmouseover, onload). Processing form data. Retrieving values from input fields, multi-line text areas, drop-down menus, radio buttons, and checkboxes. Form data validation. Using regular expressions (Regex). Cookies and tracking user actions. Utilizing cookies to facilitate website navigation. Resetting cookie values. Creating web animations using JavaScript. Implementing image sliders with manual (on-click) and automatic image transitions. Strings and string manipulation. Finding substrings within a given string, utilizing the indexOf() method, and splitting strings based on specific criteria using the split() method. XML and JSON data storage formats. Fetching data from XML and JSON files using AJAX and dynamically rendering it on a web page. Applying linters and code validators to ensure JavaScript code correctness. Best practices for saving JavaScript code in external files and embedding them into HTML pages. <i>Practical teaching</i> Successive adding of interactivity to web page components (forms, animations, image sliders, and dynamic style modification of page elements) Developing interactive web pages using JavaScript by applying the above-mentioned techniques.			
Literature Krunić T.: Klijentsko programiranje, materijal sa predavanja u elektronskoj formi, 2017 Haverbeke M., JavaScript elokventno, savremeni uvod u programiranje, Mikro knjiga, Beograd, 2019 Simpson K., Naučite JavaScript, Mikro knjiga, Beograd, 2016 Flanagan D.: JavaScript sveobuhvatan vodič, Mikro knjiga, Beograd, 2021 Svekis L. L.: JavaScript od početnika do profesionalca, Kompjuter biblioteka, Beograd, 2022 Crute A.: Coding HTML, CSS Javascript made easy, Flame Tree, Beograd, 2016 Gauchat J.D.: HTML5, CSS i Javascript, Mikro knjiga, Beograd, 2014			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Monologue-based, interactive, laboratory methods.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work – project presentation	20	Oral exam	
Interim exam/s	30		
Seminar paper/s			

Study programme: Information technologies			
Course title: Microcomputers			
Teacher: Dragan Rastovac, Lazar Kopanja			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective The objective of the course is to introduce students to the architecture fundamentals and operating principles of microprocessors and programmable logic controllers (PLCs). Additionally, students will master the peripheral components of microcomputer systems.			
Learning outcomes Students are equipped with fundamental knowledge in designing hardware modules and writing programs for the MCS-51 microcontroller family in the C language. They are also familiar with the open-source Arduino platform and the development of application software for PLCs within an appropriate development environment.			
Course contents <i>Theoretical teaching</i> Historical development of microprocessors. Microprocessor structure. Microprocessor performance. Microcomputers. Architecture of microcomputer systems. Classification. Digital integrated circuits. Standards for representing logic circuits. TTL and CMOS. Component analysis: elementary logic circuits, flip-flops, registers, counters, decoders, memories, and ADC/DAC converters. MCS-51 microcontroller family. Clock generator. Memory organisation. Timing diagrams. Data memory. External data memory. Timing diagrams. Internal data memory. Special purpose registers. Ports. Interfacing with other components of a microcontroller system. Analog and digital sensors. Arduino microcontroller boards and connectivity. Types of communication interfaces between Arduino microcontrollers. Practical introduction to the structure of PLCs. Methods of programming PLCs. <i>Practical teaching</i> Practical teaching follows the theoretical units by solving specific examples and problems through computational and laboratory exercises.			
Literature Kainka, B.: Elektronika za početnike. Analogna elektronika sa mikrokontrolerima, Agencija EHO, Niš, 2020 Ibrahim, D., Ibrahim, A.: GSM/GPRS projekti zasnovano na PIC mikrokontrolerima i Arduino, Agencija EHO, Niš, 2019 Milivojević, Z.: Mikrokontroleri - Arhitektura 8051, Punta, Niš, 2005 van Dam, B.: Arduino Uno 45 projekata za početnike i stručnjake, Eho, 2018 Ziemann, V.: A Hands-On Course in Sensors Using the Arduino and Raspberry Pi, CRC Press, Boca Raton, USA, 2018 Ibrahim D., Kolekcija projekata sa senzorima, Eho, 2020 Ibrahim D., Kolekcija projekata sa senzorima 40 + projekata za Arduino, Raspberry PI i ESP32, Eho, 2020			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Monologic, dialogic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	25	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Study programme: Information technologies			
Course title: Web databases			
Teacher: Željko Marčičević			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To acquire skills in the design, development, and implementation of database management web applications within the context of the internet economy and e-business, utilizing open-source systems.			
Learning outcomes Students are capable of independently designing and implementing web applications that utilize relational databases, and executing SQL queries on databases using server-side scripting.			
Course contents <i>Theoretical teaching</i> A brief overview of database structures (relational databases, RDBMS, web databases, Apache and MySQL administration, SQL queries, transactions). PHP as a language for accessing and manipulating web databases: characteristics of server-side scripting, variables and constants in PHP, data types, operators in PHP, program flow control statements, built-in and user-defined functions, function properties, arrays, strings, working with files and folders in PHP, and using HTML forms. Working with date and time. Multi-user database access. MySQLi extension (procedural access): connecting to the MySQL server and selecting a database using mysqli_connect() and mysqli_close(). Database queries (INSERT, DELETE, UPDATE, SELECT) from PHP code using functions: mysqli_query(), mysqli_num_rows(), mysqli_affected_rows(), mysqli_fetch_row(), mysqli_fetch_assoc(), mysqli_fetch_array(), and mysqli_fetch_object(). Application of PHP code for transactions, prepared statements, stored procedures, and triggers. Web database security: SQL injection attacks and protection methods. Filter functions. Regular expressions. Sessions: starting a session, working with session variables (string type), deleting session elements, destroying a session, and passing the session ID in a query string. <i>Practical teaching</i> Installing the MySQL database management system. Defining users – assigning a username and password to access the MySQL server. Tasks for applying data types, operators, and data type conversion. Tasks focusing on the implementation of linear, branched, and cyclic program structures. Tasks applying built-in PHP functions and creating user-defined PHP functions with or without arguments, and with or without return values. Tasks involving code for string manipulation. Tasks involving code for manipulating files and directories (files and folders). Tasks applying HTML forms and arrays \$_POST, \$_GET, and \$_FILES. Tasks applying date and time functions in PHP code. Creating code to connect to the MySQL server, select and utilize a specified database, and terminate the server connection. Writing code to perform CRUD operations on a database. Writing code to execute transactions, stored procedures, and triggers. Adding functionality to the code to prevent SQL injection attacks. Writing code that utilizes sessions.			
Literature Lovreković, Z.: Osnove PHP i MySQL, samostalno izdanje autora, Novi Sad, 2020 Williams, H., Lane, D.: Web aplikacije i baze podataka - PHP i MySQL, Mikro knjiga, Beograd, 2003 Prettyman S.: Naučite PHP 7: Objektno-orijentisano modularno programiranje korišćenjem HTML5, CSS3, Javascript, XML, JSON i MySQL, Kompjuter biblioteka, Beograd, 2016 Meloni J. C.: Samostalno naučite PHP7, MySQL i Javascript u jednoj knjizi, Kompjuter biblioteka, Beograd, 2018 Welling L., Thomson L.: PHP i MySQL: razvoj aplikacija za veb, prevod 5. izdanja, Mikro knjiga, Beograd, 2017			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	25	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Study programme: Information technologies			
Course title: Engineering communications			
Teacher: Biljana Gemović			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective Introducing students to software used for drawing and shaping mechanical, structural and design segments.			
Learning outcomes Students will be equipped to independently draw workshop and assembly drawings using computer software and technical drawing principles, and to generate complete product technical documentation.			
Course contents <i>Theoretical teaching</i> Workshop drawings: requirements, elements of a workshop drawing, and production methods. Assembly drawings: requirements, elements of assembly drawings, and production methods. Installation (erection) drawings: oblique projection drafting using the indirect projection method, elements of installation drawings, and production methods. Mechanical engineering projects: components and production methods. Electrical power engineering projects: components, production methods, and report writing. Technical drawings in mechanical, electrical, and civil engineering. Basic concepts and structure of CAD. Engineering design: phases, types of structures. Function structure. Conceptual design development. Dimensioning of parts: functional dimensioning, dimensioning based on stress and other component states. Optimization of dimensions using iterative procedures. Design for manufacturing (DFM): cast, forged, welded, and machined parts. Modern CAD software: AutoCAD, PRO/Engineer, and others. 3D solid modelling and 2D drafting. Fundamentals of design science: the engineering design process, structure, and environment. Elements of systems theory. Elements of information and decision theory. New product development. Generation of product technical documentation. <i>Practical teaching</i> Introduction to the AutoCAD user interface and software. 2D drafting of mechanical parts. Creation of workshop and assembly drawings. Dimensioning. Adding text to drawings. Plotting and printing. Working in AutoCAD 3D.			
Literature Kovačević S., Gemović B.: CAD, VTŠ, Novi Sad, 2006 Gemović B.: Kompjuterska grafika, VTSNS, Novi Sad. 2020 Dovniković, L.: Tehničko crtanje sa nacrtnom geometrijom, Fakultet tehničkih nauka u Novom Sadu, Novi Sad, 1989			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods Interactive, demonstrative and laboratory.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Fundamentals of maintenance			
Teacher: Ranko Antunović, Branko Savić			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective To introduce students to technical system maintenance procedures and technical diagnostics with the aim of ensuring equipment safety and preventing failures in the technological process.			
Learning outcomes Students will acquire core knowledge of technical system maintenance, operational procedures, and technical diagnostics.			
Course contents <i>Theoretical teaching</i> Fundamentals of technical systems maintenance. Technical systems. Maintenance objectives. Maintenance as a production function. Integrated systems approach to maintenance. Maintenance concept, organization, and technology. Working capacity and failures of technical systems. System effectiveness and effectiveness indicators. System effectiveness concepts. System effectiveness indicators. Maintenance of technical systems. Corrective, preventive, and condition-based maintenance. Total Productive Maintenance (TPM). Reliability-Centered Maintenance (RCM). Risk-Based Maintenance (RBM). Performance-based maintenance. Run-to-failure maintenance. Predictive maintenance. Proactive maintenance. Technical diagnostics. Objectives of diagnostic inspections of technical systems. Basic diagnostic methods. Subjective diagnostic methods. Objective diagnostic methods (Operating parameter monitoring procedures; Basic monitoring procedures for wear and combustion products; Root causes of vibrations in technical systems; Non-Destructive Testing (NDT) procedures). Objective and structure of a maintenance information system. Fundamentals of maintenance technology. Technology for repair and reclamation of technical system components. Weak-point analysis and elimination. Maintenance management. Maintenance planning. Maintenance quality control. Decision-making in management. Selection, training, organization, and allocation of human resources. <i>Practical teaching</i> Component reliability analysis. System reliability analysis. Preparation and defense of a seminar paper. Contact and non-contact temperature measurement – thermographic diagnostics. Mechanical vibration measurement.			
Literature Adamović, Ž., Savić, B., Stanković, N.: Osnovi održavanja mašina, Old Commerce, Novi Sad, 2003 Savić, B., Stanković, N., Ilić, B.: Održavanje mašina i opreme, Visoka tehnička škola strukovnih studija, Novi Sad, 2013 Savić, B., Stanković, N., Ilić, B.: Pouzdanost tehničkih sistema, Visoka tehnička škola strukovnih studija, Novi Sad, 2013			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Monologic, dialogic and interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	30		
Seminar paper/s	20		

Study programme: Information technologies			
Course title: Fundamentals of electrical engineering 2			
Teacher: Branislav Santrač			
Course status: Elective			
Number of ECTS: 7			
Prerequisite course: None			
Course objective To introduce students to the fundamental concepts and laws of time-invariant and time-varying magnetic fields, as well as electrical circuits with time-varying currents.			
Learning outcomes Students will acquire knowledge of the fundamental concepts and laws of time-invariant and time-varying magnetic fields, as well as electrical circuits with time-varying currents. Additionally, they will be capable of solving analytical and practical problems within these domains.			
Course contents <i>Theoretical teaching</i> Introductory Lecture: Course organization and syllabus overview, grading policy and examination methods. Electromagnetism: Magnetic field of a permanent magnet and electric current; current-carrying conductor in a magnetic field; electromagnetic induction. The Biot–Savart law and its applications. Force and torque on a current loop in a magnetic field. Magnetic field lines. Magnetic flux. Gauss's law for magnetism. Motion of a charged particle in magnetic and electric fields. Ampere's law and its applications. Matter in a magnetic field. Magnetic circuits. Electromagnetic induction. Faraday's law. Examples of electromagnetic induction. Potential and voltage in time-varying electric and magnetic fields. Mutual inductance and self-inductance. Energy and forces in a magnetic field. Alternating Currents: Phasor representation of AC quantities, phasor and vector diagrams; phasor and vector diagrams; alternating currents and voltages; AC power; power in three-phase systems. Sinusoidal AC circuits. General equations. Fundamental concepts of sinusoidal AC circuits. AC circuit analysis using phasors. Special component connections in AC circuits. Three-phase systems. Power in three-phase systems. <i>Practical teaching</i> Solving corresponding problems from all course topics, board work, and group problem-solving exercises.			
Literature B. Santrač, S. Skoko: Elektrotehnika, VTŠ, Novi Sad, 2014 B. Popović: Osnovi elektrotehnike 2, Akademska misao, Beograd, 2004 A. Torbica: Osnove elektrotehnike, VTŠ, Novi Sad, 2007 N. Pekarić-Nadž, V. Bajović: Zbirka rešenih ispitnih zadataka iz osnova elektrotehnike, Građevinska knjiga, Beograd, 1998			
Active teaching classes: 75		Theoretical teaching: 45	Practical teaching: 30
Teaching methods: Lectures and classroom tutorials. Monologue-based, dialogue-based, interactive, demonstrative, and practical teaching methods, as well as group and independent student problem-solving exercises.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s	50		
Seminar paper/s			

Study programme: Information technologies			
Course title: Audio and video technologies			
Teacher: Dragan Rastovac			
Course status: Elective			
Number of ECTS: 7			
Prerequisite course: None			
Course objective To explain the relevant aspects of audio and video technologies, and recording standards, along with the transmission and reproduction of audio and video signals. Furthermore, it covers audio, video, and signal transmission techniques in radio and television studios, as well as audio and video recording formats, and tools for digital processing of audio and video signals in multimedia.			
Learning outcomes Upon successful completion of the course, students will have mastered contemporary audio and video technologies and standards. Additionally, students are expected to understand the technical and user-centric aspects of applying audio and video technologies.			
Course contents <i>Theoretical teaching</i> Media development, concept, and structure. Signal, signal digitization. Physical and physiological characteristics of sound and image. Analog and digital video/audio technologies. Standards for encoding/compression and transmission of audio and video signals (AAC, WAV, MPEG, 3D, and others). Power supply and grounding of audio/video devices. Measuring equipment in analog and digital TV systems. Media for connecting video devices: coaxial, optical, and UTP cables. Interfaces. Devices for recording and reproducing sound and image (microphones, speakers, and headphones; cameras, monitors, and projectors). Audio and video systems and services. Multimedia systems and services. Fundamentals of acoustics. Acoustic design of the input and output environment. Television systems and monitoring (CRT, LCD, plasma, LED, multiview). <i>Practical teaching</i> Fundamentals of non-linear editing software. Workspace. Material import and processing. Editing. Adobe Premiere. Audio-visual editing. Editing tools. Ableton Live 9. Creation of intros, jingles, and lower thirds. Application of filters and effects. Development of two project assignments: Synchronization – production of a trailer and soundtrack (pixel, block, frame, shot, film). Digital audio and image processing: Sound Forge, Ableton Live 9, Cubase, Adobe Premiere.			
Literature Delić, V.: Audio izdanje udžbenika i prezentacija u okviru, UTS, Novi Sad, 2018 Farkaš, R.: Zbirka radova iz Multimedija – Digitalna Produkcija, 2018 Mijić, M.: Audio sistemi, Akademska Misao, Beograd, 2011 Fischer, W.: Digital Video and Audio Broadcasting Technology, Cham: Springer, 2020			
Active teaching classes: 90		Theoretical teaching: 45	Practical teaching: 45
Teaching methods: Monologic, dialogic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	25	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Study programme: Information technologies			
Course title: Management information systems			
Teacher: Dragan Rastovac			
Course status: Compulsory			
Number of ECTS: 5			
Prerequisite course: None			
Course objective To introduce students to the contemporary use of computers in business for the automation of existing processes. Furthermore, it aims to foster the creative use of IT to develop new business processes and improve corporate performance by mastering the capability to produce goods and services tailored entirely to the specific requirements and needs of a known customer.			
Learning outcomes Students will be equipped to apply tools and methodologies for the professional execution of tasks and assignments, specifically the design, development, evaluation, and maintenance of an organization's management information system (MIS).			
Course contents <i>Theoretical teaching</i> Basic concepts in information theory. Information representation. Computer development. Computer architecture and operation. The impact of modern technological development on business and production. A new approach to business. A new meaning of the product. Disadvantages of classical industrial business. Transition from the industrial to the knowledge age. Technology development curve. Information at the right time, in the right place, and in the right way. New quality of information. Management as coordination and control. IT and reengineering of production and business processes. Concept, role, and importance of business process reengineering. How to define a process? IT as an enabler of reengineering. Business process modeling. Workflow management. Electronic business and its impact on management information systems. Concept of electronic business. B2B. B2C. C2C. E-commerce, E-banking, E-government, E-education. Knowledge management. Impact of knowledge management concepts on management information systems. Design and production in the knowledge age. IT and organizational management in the knowledge age. Intellectual capital. Features of the transition from the industrial to the knowledge age. IT in production management. Knowledge discovery in databases. Intelligent systems in business decision-making. Information systems for strategic planning. Neural networks and fuzzy logic in management information systems. Development of information systems application models. Information model of the organization. Information infrastructure of the enterprise. Basic principles of the development of the enterprise information system. Enterprise information system software based on the intranet. Information model of the virtual production organization. <i>Practical teaching</i> Closely follows the lectures. Case study analysis. Brainstorming. Development of a project for a specific organizational MIS with full implementation of e-business concepts. Discussion of project assignment solutions.			
Literature Stair, R., Reynolds, G.: Principles of information systems, Cengage Learning, 2020 (knjiga u elektronskom obliku) Lovreković, Z.: Upravljački i informacioni sistemi, VTŠ, Novi Sad, 2012 Lovreković, Z.: Upravljanje znanjem, VTŠ, Novi Sad, 2012 Stanojević, B.: Menadžment informacionih sistema, Fakultet za internacionalni menadžment, Beograd, 1998			
Active teaching classes: 45		Theoretical teaching: 30	Practical teaching: 15
Teaching methods: Monologic, dialogic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	25	Oral exam	
Interim exam/s	25		
Seminar paper/s			

Study programme: Information technologies			
Course title: Development of e-business applications			
Teacher: Lazar Kopanja, Nebojša Jovanović			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective To acquire skills in the design, development, and application of e-business elements and systems using open-source software.			
Learning outcomes Students are capable of independently developing e-business applications, such as content management systems (CMS), e-commerce software, management information systems (MIS), and personalized report generation, utilizing object-oriented PHP and MySQL.			
Course contents <i>Theoretical teaching</i> E-business: business functions, B2B and B2C, ERP and MIS systems, e-commerce, e-banking, e-auctions. Classes and objects in PHP, PHP exceptions. Regular expressions and user input validation. MySQLi extension: classical queries, prepared statements, transactions, stored procedures, and triggers. PDO extension: classical queries, prepared statements, transactions, stored procedures, and triggers. Concept and functions of a content management system (CMS), MVC (Model-View-Controller) software architecture, Active Record, and object-relational mapping (ORM). Development of WYSIWYG editors, file upload functionality. Development of CMS models. Development of CMS controllers. Controller for the client side. Controller for the administrator side of the CMS. Development of CMS views. View components for the client side. View components for the administrator side of the CMS. Application for personalized report generation – FPDF library. AJAX. E-shop as a specific type of CMS: creation of storefronts, shopping carts, and payment systems. Web-based MIS: functions of management information systems, decision support systems, systems for defining business processes. Web forums. <i>Practical teaching</i> Closely follows the lectures and consists of developing simpler web applications for database manipulation, followed by the development of a specific web application in the form of a project assignment.			
Literature Prettyman, S.: Naucite PHP 7 Objektivno orijentisano modularno programiranje HTML 5, CSS 3, JavaScript, XML, Json i MSQl, Kompjuter biblioteka, Beograd, 2016 Lovreković Z.: Napredni PHP i MySQL, samostalno izdanje autora, Novi Sad, 2020 Gejts, B., Poslovanje brzinom misli, Prometej, Novi Sad, 2001 Dimitrijević Ružić Lj.: Elektronsko poslovanje – praktikum, Visoka tehnička škola strukovnih studija, Novi Sad, 2013			
Active teaching classes: 75		Theoretical teaching: 45	Practical teaching: 30
Teaching methods: Monologue, dialogue, interactive, and laboratory-based methods.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work		Oral exam	
Interim exam/s			
Project assignment	50		

Study programme: Information technologies			
Course title: Software application design			
Teacher: Tanja Krunić, Aleksandar Stoisavljević			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective			
Mastering ASP.NET technology for the development of object-oriented MVC web applications.			
Learning outcomes			
Students are capable of independently creating an object-oriented MVC web application utilizing ASP.NET technology and publishing it on the internet.			
Course contents			
<i>Theoretical teaching</i>			
Detailed introduction to the MVC architecture of software applications. Creating dynamically generated MVC applications using ASP.NET technology. Setting up the web.config file. Working with the controller. Default HomeController. Adding a new controller. Routing. QueryString and its application. Adding a View. Web page layout and _Layout.cshtml file. Editing the content of an existing View template. Editing the template style. Dynamic objects in the C# programming language. Working with the dynamic ViewBag object. Converting an HTML/CSS template to an ASP.NET template. @RenderBody() method. HTML helpers for creating links. Partial View and its application. Default style file site.css. Managing exceptions. Error page. Bundling. Delegates, anonymous methods, and lambda expressions in C#. Creating models. Adding classes. Adding contact forms and their elements. HTML helpers for forms: TextBoxFor, DropDownListFor, RadioButtonFor, CheckBoxFor, TextAreaFor, etc. Adding HttpGet and HttpPost attributes in the controller. Processing data from contact forms. Creating a responsive page. Validating data from contact forms. Applying the concept of class inheritance in creating more complex applications. Working with NuGet packages. Adding a SQL Server database. Migrating a database to a model class using the Entity Framework. Migrating a model class to a database. Custom helpers and their application. Creating class libraries and their use in applications. Preparing a project for publication on the internet (build and publish). Publishing a project on hosting.			
<i>Practical teaching</i>			
Development of object-oriented MVC web applications with custom responsive templates using ASP.NET technology, which access data in a relational database.			
Literature			
Krunic T., Projektovanje softverskih aplikacija – materijal sa predavanja u elektronskoj formi, 2019			
Baptista G., Abbruzzesse F., C# 9 i .NET 5 arhitektura softvera, Kompjuter biblioteka, 2021			
dodata literatura:			
Price J. M., C# 6 i .NET Core 1.0 Moderno međuplatformsko programiranje, Kompjuter biblioteka, 2016			
Price J. M., C# 7 i .NET Core 2.0 Moderno međuplatformsko programiranje, Kompjuter biblioteka, 2022			
Aroraa G., Chilberto J., C# i .NET Core projektne obrasce, Kompjuter biblioteka, 2019			
Active teaching classes: 75		Theoretical teaching: 45	
Practical teaching: 30			
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	30	Oral exam	
Interim exam/s	20		
Seminar paper/s			

Study programme: Information technologies			
Course title: Website optimization			
Teacher: Tanja Krunic			
Course status: Compulsory			
Number of ECTS: 6			
Prerequisite course: None			
Course objective The objective of the course is to acquire knowledge and practical skills in the field of search engine optimization (SEO) for websites.			
Learning outcomes Students are equipped to independently undertake a series of steps to optimize websites for search engines.			
Course contents <i>Theoretical teaching</i> Web search engines (Google, Yahoo, Bing, etc.) and their working principles. Crawlers and their databases. Indexing and ranking of sites (Google PageRank). On-page and off-page ranking factors. SEO (Search Engine Optimization). On-page optimization: formation of a set of keywords and phrases. Refinement of a keyword set. Using online tools to assess the demand for keyword phrases and obtain data on the competition strength for a given phrase. Incorporating keywords into the content of a web page. Meta tags and their optimization. Meta description and meta keywords tags, and their importance in website optimization. Optimization of meta tags for social networks. Optimization of title tags, heading tags, and alt attributes for images. Optimization of anchor text. The influence of website age and content originality on search engine ranking. Changing the structure of a website for optimization purposes. Website publishers on free hosting. Tools for checking website optimization (Lipperhey, SEO Site Checkup, Woorank, etc.). The robots.txt file and its role in search engine optimization. The importance of a website XML sitemap for SEO. Using tools to create an XML sitemap. Optimizing website loading speed. Image optimization. Code optimization. Using tools for minifying and concatenating CSS and JavaScript files. Tools for checking website loading speed. The role of responsive web design in search engine optimization. Social networks and their role in SEO. Adding plugins for sharing content on social networks as an alternative way to increase inbound traffic to the website. Adding Google Analytics tracking code to the website header. Getting to know Google Analytics data and its interpretation: bounce rate, exit rate, average time spent on the site, and average number of visitors. Building blogs for SEO optimization. Creating a blog using WordPress. The role of YouTube channels in search engine optimization. Optimizing video content for search engines. Off-page optimization. Backlinking techniques: cross-linking, backlink checking tools, backlink quality checking tools, guest posting, and other methods for attracting backlinks. <i>Practical teaching</i> On-page website optimization using the techniques mentioned above. Deploying a website to a domain. Creating a thematic blog in WordPress and linking it to the website being optimized. Off-page optimization in practice.			
Literature Krunic T: Optimizacija veb sajtova, materijal sa predavanja u elektronskoj formi, 2017 French G.: Ultimate guide to Link Building, Entrepreneur Media, 2020 Marshall, P., Todo B., Rhodes M.: Definitivni vodič za Google Ads, Kompjuter biblioteka, Beograd, 2021 Krol, K.: WordPress 4* u celosti, Kompjuter biblioteka, 2015 Hussey T.: Naučite Wordpress, Mikro knjiga, Beograd, 2011			
Active teaching classes: 45		Theoretical teaching: 30	Practical teaching: 15
Teaching methods: Monologic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work – project presentation	20	Oral exam	
Interim exam/s			
Seminar paper/s	30		

Study programme: Information technologies			
Course title: Business law			
Teacher: Ivan Bulatović			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective The aim of this course is to familiarize students with the legal framework of business and managerial decision-making. Students acquire foundational knowledge of general legal concepts, core institutes of various branches of law, business entities, and their business relationships. In addition to theoretical fundamentals, this course provides systematized practical insights necessary for understanding and resolving specific business issues. Furthermore, students will develop practical skills in drafting contracts, formulating offers, and executing acceptances. They will explore the differences between Serbia's Law on Personal Data Protection and international privacy regulations. Finally, the course covers the basics of drafting copyright agreements, as well as preparing patent applications and structuring invention descriptions.			
Learning outcomes By mastering the course content, students acquire the following specific competencies: thorough knowledge and understanding of the principles of law, and the ability to solve specific problems by connecting basic knowledge from different branches of law, such as property law, law of obligations, and intellectual property law. Students acquire and improve their ability to apply innovations in the profession by following current regulations and legal commentaries in professional literature. In addition, they develop skills for independent work and the practical application of knowledge (drafting contracts, making offers, and accepting offers). Students will also familiarize themselves with drafting <i>service agreements</i>, preparing patent applications, and structuring invention descriptions within those applications.			
Course contents <i>Theoretical teaching</i> General concepts in law: State, legal order and legal system, legal norm, concept and attributes of a legal entity. Concept and types of property rights: Concept of property rights, things, state property, ownership rights. Law of obligations: Contracts, types of contracts, formation of a contract, offer, acceptance of an offer, subject matter of a contract, legal instruments for securing contract performance and liability for damages. Right to privacy and data processing: Privacy – concept, Law on Personal Data Protection in Serbia and global privacy protection laws. Jurisdictional challenges. Intellectual property: Forms of intellectual property. Copyright and related rights: Copyrighted work as an object of protection. Scope of protection of copyrighted work. Classification of copyrighted works. Subject of copyright - author and copyright holder, as well as co-authors and joint works. Origin and content of subjective copyright: Moral rights. Economic rights. Limitations of subjective copyright and its duration. Database producer's right: Database as an object of protection. Subject matter and content of protection. Duration of rights. Rights of the first publisher of an unprotected work: Subject matter, scope and content of protection. Duration of rights. Industrial property rights: Patent law. Invention as an object of protection. Patentability criteria. Invention right - right to patent protection: Conflict between two independent inventors over the right to a patent. Lawsuit for determining inventor status. Lawsuit for challenging the right to protection. Specifics of the patent granting procedure: Patent application, sufficient description of the invention in the application, unity of invention – divisional application, supplementary application, right of priority, publication of the invention and substantive examination. Origin, duration and termination of the patent: Termination with <i>ex nunc</i> effect. <i>Practical teaching</i> During practical classes, students will review the covered material and analyze real-world case studies. They will engage in drafting various types of contracts, as well as making and accepting offers. Through case analysis, students will examine and identify the differences between Serbia's Law on Personal Data Protection and international privacy regulations. Furthermore, they will practice drafting copyright agreements, evaluating patentability criteria, preparing patent applications, and structuring invention descriptions within those applications.			
Literature Ljubojević, G., Milošević, I., Poslovno pravo, Visoka poslovna škola strukovnih studija, Novi Sad, 2020 Vernart, B., Međunarodno pravo i poslovanje, Visoka poslovna škola strukovnih studija, Novi Sad, 2022 Marković, S., Popović, D., Pravo intelektualne svojine, Pravni fakultet univerziteta u Beogradu, Beograd, 2022 Spirović-Jovanović, L., Dabić, L., Poslovno pravo, Beograd, Ekonomski fakultet Beograd, 2015 Šogorov, S., Radoman, M., Poslovno pravo, Univerzitet Singidunum, Beograd, 2007			
Active teaching classes: 60		Theoretical teaching: 45	Practical teaching: 15
Teaching methods: Oral presentation, conversation, discussion and demonstration.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes	10	Written exam	50
Practical work		Oral exam	
Interim exam/s	40		
Seminar paper/s			

Study programme: Information technologies			
Course title: Computer animations			
Teacher: Biljana Gemović			
Course status: Elective			
Number of ECTS: 6			
Prerequisite course: None			
Course objective Gaining basic knowledge of 3D modelling and visualization. Developing a clear understanding of photorealistic 3D model creation and methods for generating dynamic graphics.			
Learning outcomes Upon successful completion of this course, the student is capable of applying foundational knowledge in graphic design, cinematic language, web design, and programming. Furthermore, the student is equipped to integrate these disciplines within a multimedia environment functionally and conceptually linked to computer applications, computer graphics, and computer animation.			
Course contents <i>Theoretical teaching</i> Graphics programs, divisions and categories; Film script; Storyboarding; Character design in computer animation; Set design; Colour theory; Perspective; Basics of cinematic language and frame composition; Shot types; Elements of rhythm; Visualization goals; Virtual reality; Software for modeling, design, computation, and animation; NURBS modeling; Layout and animation; Scene organization; Rendering; Reflection and shading models; 3D animation creation process; Animation by fundamental phases; Modelling: CAD modeling of three-dimensional objects: Three-dimensional coordinate systems and construction planes; Defining a user coordinate system in 3D space; Orientation conventions; Multi-view drawings and standard 3D object projection layouts; Creating surface models: 3D surface models; Surface modelling with Bézier curves , Koons patches, and B-splines; Modelling solid objects: 3D solid models; boundary representation (B-Rep) of solid models; Creating solids by revolving 2D profiles; Modelling thin-walled objects; Creating photorealistic 3D models: Visualization of three-dimensional objects; Formation of rendered 3D models; Setting up light sources and scenes for rendering; Role of shadows in modelling objects and environments; Scene management and set design; Rendering and working with material properties; Project documentation management; Animation in CSS and AutoCAD: Computer animation; Animation methods in CAD; Camera and object positioning; Creating animations; Animation algorithms, Testing and verification of modelling algorithms; Developmental trends in CAD systems from a database perspective; Practical application examples. <i>Practical teaching</i> Computer-based laboratory exercises focused on working within the 3ds Max software suite through the creation of practical 2D and 3D environment and scene designs, texturing, configuring light sources and shadows, generating computer animations, and final rendering.			
Literature Gemović, B.: Kompjuterska animacija sa praktikumom, VTŠ, Novi Sad, 2022 Gemović, B., Subić, N: Kompjuterska grafika, VTŠ, Novi Sad, 2020 McFarland, J.: 3D studio Max, edicija: Vizuelni brzi vodič, 2011 Pandey, J.: AutoCAD 2023, 2D crtanje i 3D modelovanje, Kompjuter biblioteka – Beograd, 2023 Letić, D., Desnica, E: 3D modelovanje i vizuelizacija, Tehnički fakultet u Zrenjaninu, Zrenjanin, 2007			
Active teaching classes: 60		Theoretical teaching: 30	Practical teaching: 30
Teaching methods: Monologue, interactive, laboratory.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes	10	Written exam	50
Practical work	10	Oral exam	
Interim exam/s	30		
Seminar paper/s			

Study programme: Information technologies			
Course title: Work practicum			
Teacher: Branko Babić, Ivan Bulatović, Jovana Kopanja			
Course status: Compulsory			
Number of ECTS: 7			
Prerequisite course: None			
Course objective To introduce students to basic occupational health and safety measures and fire safety protocols in order to prevent workplace injuries and fatalities, while familiarizing them with the applicable legal regulations and laws related to launching a business venture. The course aims to enable students to effectively source information regarding government subsidies and financial assistance for first employment and startup initiatives. Furthermore, students will gain insight into the specific procedures and practical examples of business registration, exploring realistic opportunities, development phases, and entrepreneurial prospects within relevant industries. Finally, through hands-on exercises in specialized fields, students will acquire practical experience on advanced machinery and equipment not available within the institution, thereby preparing them for professional practice and direct integration into modern production plants.			
Learning outcomes Upon successful completion of the course, students will possess a foundational knowledge of occupational health and safety regulations and fire safety protocols, enabling them to implement prescribed personal protection measures in the workplace and apply the code of business conduct. Furthermore, students will understand legal instruments used for securing contracts, such as loan and current account agreements, and will master the formal procedures required to establish their own company. They will be able to evaluate realistic opportunities, development phases, and entrepreneurial potential within relevant industries. Finally, students will acquire practical, hands-on experience by operating advanced machinery and specialized equipment not available within the institution, thoroughly preparing them for professional practice and seamless integration into modern production facilities.			
Course contents <i>Theoretical teaching</i> 1. Training students in the field of occupational safety and health (OSH) to ensure safe participation in work processes and environments. Through professional OSH training, students acquire foundational knowledge regarding the obligations and responsibilities of employers, the rights and duties of employees, the organization of workplace safety, and the personal protective equipment used in work processes. During their practical work within the company, students apply this knowledge to minimize the risk of workplace injuries and fatalities. 2. Fire safety training provides students with fundamental knowledge about fire behavior, combustion products, smoke toxicity, fire classes, and safe extinguishing techniques. It covers preventive measures, alerting Fire and Rescue Services, and operating portable fire extinguishers. Students apply and practice these skills within a limited, controlled scope during their practical placement. 3. Individual organizational characteristics, corporate representation, ownership and property relations, and special regulations governing internal company relations. 4. Cash deposits, savings deposits, loan agreements, and current account contracts. 5. Core rules of business etiquette, dress code, principles of ethics and integrity, conflict resolution mechanisms in professional relationships, and strategies for achieving business goals and navigating diverse workplace scenarios. 6. Preparation for establishing a business and the foundations of the regulatory framework, including: the Constitution of the Republic of Serbia, the Labor Law, the Law on Companies, the Law on the Registration Procedure with the Serbian Business Registers Agency (APR), the Law on Safety and Health at Work, the Law on Mandatory Social Security Contributions, the Law on Health Care, the Law on Pension and Disability Insurance, the Law on Health Insurance, and relevant bylaws issued by the Ministry of Labor. 7. The concept and legal nature of trade secrets, and their relationship with the protection of exclusive intellectual property rights. 8. Students undergo a practical knowledge assessment based on the first two topics, which serves as a prerequisite for implementing prescribed safety and security measures during their company placement. <i>Practical teaching</i> Students deliver presentations on the procedures and practical examples of launching their own business. The course also includes company site visits to help students understand real-world opportunities, development phases, and the broader potential of entrepreneurship. Within these partner enterprises, students conduct practical exercises in relevant fields, operating modern machinery and advanced equipment not available within the institution. This hands-on approach ensures that students are thoroughly prepared for their professional practice and ready to operate within modern production facilities.			
Literature Zakon o bezbednosti i zdravlju na radu („Sl. glasnik RS“, br. 35/2023) Zakon o zaštiti od požara, Službeni glasnik RS, broj 111/2009, 20/2015, 87/2018 i 87/2018 – dr. zakoni. Normativno-pravna regulativa iz oblasti rada Marković, S., Popović, D.: Pravo intelektualne svojine (Beograd, Pravni fakultet univerziteta u Beogradu), 2022 Ljubojević, G., Milošević, I.: Poslovno pravo (Novi Sad, Visoka poslovna škola strukovnih studija), 2020 Vernart, B.: Međunarodno pravo i poslovanje (Novi Sad, Visoka poslovna škola strukovnih studija), 2022			
Active teaching classes: 120		Theoretical teaching: 60	Practical teaching: 60
Teaching methods: Monologic, dialogic, interactive, demonstrative.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes	5	Written exam	50
Practical work	15	Oral exam	
Interim exam/s	30		

Study programme: Information technologies			
Course title: Theoretical and experimental bases of professional work			
Teacher: Božo Ilić, Jovana Kopanja, Branko Savić			
Course status: Compulsory			
Number of ECTS: 9			
Prerequisite course: None			
Course objective Introduction of students to the methodology of producing various types of professional papers. Training students for engineering research in practice, as well as for conducting experimental and other types of research using various scientific and professional methods.			
Learning outcomes Upon successful completion of the course, students will be able to independently produce various types of professional papers by effectively applying diverse scientific and professional research methodologies. Additionally, students will demonstrate the ability to conduct experimental and other engineering research projects using advanced methodological frameworks.			
Course contents <i>Theoretical teaching</i> Basic concepts of science and publication. Scientific papers. Scientific versus professional papers. Types of professional papers (Final paper, Specialist paper, Project, Technical study, Professional report, etc.). Methodology for writing professional papers: Selecting a research topic; Choosing and reviewing literature (collecting relevant data on the addressed problem); Structuring the paper (preface, table of contents, introduction, main body, conclusion, literature, appendices). Core rules for drafting professional papers. Scientific and professional methods in research: Analysis method. Synthesis method. Generalization method. Proof method. Refutation method. Comparative method. Statistical method. Sampling method. Mathematical method. Modeling method. Cybernetic method. Experimental method. Counting method. SWOT analysis. Organization of research applying various methodological frameworks. Practical application: conducting experimental and alternative research types relevant to the student's study programme, using real-world examples and diverse scientific and professional tools. Engineering foundations and engineering decision-making. <i>Practical teaching</i> A portion of the instruction for this course is conducted within a host company where students undergo professional internships and perform various activities directly related to their study program. During this internship period, students gain practical experience and familiarize themselves with business, production, and technological systems, specifically focusing on design, development, production, research, and testing. Throughout their practical placement, students maintain an internship logbook, recording descriptions of their tasks, conclusions, and observations. Upon completing the practical work, students compile their findings into a final report structured as a seminar paper.			
Literature Ilić, B., Savić, B.: Teorijske i eksperimentalne osnove stručnog rada, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2022 Segedinac, T.: Teorija inženjerskog eksperimenta, Visoka tehnička škola strukovnih studija u Novom sadu, Novi Sad, 2012 Kovačević, S.: Teorijske i eksperimentalne osnove specijalističkog rada, Visoka tehnička škola strukovnih studija u Novom Sadu, Novi Sad, 2012 Adamović, Ž., Vulović, S.: Metodologija naučno-istraživačkog rada, Društvo za tehničku dijagnostiku Srbije, Beograd, 2011 Adamović, Ž., Nadrljanski, Đ.: Metodologija naučno-istraživačkog rada – Statističke metode u istraživanju, Društvo za tehničku dijagnostiku Srbije, Pedagoški fakultet, Sombor, 2011			
Active teaching classes: 150		Theoretical teaching: 90	Practical teaching: 60
Teaching methods: Monologic, dialogic, interactive.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	50
Practical work	20	Oral exam	
Interim exam/s	30		
Seminar paper/s			

Study programme: Information technologies			
Course title: Professional practice			
Teacher: Head of the study programme			
Course status: Compulsory			
Number of ECTS: 4			
Prerequisite course: None			
Course objective Acquiring and applying practical knowledge related to the study programme within the host organization, specifically for the purpose of drafting the final thesis.			
Learning outcomes Practical experience in the application and use of knowledge and skills acquired during undergraduate studies. Understanding of the work processes, operational structures, and management of the host company. Data collection and analysis necessary for drafting both the preliminary thesis and the final thesis.			
Course contents Professional practice is carried out in the sixth semester of basic professional studies. It is conducted within manufacturing, service, or other relevant business organizations, following general and individual programme contents designed for final thesis preparation, as agreed upon by the company co-mentor, the institution's mentor, and the student. Students may also complete their professional practice directly at the Higher Technical School of Professional Studies in Novi Sad (the Institution), according to a pre-determined and approved plan. All relevant forms regarding professional practice are available to students registered for the course. Throughout the internship, students perform both general and specialized tasks. General tasks require students to familiarize themselves with the company's history, organizational structure, production or service portfolio, and overall work processes. Specialized professional tasks are jointly defined by the company co-mentor and the mentor. These tasks represent thematic units that students have already studied during their coursework and are now applying under practical conditions within the selected company. The mentor and co-mentor are responsible for precisely defining work assignments and obligations to familiarize students with the organizational structure, work processes, technology, quality control procedures for products and services, and methodologies for data collection and processing related to the preparation of the final thesis. The company co-mentor cooperates with the student on a daily basis, providing guidance and monitoring progress. During the placement, students maintain an Internship Logbook. Assigned work tasks should enable students to actively apply the knowledge acquired throughout their studies, ensuring effective training for their future profession. Upon completing the internship, students submit a final report that corresponds in content and form to the instructions provided at the beginning of the placement.			
Literature Technical documentation from the company and other relevant literature agreed upon between the student, the company co-mentor and the mentor.			
Active teaching classes: 90		Theoretical teaching:	Practical teaching:
Teaching methods: Practical, laboratory, individual work.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	
Practical work	45	Oral exam	
Interim exam/s		Exam	55
Seminar paper/s			

Study programme: Information technologies			
Course title: Preliminary thesis			
Teacher: Head of the study programme/Mentor			
Course status: Compulsory			
Number of ECTS: 2			
Prerequisite course: None			
Course objective Developing the ability to identify and define problems and communicate with the mentor. Familiarization with practical methodologies applicable to the selected field of study. Integrating, upgrading, and practically applying the knowledge acquired throughout the studies. Preparation for the writing of the final thesis.			
Learning outcomes Through independent and mentored research, the student defines and elaborates upon the initial topic of the final thesis, culminating in a written thesis proposal and an oral defense of a detailed research plan. Consequently, the student develops the ability to conduct analysis and identify problems within the given topic, demonstrating full readiness to write the final thesis.			
Course contents The course is taught through independent professional research and mentoring, during which the student defines the initial topic of the final thesis and elaborates it in detail, leading up to a written proposal and an oral defense of a detailed plan for the preparation of the final thesis. Upon receiving the topic and research assignment, and through regular consultations and progress reporting, the student reviews relevant academic literature, past final theses, and other publications in a related field. The student then conducts preliminary analyses to better delineate the assigned research problem. In the second phase, the student studies the nature, structure, and complexity of the problem in more detail. The student actively searches for published knowledge within the broader topic of the assigned work, and plans and conducts preliminary research or conceptual solutions in order to better conceptualize the task and direct it toward implementation and finalization. In this way, the student draws conclusions about possible solutions, chooses a methodology/technology, and plans in detail the organization and execution of the main analyses or applications of the selected technology when writing the final thesis. During this process, the student regularly consults with the mentor, and if necessary, with other faculty members of the School. The goal of the activities is to gain the necessary experience for problem-solving and to identify opportunities for applying previously acquired knowledge in practice. At the end of the research work, the student writes a Preliminary Thesis Paper. The quality of the written proposal is assessed by the mentor/head of the study programme, and it is defended orally (viva).			
Literature Textbooks in the chosen field, papers from professional journals, technical documentation and company records, software tutorials, past final thesis, etc.			
Active teaching classes: 30			
Teaching methods: Practical, research, mentoring.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	
Practical work		Oral exam	
Interim exam/s		Preliminary thesis (viva)	50
Preliminary thesis (preparation)	50		

Study programme: Information technologies			
Course title: Final thesis			
Teacher: Mentor			
Course status: Compulsory			
Number of ECTS: 8			
Prerequisite course: Passed all courses from the study programme			
Course objective Systematization of theoretical and practical knowledge acquired throughout the study programme, enabling students to develop decision-making and practical problem-solving skills. Documentation of the work done in a written format and the public defense (viva) of the results of the work.			
Learning outcomes The capacity to analyze and resolve practical problems. Skills in presenting research results through both written reports and oral presentations.			
Course contents Upon passing all examinations, the student proceeds to draft the final thesis. This is an applied research paper through which the student becomes familiar with practical problem-solving and research methodologies within one of the fields of the study programme. All procedures and forms related to the final thesis are available on the School's website. The mentor is an active participant in all phases of writing the final thesis, and if necessary, includes a co-mentor from the company (from the student's professional practice) and other faculty members of the School. In addition to a comprehensive review of the existing literature and/or legal and technical regulations in the chosen field, the final thesis should include at least one of the following elements: an analytical, computational, design, or experimental/practical aspect. The student completes the final thesis independently, and it is highly desirable that the work is linked to specific knowledge acquired during professional practice. The student drafts the final thesis based on the detailed execution plan previously presented in the Preliminary Thesis. In doing so, the preliminary experiments, analyses, or software solutions obtained during the research for the Preliminary Thesis are finalized to achieve the definitive results or programs. Subsequently, the student prepares the final thesis in the prescribed format, which includes the following chapters: Introduction, Thesis Objective, Elaboration of the Topic, Conclusion, and Literature. After submitting the written version of the thesis, a verification of fulfillment of conditions follows, according to the procedure given by the <i>Regulations on Topic Application, Preparation, and Defense of the Final Thesis on Bachelor, Specialist, and Master Studies at the Higher Education Technical School of Professional Studies</i> . Then the student proceeds to the oral presentation and defense of the final thesis. The viva is public, and the thesis is defended before a committee.			
Literature Textbooks in the chosen field, papers from professional journals, technical documentation and company records, software tutorials, past final thesis, etc.			
Number of classes: 45			
Teaching methods: Mentoring, practical, laboratory, individual work.			
Assessment (maximum number of points 100)			
Pre-exam obligations	Points	Course exam	Points
Active participation in classes		Written exam	
Practical work		Oral exam	
Interim exam/s		Final thesis (viva)	50
Seminar paper/s			
Final thesis (preparation)	50		