FACULTY OF ORGANIZATIONAL SCIENCES

BOOK OF SUBJECTS
Information Systems and Technologies

Belgrade

2025.

CONTENT:

CONTENT:

CONTENT

CONTENT

CONTENT

Teaching subject	
Teaching subject	01.IT0001
Number of ECTS:	6

Fundamentals of Information and Communication Technologies

Program(s) in which it is performed	IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects	
Teachers:	Simić B. Dejan Jovanović D. Bojan Bogićević Sretenović S. Marija Šošević Z. Uroš

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Students are introduced to relevant concepts, principles of work in the field of information and communication technologies and acquire the necessary skills for working on computers. The goal of the course is to increase productivity in solving complex problems by applying information technologies and tools typically available on personal computers and smartphones..

2. Educational outcomes (acquired knowledge):

The student uses the acquired academic and professional knowledge and skills necessary for independent and team work on computers, and is able to apply, analyze and evaluate the learned concepts and technologies in the process of further independent learning in the field of modern information and communication technologies.

3. Course content/structure:

Theoretical teaching
P-01: Number systems and codes, P-02: History of computing, P-03: Data, information, knowledge and entropy, P-04: Fundamentals of hardware, P-05: Types of software and their applications, P-06: Data organization, P-07: Blockchain technology, P-08: Databases, P-09: Computer networks, P-10: Java, P-11: Communication technologies, P-12: Electronic commerce, P-13: Data protection, P-14: HTML, P-15: XML
Practical teaching
Exercises, Other forms of teaching, Study research work V-01: Introduction, V-02: Configuration and administration of the operating system – Windows, V-03: Advanced use of word processors – Word, V-04: Advanced use of word processors – Word (continued), V-05: Advanced Spreadsheet Techniques – Excel, V-06: Advanced Spreadsheet Techniques – Excel (continued), V-07: Test: Windows+Word+Excel, V-08: Creating Presentations – PowerPoint, V-09: Internet + e-mail, V-10: Creating Internet Presentations, V-11: Creating Internet Presentations (continued 1), V-12: Creating Internet Presentations (continued 2), V-13: Test: PowerPoint + Internet, V-14: Comprehensive Test, V-15: Comprehensive Test

4. Teaching methods:

Classical Lectures. Auditory exercises and exercises in the computer room..

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical teaching	YES	40.00	Written exam	YES	60.00

Literature

NO..	Authors	Title	Publisher	Year
1	Rajaraman, V.	Introduction to Information Technology	PHI Learning Pvt. Ltd.	2018
2	Jennifer H. Meadows, August Grant	Communication Technology Update and Fundamentals, 16th Edition	Routledge	2018
3	Dejan Simić	Electronic material, presentations from lectures	FON, Belgrade	2020
4	Dejan Simić	Fundamentals of Information and Communication Technologies	FON, Belgrade	2011
5	Dejan Simić	A collection of questions and tasks from the basics of information and communication technologies with solutions	FON, Belgrade	2011

Literature

NO..	Authors	Title	Publisher	Year
6	George W. Raynolds	Information Technology for Managers, Second Edition	Boston	2016
7	Douglas E. Comer	Internetworking with TCP/IP Volume 1: Principles, Protocols, and Architecture	Pearson Education	2013
8	R. Kelly RainerJr., Efraim Turban	Uvod u informacione sisteme (IT poglavlja)	Data Status	2009

Teaching subject		E-bussines
Subjecst designation:	01.EP0001	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Despotović-Zrakić S. Marijana Bogdanović M. Zorica Vukimirović B. Dragan Barać M. Dušan Labus B. Aleksandra

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of this course is to introduce students to the Internet infrastructure for e-business, current e-business business models, as well as the possibilities of applying e-business in various fields: trade, banking, public administration, education, healthcare. Students are also introduced to the basics of digital marketing, customer relationship management and social media business. A specific aim of the course is to enable students to work independently in the development of simple web portals, e-shops and customer relationship management systems.

2. Educational outcomes (acquired knowledge):

Students apply the acquired theoretical and practical knowledge to develop e-business systems in various fields, as well as to implement simple e-business systems using content management systems, customer relationship management systems, and software for developing e-stores.

3. Course content/structure:

Theoretical teaching
Introduction to e-business. The Internet as an infrastructure for e-business. Forms of e-business: B2C, B2B, C2C. E-business models: e-shops, e-auctions, web portals. Business models on social media. E-business strategies. Digital business transformation. Planning online presence, online business plan. Planning entrepreneurial ventures on the Internet (startup). E-business services and applications. E-commerce and e-shops. Mobile business. Digital marketing. E-business on social media. Customer relationship management, CRM. Electronic payments. E-business services: e-banking, e-government, e-education, e-health. Analytics in e-business systems. Trends in e-business: blockchain, omnichannel approach, ubiquitous computing, cloud computing, internet of things, big data, artificial intelligence.
Practical teaching
Internet infrastructure for e-business. Introduction to web presentations. Static and dynamic websites. Local web servers XAMPP/WAMP. Basics of client technologies: HTML, CSS. Introduction to JavaScript. Web content management systems: Wordpress, WordPress plugins. Website responsiveness and content adaptation for mobile devices. Website optimization for search engines, SEO techniques. Connecting websites to social media. Design and implementation of e-shops: WooCommerce, Magento. Design and implementation of CRM systems, SuiteCRM. Integration of web portals, e-shops and CRM systems.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Seminar paper	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
1	Б. Раденковић, М. ДеспотовићЗракић, З. БогYesновић, Д. Бараћ, А. Лабус	Електронско пословање	Faculty of Organizational Sciences, Belgrade	2015
2	K. C. Laudon, C.G. Traver	E-Commerce 2020–2021: Business, Technology and Society	Global Edition, 16th edition, Pearson	2020
3	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materials for the course Electronic business, in e-form, from the e-learning portal moodle.elab.fon.bg.ac.rs		2021

Teaching subject	**Management**
Subjecst designation: 01.Z00001	
Number of ECTS: 6	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects	
Teachers:	Petrović Č. Dejan Bjelica Lj. Dragan Mitrović M. Zorica Mihić M. Marko

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring the latest academic and professional knowledge in the field of management, a modern scientific discipline that deals with the problems of managing organizational systems. Training students to use modern methods and techniques used in management, as well as illustrating skills that contribute to improving the functioning of the organization.

2. Educational outcomes (acquired knowledge):

Application of academic and professional knowledge, methods and techniques in the processes of planning, organizing, leading and controlling various businesses, ventures and organizational systems. Students will be able to apply advanced skills in team building, communication, negotiation, conflict resolution, leadership and motivation in making business decisions.

3. Course content/structure:

Theoretical teaching
Defining and developing management. Management processes. Functional areas of management. Planning process. Organizing process. Staffing process. Leadership process. Control process. Decision-making process. Information system for enterprise management. Manager. Manager and teamwork. Management and specialized management disciplines. Management skills. Organizational strategy. Management of service and production operations.

Practical teaching
Management methods and techniques. Planning methods. Organizing methods. Control methods. Methods of managing communications and information in the organization. Managerial decision-making. Required knowledge and skills of managers. Selection and election of managers. Team formation and management. Case studies.

4. Teaching methods:

Auditory, illustrative-demonstrative, verbal-textual, practical work methods.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	30.00
Colloquiums	Yes	50.00			
Seminars	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Chuck W.	Principi menadžmenta	Data Status, Beograd	2013
2	Јовановић П.	Менаџмент – Теорија и пракса	Висока школа за пројектни менаџмент, Београд	2007
3	Robbins P. S, Coutler M	Menadžment	Data Status, Beograd	2005

Teaching subject		Organizational basics
Subjecst designation:	01.Z00005	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Jaško O. Ondrej Čudanov J. Mladen Jevtić N. Miloš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to introduce first-year students to the basic definitions and concepts of organizational sciences, and then to introduce them to the features and specificities of leading theories of organization and management. Furthermore, students are introduced to practically applicable knowledge and develop skills in the organization of business systems that will enable them to understand the individual aspects of business systems that are later elaborated in detail in the subjects of higher Year studies.

2. Educational outcomes (acquired knowledge):

Acquiring advanced academic and professional knowledge in the field of business systems organization and developing skills for solving complex problems of business systems organization in a modern environment and with coordination and communication with various stakeholders. Training for independent management of projects for the development and improvement of business systems organization as well as for transferring acquired knowledge and skills with the possibility for and a positive attitude towards continuous improvement in

3. Course content/structure:

Theoretical teaching
Development of organizational sciences. Definition of the term, social scope and importance of organization. Principles of organization, methods, techniques, means and instruments. Organizational theories. Strategic elements of organization. Organization of business systems. Organization of work processes in production and other activities. Production management. Production capacities of enterprises, calculation, coordination. Productivity, definition, factors, importance of labor productivity. Organization, structuring of organization, directing and planning of work processes. Organizational models. Models of organizational structure. Basic institutional forms of organization.
Practical teaching:Exercises
Development of organizational theories – Scientific management. Development of organizational theories – Administrative theory. Development of organizational theories – Bureaucratic organization. Interpersonal relations direction. Development of organizational theories – Theories of behavior in organizations. Management science. Contemporary theories of organization. Work organization - analysis of technological alternatives, organization of production processes. Methods of determining work time norms. Management and regulation - cost and inventory control. Quality management. Work productivity - mechanization, automation, innovations. Types of authority in the organization. Models of organizational structure - examples. Basic functions of the enterprise - job descriptions.

4. Teaching methods:

Monologue method, demonstrative method, case study, learning through collaborative work on solving practical problems, independent student research and problem solving based on the tasks given.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	30.00	Oral exam	Yes	45.00

Literature

NO..	Authors	Title	Publisher	Year
1	Јашко, О., ЧуYешнов, М., Јевтић, М. & Кривокапић, Ј.	Основи организације и менаџмента	Belgrade, Serbia: Faculty of Organizational Sciences	2014
2	Кривокапић, Ј., Тодоровић, И. & Комазец, С.	Основи организације и менаџмента – практикум	Belgrade, Serbia: Faculty of Organizational Sciences	2014
3	Daft, R. L.	Organization Theory and Design, 12th edition	Stamford, Connecticut, USA: CengageLearning	2016

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Laloux, F	Reinventing Organizations: A Guide to Creating Organizations Inspired by the Next Stage in Human Consciousness 1st Edition	Millis, MA, USA: Nelson Parker	2014
5	Morgan, G.	Images of Organization	London, UK: Sage Publications	2006

Teaching subject		Mathematics 1
Subjecst designation:	01.Z00002	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Stanojević F. Bogdana Mihić P. Olivera Nikolić T. Nebojša Boričić Joksimović B. Marija

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Presentation and explanation of mathematical content related to the concept of number, basic concepts from algebraic structures, elements of linear algebra and analytic geometry, as well as differential calculus of functions of one real variable, which are intended for the engineer profile.

2. Educational outcomes (acquired knowledge):

Students will use and apply matrix calculus and differential calculus of functions of one variable, which are essential tools for modeling organizational and technical systems.

3. Course content/structure:

Theoretical teaching 1. Introductory concepts. 2. Algebraic structures. 3. The concept of a function. 4. The concept of a vector. Vector space. 5. The concept of a matrix. Operations with matrices. Matrix rank. Inverse matrix. 6. Systems of linear algebraic equations. Kronecker-Capelli and Cramer theorems. Gaussian algorithm. 7. Equation of a plane and a line in space. 8. Sequences. Convergence criteria. 9. The concept of a real function of one variable. Limit value of a function. 10. Continuity of a function. Properties of functions continuous on a segment. 11. First derivative of a function. 12. Differential of a function and applications. Differentials of higher order. 13. Basic theorems of differential calculus. Taylor's formula. 14. The concept of extremum. Necessary and sufficient conditions for an extremum. 15. Convexity of a curve and inflection points. Asymptotes of a curve.
Practical teaching 1. Binary relations and operations. 2. Group, field, ring, field. 3. Examples of functions. 4. Vector spaces. Scalar, vector and mixed product of vectors. 5. Matrix multiplication, inverse matrix, matrix rank, eigenvalues and eigenvectors. 6. Solving systems of linear algebraic equations. 7. Line and plane. 8. Limit value of a sequence. 9. Limit value of a function. 10. Continuity of a function. 11. Derivatives of functions. 12. L'Hôpital's theorem. 13. Taylor's formula. 14. Examining functions. 15. Exam questions.

4. Teaching methods:

The classic way using a whiteboard and computer presentations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	25.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Д. Ђорић, Р. Лазовић	Математика 1	FON, Belgrade	2012
2	О. Михић, В. Балтић, М. Боричић	Методичка збирка решених заYестака из Математике 1	FON, Belgrade	2013

Teaching subject		Economy
Subjecst designation:	01.Z00003	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Jednak J. Sandra

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring basic knowledge in economics (introduction to economic analysis, microeconomics and macroeconomics) through theory, techniques and practical examples. The course is an introduction and foundation for related subjects in higher years.

2. Educational outcomes (acquired knowledge):

Introduction to economic science; elucidation and mastery of basic economic categories, laws, principles and processes; connection and critical understanding of economic concepts, as abstract categories, with practical economic life; proper orientation in identifying significant economic events in a country, but also on a global scale; development of economic logic and thinking about contemporary microeconomic and macroeconomic problems.

3. Course content/structure:

Theoretical teaching:
Introduction to economics; Subject and method; Economic categories, laws and models; Leading schools of economic thought; Structural problems of production; Interdependence of production, distribution, exchange and consumption; Production possibilities frontier and opportunity cost; Factors of production and enterprises in a market economy; Analysis of the market of factors of production; Capital and labor; Wages and profit; Concept and forms of enterprise; Basic elements of a market economy; Demand and supply of goods and services; Elasticity of demand and supply; Market equilibrium; Welfare analysis; Production function and economic analysis of costs; Production function; Law of diminishing returns; Total, average and marginal product and their interdependence; Production and costs; Total, average and marginal costs; Break-even point and break-even point; Cost economy and diseconomies; The concept and functions of the market; Spheres of market inefficiency; Alternative market structures; Maximization of the producer objective function under conditions of perfect and imperfect competition; Monopoly; Monopolistic competition; Monopoly price and monopoly profit; Basic macroeconomic aggregates; Gross domestic product; Gross national product and national income; AD-AS model and multiplier model; Aggregate demand curve and determinants; Aggregate supply curve and determinants; Aggregate demand and aggregate supply equilibrium; Accumulation, investment, consumption and national income; Determinants of national income; Use of the accumulation curve and consumption curve; Accumulation and investment; Investment performance and capital ratio; Consumption plus investment; Recession and inflation gap; Investment multiplier; Paradox of saving; Economic development and foreign direct investment; The concept, importance, goals and factors of economic growth and development; The concept of sustainable development; Development indicators; Theories of economic growth and development; Economic development and inflation; Business cycles; Countercyclical policy; International capital movements; Portfolio investment and foreign direct investment; Money and the money market; Origin, forms and functions of money; Monetary aggregates and the quantitative theory of money; Central bank and banking; Money supply and demand for money; Monetary multiplier; Inflation and unemployment; The concept, indicators, types and effects of inflation; Anti-inflationary policy; Interdependence of inflation, unemployment and economic growth; Forms of unemployment; Labor market and wages; Deflation; Macroeconomic policy instruments; Stabilization and development economic policy; Budget and fiscal policy; Taxes; Public debt; Government spending multiplier and crowding out effect; Monetary and credit policy; Exchange rate policy; Devaluation and revaluation; Balance of payments; Investment policy; Price system and policy; Economic policy in the field of international trade; European integration processes; European Union; European Monetary Union; European transition processes.
Practical teaching:
Exercises follow the methodological units Lectures.

4. Teaching methods:

Lectures, exercises, calculations and presentation of seminar papers and essays, case studies, colloquia, consultations. Each form of teaching requires preparation, cooperation and participation of students. Students are stimulated and activated through interactive

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Oral exam	Yes	50.00
Colloquiums	Yes	40.00			
Seminar paper	Yes	5.00			

Literature

NO..	Authors	Title	Publisher	Year

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
1	Крагуљ, Д.	Економија - Основи микроекономске и макроекономске анализе	изYесње аутора, Београд	2020

Teaching subject		English in computer science
Subjecst designation:	01.I00079	
Number of ECTS:	4	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Andjelković S. Jelena Meršnik T. Marija

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introduction to the basics of professional English and terminology in the field of ISIT, improvement of oral communication skills on professional topics, skills in reading and understanding read professional texts, mastering the basics of business correspondence in English, and establishing knowledge of grammar.

2. Educational outcomes (acquired knowledge):

Students will master the basics of this professional field and establish their knowledge of grammar. They will actively use basic professional terminology, learn to communicate verbally and in writing on professional topics, read simpler professional texts with understanding, and learn to write and respond to business letters and emails.

3. Course content/structure:

Theoretical teaching
P01: Computer essentials: reading and vocabulary; P02: Software basics: reading and vocabulary; P03: Operating systems and GUIs: reading and vocabulary; P04: Programming: reading and vocabulary; P05: ICT systems in business: reading and vocabulary; P06: E-business: reading and vocabulary; P07: Mid-term revision; P08: Job hunting in ICT: reading and vocabulary; P09: Careers in ICT sector: reading and vocabulary; P10: History of ICT: reading and vocabulary; P11: The Internet and Internet Security: reading and vocabulary; P12: Recent developments of ICT: reading and vocabulary; P13: The Future of ICT: reading and vocabulary; P14: IT idioms and slang; P15: Final revision.

V01: Computer essentials: vocabulary practice; present tenses; V02: Software basics: vocabulary practice; comparison of adjectives; aV03: Operating systems and GUIs: vocabulary practice; past tenses; V04: Programming: vocabulary practice; future tenses; V05: ICT systems in business: vocabulary practice; modal verbs; P06: E-business: vocabulary practice; conditionals; V07: Mid-term revision; V08: Job hunting in ICT: vocabulary practice; reported speech; V09: Careers in the ICT sector: vocabulary practice; passive; V10: History of ICT: vocabulary practice; infinitive and gerund; V11: The Internet and Internet Security: vocabulary practice; plural of nouns; V12: Recent developments of ICT: vocabulary practice; articles V13: The Future of ICT vocabulary practice; prepositions V14: IT idioms and slang – vocabulary practice; grammar revision; V15: Exam practice.

4. Teaching methods:

Communicative approach and interactive teaching: through discussions, oral presentations, use of audio and video materials, individual, team and pair work, solving mini case studies, writing short texts.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	45.00
Colloquiums	Yes	45.00			

Literature

NO..	Authors	Title	Publisher	Year
1	P. Fitzgerald, M. McCullagh, C. Tabor	English for ICT Studies in Higher Education	Garnet Publishing Ltd, Reading	2011
2	S. R. Esteras, E. M. Fabre	Professional English in Use: ICT	Cambridge University Press, Cambridge	2007
3	J. McCarthy, J. McCarten, D. Clark, R. Clark	Grammar for Business	Cambridge University Press, Cambridge	2009

Teaching subject		French language in computer science
Subjecst designation:	01.I00080	
Number of ECTS:	4	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Andjelković S. Jelena Meršnik T. Marija

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: B1 level of French (according to ZEROJ)

1. Educational goal:

The aim of this course is to provide students with the necessary basics of the French language in the domain of information systems and technologies that will be useful for them in carrying out professional activities in French IT companies, which are increasingly numerous in our country, and which are looking for IT specialists with knowledge of the French language. Students' language skills will be developed, especially oral and written communication, primarily through familiarization with innovations in French companies. France is first in Europe and second in the world in technological innovation in companies). Students will be encouraged to adopt the specific terminology of the various disciplines of information systems and technologies that they study within this study program.

2. Educational outcomes (acquired knowledge):

Students will master the basics of professional French and professional terminology in the field of information systems and technologies. They will be able to actively communicate in French, both orally and in writing, with Francophone business partners. They will be able to read and understand current events and professional texts in this field, and they will improve their knowledge of business communication and correspondence related to IT, especially via e-mail.

3. Course content/structure:

• Science informatique, graphic environment, matériel, systems d'exploitation...
• Choix et installation du nouvel ordinateur.
• Les professionnels de l'informatique : développer un projet informatique, enseignements de programmation, d'algorithmique et de génie logiciel.
• L'équipement informatique multimedia.
• L'ordinateur : un tool de travail.
• Connexion Internet et navigation sur la Toile.
• Virus informatique, antivirus et pare-feu.
• Les components de l'unité centrale.
• La correspondence électronique.
•Conclusion.

4. Teaching methods:

Communicative approach and interactive teaching with the help of modern video podcasts and other materials, as well as current texts on innovations in the IT sector. Students' language skills will be developed during exercises, especially through simulating professional situations, solving small case studies, and understanding authentic video materials from the Internet.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	50.00
Colloquiums	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Oddou, M.	Informatique.com	Paris, CLE International	2010
2	Cakeljić, V.	Lexique des affaires	Beograd, FON	2013
3	Madeleine, D.	Dictionnaire de l'informatique bilingue français-anglais anglais-français	Paris, D. Madeleine	2017
4	Љубица Ђурић	ДоYестни материјали: савремени видео-клипови са интернета, презентације саLectures и вежби	ФОН	2020

Teaching subject		Introduction to information systems
Subjecst designation:	01.IS0001	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Panterlić M. Ognjen Babarogić S. Slađan Luković S. Ivan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

To introduce students to the basic terms and concepts in the field of information systems and the process of IS development. Students are introduced to the ways of using information in a company and how IS enables the improvement of quality, dynamics and competitiveness.

2. Educational outcomes (acquired knowledge):

Students will be able to Yes describe the phenomenon of IS, the processes and stages of its development. The student can Yes identify the types of modern IS and indicate their function in the business system. They will be able Yes analyze the processes and Yestki of a

3. Course content/structure:

Theoretical teaching
Basic concepts in the field of information systems. Information system architecture. IS development models. System analysis. Database modeling. Standardization in software engineering.
CASE tools. Implementation. Use and maintenance of IS. Analytical processing - IS for decision support. Artificial intelligence and Expert IS. Fundamentals of e-business. IS security and control. Ethical, social and global aspects of IS. Exam preparation.
Practical teaching
Structural system analysis. Structural system analysis - examples. Structure and content of the database. Fundamentals of database modeling. Examples of designing relational databases. More complex examples of designing relational databases. Examples of translating PMOV into a relational model. Introduction to Access. Creating tables. Examples of SQL - query language. Working with forms. Creating reports. Preparing for tests.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real-life examples, through interactive work with students.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical exam	Yes	12.00	Written exam	Yes	60.00
Tests	Yes	28.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Rainer, Turban	Увод у информационе системе	Data Status	2009
2	Пантелић О.	Материјали у е-форми са сајта is.fon.bg.ac.rs	ФОН	2020
3	Огњен Пантелић	Скрипта Access	ФОН	2007
4	Vladimir Zwass	Fondations of information systems	McGraw-Hill	1998
5	Огњен Пантелић, Ана Пајић Симовић	Збирка заYestака из пословних информационих система	ИСБН 978-86-7680-355-2	2019

Teaching subject		Mathematics 2
Subjecst designation:	01.Z00006	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Stojanović A. Milica Džamić Ž. Dušan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Presenting and explaining mathematical content related to differential calculus of functions of several variables and integral calculus of functions of one and several variables, which are intended for the engineer's profile.

2. Educational outcomes (acquired knowledge):

Students will use and apply differential calculus of functions of several variables and integral calculus of functions of one and several variables, which are part of the basic tools for modeling organizational and technical systems.

3. Course content/structure:

Theoretical teaching 1. The concept of a function of several variables. Limit value and continuity. 2. Partial derivatives. Total differential. Differentiability. 3. Existence of an implicit function. 4. Elements of field theory. Derivative in the other direction and gradient. 5. Taylor's formula. 6. Necessary and sufficient conditions for an unconditional extremum. 7. Necessary and sufficient conditions for a conditional extremum. 8. Definite integral. 9. Indefinite integral. The relationship between a definite and an indefinite integral. 10. Methods of change and partial integration. 11. Integration of rational and some classes of irrational functions. 12. Applications of integral calculus. Improper integrals. 13. Double and triple integral. 14. Change of variables in double and triple integrals. 15. Infinite series. Power series
Practical teaching 1.Examples of functions of several variables. 2. Partial derivatives. 3. Derivatives implicitly for silent functions. 4. Derivative in direction and gradient. 5. Taylor's formula. 6. The problem of the unconditional extremum. 7. The problem of the conditional extremum. 8. Calculation of the definite integral. 9. Integration methods. 10. Integration of rational and some classes of irrational functions. 11. Applications of integral calculus. 12. Double and triple integrals. 13. Change of variables. 14. Testing the convergence of series. 15. Exam questions.

4. Teaching methods:

The classic way using a whiteboard and computer presentations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	25.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	М. Стојановић, О. Михић	Математика 2	ФОН	2019
2	В. Тодорчевић, Д. Џамић, Н. Младеновић, Н. Николић	Математика 2 – збирка заYестака	ФОН	2016
3	Д. Јованов, Р. Лазовић, Д. Ђорић	Математика 2, збирка заYестака и примери колоквијума	ФОН	2009
4	Д. Ђорић	Математика 2, решени примери са Exama и колоквијума	ФОН	2014

Teaching subject		Psychology
Subjecst designation:	01.OP0001	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Kovačević Z. Ivana Miladinović M. Slobodan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Defining theoretical and methodological principles of psychology, relevant for critically assessing human behavior in organizations and solving business problems in the domain of organizational behavior.

2. Educational outcomes (acquired knowledge):

The student will be able to critically evaluate human behavior in an organizational context, and to recognize and solve business problems of a psychological nature (in the domain of organizational behavior)

3. Course content/structure:

Theoretical teaching
Psychology as an applied science and the psychological side of work. Personality, personality traits and measurement. Psychology of work: subject, goals, areas and methods of psychology of work - job analysis. Professional orientation; the process of choosing a profession. The procedure and modern tendencies of professional selection; prediction of work behavior. Work adaptation: problems of adaptation and methods of technopsychophysiology of work. Work absenteeism, employee fluctuation and psychological aspects of work injuries. Introduction to organizational psychology. Social and work groups. Personality and organization: types and problems. Management: concept, theories and psychological problems. Motivation for work: concept and theoretical interpretations, factors and motivation management. Communication in the organization: process, types, types, difficulties in the communication process. Stress in the organization: concept, stages, types, sources, consequences and management.
Practical teaching
Subject and tasks of psychology - workshop. Agreement on practical group work - experiments that changed psychology as a science. Job analysis - group workshop. Professional selection techniques - job interview: role-playing. Injuries at work: example analysis (group work). Preparation for the first colloquium - quiz. Social and work groups: case study. Problems of management and management theories: case study. Motivation for work: case study. Problems of communication in the organization: case study. Stress: individual differences in reactions to stressful events - discussion. Presentation of seminar papers.

4. Teaching methods:

Lectures interactive teaching: solving a specific structured problem (workshop), experiential learning using role-playing techniques, group discussion, case study, teamwork on the preparation of a seminar paper on an agreed topic.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	60.00	Oral exam	Yes	30.00
Seminars	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Михаиловић, Д.	Психологија раYes и организације	FON, Belgrade	2010
2	-	Истраживачки чланци по договору са студентима		2020

Teaching subject		Sociology
Subjecst designation:	01.OP0002	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Miladinović M. Slobodan Kovačević Z. Ivana

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The student should be presented with basic knowledge of sociology, introduced to the main social categories and laws that are brought into an organizational context, and introduced to the main characteristics and peculiarities of our society so that he can use this knowledge in practice, i.e. understand the social context of organizational phenomena and understand the sociological way of thinking about them and apply it in practice.

2. Educational outcomes (acquired knowledge):

Course Outcome
Acquiring basic sociological knowledge with the ability to practically recognize social categories and apply them, as well as demonstrating a positive attitude towards the importance of lifelong learning in personal and professional development. This includes developing the ability to:
- solve complex problems in non-standard conditions;
- apply successful communication skills in interaction and cooperation with members of different social groups;
- independently and responsibly manage complex projects related to knowledge of the social context in which one operates;
- apply professional ethical standards in management in accordance with the applicable social context;
- organize, control and train others for work;
- improve existing management practice in accordance with the social context, through analysis and evaluation of various concepts, principles, models and practices.

3. Course content/structure:

Theoretical teaching
Introductory lesson, Sociology as a science, concept and subject of sociology; Group and organization; Bureaucratic organization; Social values; Social power; Social structure: classes and elites; Social-class structure of our society; Social mobility; Modern social systems: capitalism and socialism; Globalization of modern society; Society in transition; Scientific and technological development and society; Development of information and communication technologies and modern social changes; Ecology and society; Work, organized work, economic democracy and participation.

Practical teaching
Introductory lesson, Sociology as a science, concept and subject of sociology; Group and organization; Bureaucratic organization; Social values; Social power; Social structure: classes and elites; Social-class structure of our society; Social mobility; Modern social systems: capitalism and socialism; Globalization of modern society; Society in transition; Scientific and technological development and society; Development of information and communication technologies and modern social changes; Ecology and society; Work, organized labor, economic democracy and participation.

4. Teaching methods:

Frontal teaching with students, Group and individual seminar teaching, Mentoring, Presentation of seminar papers. Project work in small groups.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	45.00
Colloquiums	Yes	40.00			
Seminars	Yes	5.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Миладиновић,	Основи социологије организације	Београд: ФОН	2014
2	Giddens, Anthony	Sociologija	Beograd: Ekonomski Fakultet	2007

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	Alexander, Jeffrey C; Thompson, Kenneth; Edles, Laura Desfor; Capous-Desyllas, Moshoula	A Contemporary Introduction to Sociology: Culture and Society in Transition	Routledge	2017

Teaching subject		Programming principles
Subjecst designation:	01.SI0001	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Lazarević D. Saša Antović D. Ilija Savić S. Dušan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	IT0001	Basics of infomtaional communications technology	Yes	Ho

Conditions:

1. Educational goal:

Understanding and applying the principles, rules and methods of Yes programming:
• the program development process: analyzing, designing, implementing, testing, installing and administering programs;
• the program coding and testing process: creating programs using appropriate algorithmic and instructional structures and verifying their correctness (unit testing); using imperative programming languages; using appropriate software tools for creating programs and verifying their correctness;
• the program evaluation process: measuring program performance and optimizing them; applying basic software метрика.

2. Educational outcomes (acquired knowledge):

Students develop software using the functional decomposition method and structural programming in a non-objective imperative language.

3. Course content/structure:

Theoretical teaching:
1. Introduction
2. Programming using the machine-dependent programming language L3S (2.1. Construction of a hypothetical lower-level language: Low-Level Language Simulator (L3S); 2.2. Architecture of the processor on which programs written in the L3S language are executed; 2.3. Set of instructions of the language <eng>L3S; 2.2. Programming in the L3S language)
3. Basics of the higher-level programming language C
4. Lists (4.1. Concept of the list type /TP/; 4.2. Basic TP; 4.3. Constants; 4.4. Variables; 4.5. Enumeration type; 4.6. Interval type; 4.7. Pointer type)
5. Statements (5.1. Program structure; 5.2. Arithmetic, logical and other expressions; 5.3. Value assignment statement; 5.4. Input/output statements; 5.5. Statements for controlling program execution)
6. Algorithmic structures /AS/(6.1. Algorithm; 6.2. Linear AS /sequence/; 6.3. Branched AS /selection/; 6.4. Cyclic AS /iteration/; 6.5. Programming language (implementation) idioms)
7. Subroutines: functions and procedures (7.1. The concept of subroutine; 7.2. Types of parameters: formal and actual /real/, input and output, value and address, constant and non-constant; 7.3. Mechanisms for transferring parameters by value and by address; 7.4. Block, local and global variables; 7.5. Area identifier definitions; 7.6. Subroutine testing; 7.7. Algorithmic (procedural) abstractions; 7.8. Recursive functions and procedures)
8. Structured types of lists (8.1. Composite types: 8.1.1. Structures; 8.1.2. Unions; 8.2. Collection types: 8.2.1. Static TP: (a) Arrays; (b) Matrices; 8.2.2. Dynamic TP: (a) Linked lists /pointers and dynamic memory allocation; stack, queue, list; 1UL, 2UL/; (b) Libraries; 8.3. List abstractions and ATP)
9. Input/output operations (9.1. Streams; 9.2. Creating, opening and closing Libraries; 9.3. Yestočna variable; 9.4. Yestočna pointer; 9.5. Reading files from Yestočna; 9.6. Writing files to Yestočna; 9.7. Text Yestočna; 9.8. Operations on Yestočna: search, browse, sort, update)
10. Program development using algorithmic abstractions and file abstractions (10.1. Program (software) development process; 10.2. Analysis and design: methodYes functional decomposition (top down); 10.3. Implementation: methodYes structured programming (structured programming); 10.4.
Testing: unit testing; 10.5. Case study)
11. Fundamentals of software (program) engineering.
Practical teaching: The exercises are fully aligned with the lessons, both in structure and content.

4. Teaching methods:

Lectures: Lectures ex cathedra, with the use of multimedia resources; development of case studies. Exercises: work in a computer lab, solving problems, programming.

Knowledge scores (maximum number of points 100)					
Pre-exam obligations	**Required**	**Points**	**Final exam**	**Required**	**Points**
Colloquiums	Yes	40.00	Written exam	Yes	30.00
			Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	B.W. Kernighan, D.M. Ritchie	Programski jezik C, II izdanje	CET, Beograd	2003
2	C.L. Tondo, S.E. Gimpel	Programski jezik C – rešenja zadataka, II izdanje	CET, Beograd	2004
3	O.J. Dahl, E.W. Dijkstra, C.A.R. Hoare	Structured Programming	Academic Press	1972
4	N. Wirth	Algorithms + Data Structures = Programs	Prentice-Hall, Englewood Cliffs	1976
5	Д. Иветић	Структурирани приступ програмирању	ФТН ИзYesваштво, Нови Сад	2005
6	B.W. Kernighan, R. Pike	The Practice of Programming	Addison-Wesley	1999
7	D.R. O'Hallaron, R.E. Bryant	Computer Systems: A Programmer's Perspective (using C), 3rd ed.	-	2016
8	K.N. King	C Programming: A Modern Approach , 2nd ed.	-	2008
9	Stephen Kochan	Programming in C, 4th ed.	-	2014

Teaching subject		Process engineering
Subjecst designation:	01.Z00017	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Slović R. Dragoslav Simeunović P. Barbara Stojanović D. Dragana Tomašević B. Ivan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introducing students to the basic concepts of the process approach and process engineering in manufacturing and service business systems. Students will learn how to identify, map, document, measure and improve business and labor processes, using specific engineering and management methods.

2. Educational outcomes (acquired knowledge):

By studying the subject, students acquire advanced academic and professional knowledge that enables critical understanding and application of the process approach, as well as skills for independent and team work to solve complex problems of design (identification and classification, mapping, documentation), setup, and improvement of processes in business systems.

3. Course content/structure:

Theoretical teaching: Process engineering – subject, procedure, instruments, objectives. Concept, importance and development of the process approach. Design, setting up, managing and improving processes. Types of processes. Processes and organizational structure. Basic, supporting and management processes. Processes as a basis for designing information systems. Universal technology of the process approach. Designing process architecture. Process planning. Process selection and ranking. Process specification (mapping, documentation, hierarchical decomposition, creation of process ID cards). Process review and improvement. Selection of process improvement methodology. Continuous improvement, redesign and reengineering of processes. IT support for process engineering.
Practical teaching: Concept and structure of processes. Designing the value chain of a business system. Selecting processes for improvement. Mapping process activities and resources. Process analysis from the perspective of process efficiency, costs, quality and frustration. Qualitative process analysis (identification of activities that do not add value, root cause analysis of the problem) and identification of problem areas. Formulation of proposals for process improvement. Design of the new state of the process. Assessment of the effects of improvement, preparation and deployment of the improved process.

4. Teaching methods:

monologue method, conversation method, demonstrative method, case study, learning through collaborative work on solving practical problems, independent research by students and problem solving based on the received proposals, consultations in developing a project proposal and independent work by students through learning and developing a project proposal.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Written exam	Yes	30.00
Colloquiums	Yes	20.00			
Project assignment	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Радовић М., Томашевић И., Стојановић Д., Симеуновић Б.	Инжењеринг процеса	FON, Belgrade	2012
2	Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A.	Fundamentals of business process management	Heidelberg: Springer	2018
3	Madison D.	Process Mapping, Process improvement and Process Management – A Practical Guide to Enchancing Work and Information Flow	Paton Press LCC, Chico, California	2005

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Slack, N., & Brandon-Jones, A.	Operations and process management: principles and practice for strategic impact	Pearson, UK	2018

Teaching subject		Technology and Development Management
Subjecst designation:	01.Z00018	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Marinković P. Sanja Petković G. Jasna

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Development of academic and professional knowledge and skills in the functional area of technology management and development in the enterprise. Technology, an external force and internal strength of the enterprise, is considered in the management approach as a strategic factor in the competitiveness of enterprises, industries and the economy as a whole. The program includes methods, techniques and models to support strategic and operational technology management in the enterprise. Students are trained to apply knowledge to solve specific issues of predicting, planning, organizing and managing the dynamics of changes in technology, technological systems, processes and operations in practice.

2. Educational outcomes (acquired knowledge):

The student possesses academic and professional knowledge in the field of technology management and technological development in the enterprise. The student is able to Yes solve specific issues of predicting, planning, organizing and managing the dynamics of changes in technology, technological systems, processes and operations in practice. He applies the skills of agile management of technological development and rapid response to changes in the environment. He analyzes technologies that can be introduced into the enterprise and is able to Yes choose a technological alternative that contributes to business improvement. He defines indicators of technological progress and analyzes and monitors technological progress in the enterprise.

3. Course content/structure:

Theoretical teaching
Technology management; Technology and organization; ICT and business development; Strategic technology management; Support for strategic technology management; Technological innovations; Operational technology management; Support for operational technology management; Components of processes and operations; Technology transfer; Fundamentals of technological entrepreneurship, Globalization and technological cooperation; Global technology strategies, Technology management and sustainable development.
Practical teaching
Analysis of application examples and solving problems using various methods from the field of technology management and development: Technological forecasting: Delphi, PATTERN, Brainstorming; Agile technology management, Technology performance indicators in the enterprise: Technological progress indicators (TP), Types of TP, TP rate, Objective matrix; Technology evaluation and selection methods: Yes ranking method, Yes AHP method, Methods for supporting technology innovations in the enterprise; Solving Yes tasks using software, Application of Yes method in domestic enterprises; Creative workshops; Presentations of seminar papers and project tasks.

4. Teaching methods:

Lectures, interactive teaching: workshops, exchange of ideas and knowledge through group discussion, learning by example through case studies, mentoring and teamwork; Training students in the application of technology management methods and techniques in companies; Solving problems with active student participation; Involving students in research work through the preparation of seminar papers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	40.00	Written exam - tasks	Yes	40.00
			Written exam - theory	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Леви-Јакшић, М.	Менаџмент технологије и развоја	Београд: Чигоја штампа	2010
2	Леви-Јакшић, М., Маринковић, С., & Петковић, Ј.	Менаџмент иновација и технолошког развоја	Београд: ФОН	2015
3	Burgelman, R., Christensen, C. M., &Wheelwright, S. C.	Strategic Management of Technology and Innovation	Mc Graw Hill	2008

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Cetindamar, D., Phaal, R., &Probert, D.	Technology Management – Activities and Tools	Palgrave Macmillan	2010
5	Harrison, N., &Samson, D.	Technology Management - Text and International Cases	Mc Graw Hill	2002

Teaching subject		Basics of operational management
Subjecst designation:	01.Z00019	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Lečić-Cvetković M. Danica Antić R. Slobodan Đorđević Milutnović S. Lena Cvetić B. Biljana Danilović D. Miloš Rakićević M. Zoran

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring advanced academic and professional knowledge about the concept, domain and content of operations management, its importance in modern business and the digitalized environment, as well as preparation and training for the application of modern concepts, models and methods of operations management in a real organizational and business system.

2. Educational outcomes (acquired knowledge):

After completing the learning process, students will be able to Yes define and argue the key elements of operational strategy, as well as Yes apply the concepts and methods of operations management in solving problems related to production programming, product development, resource planning, capacity planning and balancing, and inventory and quality management.

3. Course content/structure:

Theoretical teaching
P-01: Introductory notes on the subject and method of work; P-02: Concept, importance and development of operations management; P-03: Demand forecasting and production programming; P-04: Designing product-service packages; P-05: Resource and capacity planning: concept and importance; P-06: Product and process quality; P-07: Logistics and supply chains; P-08: Material flow and inventory management; P-09: Lean management concept; P-10: Quantitative models in operations management; P-11: Information technologies and digitalization in operations management; P-12: Big data analytics in operations management; P-13: Computer-integrated and flexible production.

Practical teaching
V-01: Operational strategy in a global environment; V-02: Make or buy analysis; V-03: Demand forecasting methods; V-04: Facility location and layout; V-05: Capacity calculation and capacity utilization; V-06: TQM (Total Quality Management) concept, TQM tools; V-07: Planning of logistics processes and flows; V-08: Methods of waste identification and just-in-time supply; V-09: Operational and lean management: presentation and analysis of selected case studies; V-10: Fundamentals of aggregate planning; V-11: Operational management and business intelligence; V-12: Software support for operational management, part 1/2; V-13: Software support for operational management, part 2/2.

4. Teaching methods:

Lectures ex cathedra, interactive and Auditory exercises (creative workshops and case studies) and practical (laboratory) exercises.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	40.00
Colloquiums	Yes	30.00			
Practical teaching	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Омербеговић-Бјеловић Ј. и др.	Основе операционог менаџмента	FON, Belgrade	2010

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Хејзер Ц., Рендер Б.	Операциони менаџмент (превод са енглеског језика)	Центар за Publisherку делатност Економског факултета, Београд	2011
3	Васиљевић, Д., Цветић, Б., Yесниловић, М.	Менаџмент логистике и ланаца снабдевања, друго допуњено и проширено изYесње	FON, Belgrade	2018
4	Васиљевић Д., Словић Д.	Каизен – јапанска парадигма пословне изврсности	FON, Belgrade	2015
5	Лечић-Цветковић, Д., Атанасов, Н.	Управљање производњом и пружањем услуга	FON, Belgrade	2015
6	Илић О.	Рачунарски интегрисана производња	FON, Belgrade	2015
7	Reid D.R, Sanders N.R.	Operations Management: An Integrated Approach, 6th Edition	Wiley	2016
8	Slack, N., Brandon-Jones, A., Johnston, R. and Betts, A.	Operations and Process Management: Principles and Practice for Strategic Impact, 4th edition	Pearson, Harlow, UK	2015

Teaching subject		Probability theory
Subjecst designation:	01.Z00010	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Đoković M. Aleksandar Ignjatović P. Marina

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring basic knowledge of probability theory and training in the application of that knowledge in solving practical problems.

2. Educational outcomes (acquired knowledge):

Studying probability theory equips students to solve concrete problems and provides a foundation for understanding the methods and models of statistical analysis.

3. Course content/structure:

P01: Random events, properties. Operations and relations with random events. Probability (definitions). P02: Conditional probability, properties. Total probability formula, Bayes' formula. P03: One-dimensional random variables of discontinuous type. P04: One-dimensional random variables of continuous type. P05: Parameters of a random variable. Generatrix function. Chebyshev's theorem. P06: Models of discontinuous distributions. P07: Models of continuous distributions. P08: Limit theorems in probability. P09: Two-dimensional random variables of discontinuous type. P10: Two-dimensional random variables of continuous type. P11: Moments of two-dimensional distributions. P12: Marginal distributions. Conditional distributions. P13: Regression analysis.P14: Two-dimensional normal distribution. P15: Distributions of some functions of random variables.
Practical teaching
V01: Combinatorics. V02: Random events. V03: Probability. Conditional probability. V04: Total probability, Bayes' formula. V05: One-dimensional random variables of discontinuous type. V06: One-dimensional random variables of continuous type. V07: Parameters of random variables. V08: Models of discontinuous distributions. V09: Models of continuous distributions. V10: Two-dimensional random variables of discontinuous type. V11: Two-dimensional random variables of continuous type. V12: Marginal distributions. Conditional distributions. V13: Regression analysis. V14: Two-dimensional normal distribution. V15: Distributions of some functions of random variables.

4. Teaching methods:

The classic way, using a blackboard and a computer.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	40.00	Oral exam	Yes	60.00

Literature

NO..	Authors	Title	Publisher	Year
1	Вуковић Н.	Основе вероватноће	FON, Belgrade	2012
2	Булајић М., Вукмировић Д., Радојичић З., Ђоковић А., Тотић С., Доброта М.	Теорија вероватноће збирка заYестака	FON, Belgrade	2015

Teaching subject		Computer architecture and operating systems
Subjecst designation:	01.IT0002	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Jovanović D. Bojan Bogićević Sretenović S. Marija Šošević Z. Uroš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

To enable understanding of computer architecture and organization, to analyze computer components and their interconnections; to analyze the principles of component management, to introduce aspects of computer architecture that are necessary for acquiring knowledge in other areas of computing such as operating systems and computer networks.
To introduce students to the fundamental concepts and principles of modern operating systems, with examples of modern operating systems.

2. Educational outcomes (acquired knowledge):

The student can describe the classical computer architecture and its functional units, explain how the processor works by executing instructions; explain different instruction formats, identify the main memory technologies and describe the principles of memory hierarchy; describe how interrupts are used to control input, output and message transfer; identify different types of buses in a computer system.
Students will be able to use modern operating systems as tools for managing the hardware components of the system. They will be able Yes to apply the acquired skills to manage the performance of the operating system, as well as methods of interprocess communication in solving problems involving message transfer between dependent processes.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to computer architecture and organization, P-02: Processor and memory, Computer components, Amdahl's law, P-03: Instruction execution model (9 phases), Instruction format, Instruction types, P-04: Flow of instructions between processor and memory at the RTL level, Addressing methods, Interrupts, P-05: Program execution control, Assembly programming, P-06: Multi-core processors, Microprogram level, P-07: Introduction to operating systems, P-08: Process control, P-09: Concurrent processes and interprocess communication, P-10: Memory management, P-11: Virtual memory, P-12: Processor allocation, P-13: Deadlock and methods for its resolution, P-14: Management bills, P-15: Protection of bills.
Practical teaching
Exercises, Other forms of teaching, Study research work V-01: Basic concepts in the field of computer architecture and organization, V-02: Characteristics of processors and memory, classification of processors and memory, Examples of the application of Amdahl's law, V-03: Examples of different types of instructions, examples of the basic set of processor instructions, V-04: Examples of executing processor instructions, Examples of instructions in assembler, V-05: Examples of programs in assembler, V-06: Examples of improving performance by applying parallel processing of instructions, V-07: Basic concepts in the field of operating systems, V-08: The process of booting, configuring and monitoring the performance of an operating system, V-09: Examples of interprocess communication, V-10: Examples of memory management, V-11: Introduction to the Linux operating system, V-12: Examples of working in command line under Linux operating system, V-13: Startup protection using Windows as an example, V-14: Startup protection using Linux as an example, V-15: Review exercises and preparation for the Final exam.

4. Teaching methods:

Lectures, exercises, lab. exercises.
Lectures are performed according to the ex cathedra model, the teacher uses a mandatory prepared presentation that is shown in the classroom via a projector. The teacher uses a blackboard and a marker for individual teaching units as needed.
Exercises are performed in a regular classroom, where the teacher shows prepared presentations as well as specific tools via a projector. The teacher uses a blackboard and a marker for individual tasks. The teacher instructs students Yes to set up the necessary tools on their own computers and, according to the blended learning approach model, students work on their own computers in the classroom and at home.
Laboratory exercises are performed in computer rooms, where the teacher shows prepared presentations as well as specific tools via a projector, while students follow the exercises using computers in the classroom.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical part	Yes	40.00	Written exam	Yes	60.00

Literature

NO..	Authors	Title	Publisher	Year

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
1	John L. Hennessy, David A. Patterson	Computer Architecture: A Quantative Approach, Sixth Edition	Morgan Kaufmann.	2017
2	Abraham Silberschatz, Peter Baer Galvin, GregGagne	Operating System Concepts	John Wiley & Sons, Inc.	2018
3	Dejan Simić, Павле Батавељић	Организација рачунара и оперативни системи	ФОН	2011
4	Douglas Comer	Essentials of Computer Architecture	Chapman and Hall CRC	2017
5	Linda Null	Essentials of Computer Organization and Architecture	Jones & Bartlett Publishers	2018
6	William Stallings	Operating Systems: Internals and Design Principles	Pearson Education Limited	2018
7	Dejan Simić	Материјал у електронском облику, презентација са часова Lectures	FON, Belgrade	2020

Teaching subject		Programming 1
Subjecst designation:	01.SI0002	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Tomić B. Bojan Ševarac V. Zoran Jovanović M. Jelena

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0001	Programming principles	Yes	Yes

Conditions:

1. Educational goal:

Mastering programming techniques and using the Java programming language.

2. Educational outcomes (acquired knowledge):

Students' proficiency to program at an intermediate level in the currently most important programming language when it comes to business applications, and Yes, they use appropriate software environments for programming.

3. Course content/structure:

Theoretical teaching
Review of basic concepts in programming using the Java programming language. Classes and objects. Methods and static methods. Constructors. Advanced work with objects. Arrays as objects. Advanced work with strings. Interfaces. Important packages, classes and interfaces from the Java API. Handling exceptions. Working with files. Collections of objects. Iterators. Java classes for working with the most important instruction structures. Reflection. Handling events. Graphical user interface 1. Graphical user interface 2.
Practical teaching
Introduction to using various software tools for developing Java programs. Creating programs that illustrate advanced work with objects. Review exercises 1. Creating programs that illustrate writing user classes. Creating programs that illustrate writing Java interfaces. Review exercises 2. Creating programs that illustrate working with exceptions. Create programs that illustrate working with files. Create programs that illustrate working with collections. Create programs that illustrate working with the most important instruction structures. Create programs that illustrate working with reflection. Review exercises 3. Create programs with a graphical user interface. Review exercises 4. Exam preparation 1. Exam preparation 2.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software tools. Exercises in computer laboratories, in small groups. Part of the exercises are performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Computer exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Томић, Ј. Јовановић, З. Шеварац, Д. Ђурић	Programming principles: a practical course with examples and solved problems in the Java programming language	FON, Belgrade	2018
2	H. Schildt	Java: A Beginner's Guide	McGraw-Hill Education, New York	2014
3	-	subject website with numerous links to solved examples		2020

Teaching subject		Marketing
Subjecst designation:	01.D00003	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Kostić-Stanković M. Milica Janičić R. Radmila

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

To introduce students to marketing concepts, factors that influence value creation, creating value for customers, ensuring availability and building value for customers, and communicating and promoting value. To introduce students to digital marketing, marketing management, and marketing in a global environment.

2. Educational outcomes (acquired knowledge):

Advanced academic and professional knowledge in the field of market analysis, segmentation, target market selection and value positioning. Problem solving in defining the product mix and determining the price of the product, defining the distribution and sales mix and developing marketing communication and promotion. Leading complex projects in the field of planning, organizing and controlling marketing activities. Analyzing the global environment and defining marketing strategy in the international market.

3. Course content/structure:

heoretical teaching
Conceptual aspects of marketing. Development of the marketing concept. Modern marketing concept. Marketing environment - linking supply and demand. Market as a development potential of marketing activities. Basic market factors in shaping the marketing offer. Structural types of markets. Target marketing. Analysis of the market environment. Relations between enterprises and the market. Marketing research system. Shaping value for customers. Product. Project price. Availability and value addition. Distribution mix and project. Communication and promotion of value. Marketing communication and promotion. Marketing communication instruments. Digital marketing. Marketing process in value creation. Marketing management. Marketing planning. Marketing organization. Control of marketing activities. Marketing in a global environment.

Practical teaching
Market analysis, application of external and internal analysis methods. Market segmentation, development of target segment profiles and product positioning. Development of a marketing research plan. Determination of product characteristics. Product life cycle. Methods for determining product pricing. Development of distribution and product strategies. Designing marketing communication activities. Analysis of various promotional campaigns. Marketing activities for example services. Development of a marketing plan. Development of digital marketing channels. Development of marketing tools for a selected international environment.

4. Teaching methods:

Lectures illustrated with multimedia aids, interactive discussion, work in small groups, solving and presenting practical examples, role play, independent student research and work through learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Colloquiums	Yes	25.00
Project development and presentation	Yes	25.00	Oral exam	Yes	40.00

Literature

NO..	Authors	Title	Publisher	Year
1	Костић-Станковић М, Филиповић В, Штављанин В	Маркетинг	FON, Belgrade	2017
2	Kotler, P. T., Keller, K. L.	Marketing Management (17th Edition)	London: Pearson Education Limited	2017

Teaching subject		Project management
Subjecst designation:	01.D00004	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Mihić M. Marko Bjelica Lj. Dragan Mitrović M. Zorica

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions:

1. Educational goal:

Acquiring scientific and professional knowledge in the theory and practice of project management necessary for successful application in the implementation of various projects and programs.
Familiarization with and mastering modern project management methods and techniques.

2. Educational outcomes (acquired knowledge):

Students' ability to practically apply professional knowledge in managing time, costs, resources, quality, risk, contracts and communications in the preparation and implementation of projects.

3. Course content/structure:

Theoretical teaching
The concept and types of projects, project life cycle. The concept of project management. Project management organization. Human resource management in the project. Contracting management. Project quality management. Project risk management. Project communication management. Project change management. Project implementation planning. Project implementation monitoring and control. Project implementation reporting system. Standard computer programs for project management. Project management. Project-oriented organization. Program management. Multi-project management. Agile project management.

Practical teaching
Structure diagrams – WBS and OBS. Structure diagrams – RACI matrix. Project Charter. Key event method. Gantt chart. Priority method. Analysis of the structure of the network diagram. Time analysis using the CPM method. Time analysis using the PERT method. Resource leveling method. Cost analysis. Realized value method. PRINCE 2 method. Overview of the Microsoft Project software package. PMI methodology

4. Teaching methods:

Auditory, illustrative-demonstrative, verbal-textual, practical work methods.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	20.00
Colloquiums	Yes	50.00	Oral exam	Yes	10.00
Seminars	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Јовановић П.	Управљање пројектима, 11.изYесње	Факултет за пројектни и иновациони менаџмент, Београд	2015
2	Kerzner Harold	Project Management – A System Approach to Planning, Scheduling, and Controling, Eleventh edition	John Whiley & Sons, Hoboken, New Jersey	2013

Teaching subject		Mathematics 3
Subjecst designation:	01.000027	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Stojanović A. Milica Mihić P. Olivera Boričić Joksimović B. Marija

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes

Conditions:

1. Educational goal:

Presentation and explanation of mathematical content related to the theory of ordinary differential equations and systems of differential equations with applications, as well as to elements of complex functions and the Laplace transform.

2. Educational outcomes (acquired knowledge):

Students will analyze and solve simple classes of differential equations and systems of differential equations. Students will apply the Laplace transform to solve systems of linear differential equations.

3. Course content/structure:

Theoretical teaching 1. The concept of a differential equation (DJ). Picard's theorem. 2. Methods of solving DJ of the first order. 3. DJ of the nth order. Reduction of the order of the equation. 4. Linear DJs of order n. 5. DJ systems. The concept of the first integral. 6. Systems of linear DJs. Fundamental matrix. 7. Systems of linear DJs with constant coefficients. 8. The concept of a partial DJ. 9. The concept of a function of a complex variable. Cauchy-Riemann Conditions. The concept of an analytic function. 10. Integral. Cauchy's theorem and Cauchy's formulas. Residue. 11. Application of the residue calculus. 12. Definition of the Laplace transform. 13. Inverse Laplace transform. Melin's formula. 14. Application of the Laplace transform to linear DJs and systems of linear DJs. 15. Selected chapters in mathematics.
Practical teaching 1.- 2. Some classes of DJs of the first order. 3. Linear DJs with constant coefficients. 4. Methods of constant variations for linear DJs. 5. DJ systems. 6. Systems of linear DJs with constant coefficients. 7. Methods of constant variations for systems of linear DJs. 8. Partial DJs of the first order. 9-10. Examples of functions of a complex variable. 11. Integral. 12. Residue calculus. 13. Laplace transform. 14. Inverse Laplace transform. 15. Application of the Laplace transform.

4. Teaching methods:

The classic way using a whiteboard and computer presentations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	25.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	М. Стојановић, Д. Ђорић, Р. Лазовић, О. Михић	Математика 3	ФОН	2015
2	Н. Николић, Р. Лазовић, Н. Младеновић, Д. Џамић	Математика 3, Збирка заYестака	ФОН	2014
3	Д. Ђорић	Математика 3 - решени примери	ФОН	2009

Teaching subject		Discrete mathematical structures
Subjecst designation:	01.000054	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Nikolić T. Nebojša

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes

Conditions:

1. Educational goal:

Introduction to and mastery of some standard content of discrete mathematics, such as elements of mathematical logic and graph theory, relational structures, finite automata and formal languages, which are intended for the profile of computer engineers.

2. Educational outcomes (acquired knowledge):

The content of this course equips students of information systems and technologies with a formalized method of reasoning, which is an essential foundation of computer science.

3. Course content/structure:

Theoretical teaching
1. Introductory concepts. 2. Propositional calculus. Propositional formula. 3. Conjunctive and disjunctive normal form. 4. Rules of inference in propositional calculus. Boolean algebras. 5. Predicate calculus. Predicate formula. 6. Truth value of a predicate formula. Rules of inference in predicate calculus. 7. Relational structures. Partially ordered set, chain and lattice. 8. Elements of graph theory. Directed and undirected graphs. 9. Trees. Applications of binary trees. 10. Finite machine and finite automaton. 11. Minimization and merging of automata. 12. Formal languages and grammars. 13. Language generated by a grammar. 14. Connection between finite automatons and grammars. 15. Turing machine.
Practical teaching:Exercises, Other forms of teaching, Research work
1. Properties of logical operations. 2. Elimination of some logical operations. Tautologies. 3. Disjunctive and conjunctive normal form. Properties of Boolean algebras. 4. Predicates. Properties of quantifiers.
5. Truth value of predicate formula. 6. Relations on finite and infinite sets.
7. Partially ordered set. Supremum. Infimum. Lattice. Hasse diagram. 8. Equivalence relations. Equivalence classes. 9. Graphs. Representation of graphs. 10. Euler and Hamilton paths in a graph. 11. Trees and their application in computing. 12. Finite automata. 13. Minimization of finite automata. 14. Regular grammars and their connection with finite automata. 15. Exam questions.

4. Teaching methods:

The classic method using a board, transparencies and computer presentations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	25.00	Oral exam	Yes	45.00
Seminars	Yes	5.00			

Literature

NO..	Authors	Title	Publisher	Year
1	М. Чангаловић, В. Тодорчевић, В. Балтић	Дискретне математичке структуре	FON, Belgrade	2019
2	В. Тодорчевић, В. Балтић, М. Чангаловић	Збирка заYестака из дискретних математичких структура	FON, Belgrade	2016
3	J.A. Anderson	Discrete Mathematics with Combinatorics	Pearson Education	2004
4	Д. Стевановић, В. Балтић, С. Симић, М. Ћирић	Дискретна математика - основе комбинаторике и теорије графова	ДМС, Београд	2008
5	Д. Цветковић, С. Симић	Дискретна математика	Либра, Београд	2000

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
6	K.H. Rosen	Discrete Mathematics and Its Applications, fourth edition	McGraw-Hill	1999

Teaching subject		Programming 2
Subjecst designation:	01.SI0003	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Devedžić B. Vladan Jovanović M. Jelena

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Mastering programming techniques and using programming languages that are in trend.

2. Educational outcomes (acquired knowledge):

Students' skills to program at an advanced level using programming languages whose popularity is growing and Yes, they use appropriate software environments for programming.

3. Course content/structure:

Theoretical teaching
Overview of basic and advanced concepts in programming using selected programming languages (e.g. Python, R, etc.; in this sense, the course content is adjusted to trends and market movements as needed). These selected programming languages are not permanent – the basic idea is to follow current programming trends and the popularity of individual programming languages, and the languages studied in this course change accordingly as needed. Work with programming libraries and appropriate programming environments dynamically follows the selected programming languages, their paradigms, their application focus, and their development.
Practical teaching
Introduction to the use of various software tools for program development using selected programming languages. Creation of programs that illustrate basic work using these languages. Review exercises 1. Creation of programs that illustrate advanced work using these languages. Review exercises 2. Create Yes applications using these languages. Review exercises 3. Exam preparation 1. Exam preparation 2.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software tools. Exercises in computer laboratories, in small groups. Part of the exercises is performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Computer exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	-	course website with numerous links to solved examples, websites of programming languages and corresponding programming libraries studied within this course		2020

Teaching subject		Human-computer interaction
Subjecst designation:	01.IT0005	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Minović V. Miroslav Milovanović M. Miloš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Understanding human-computer interaction from the user's perspective and understanding the user experience with special attention to the cognitive characteristics (and limitations) of the user. Training of Yes students to define user requirements in the domain of user-system interaction, perform analysis, design, implement and evaluate user interface elements.

2. Educational outcomes (acquired knowledge):

The student will be able to understand user characteristics, systematically and objectively evaluate system performance with respect to user experience, and create systems in which there is harmony between system characteristics and cognitive requirements (constraints) of the user..

3. Course content/structure:

Theoretical teaching
P-01: Introduction to the field of human-computer interaction. P-02: Man and his role in the interaction process. P-03: Computer and its components. P-04: Interaction models. P-05: User models in the design process. P-06: User requirements modeling. P-07: Physical and device models. P-08: Task analysis. Digital notation and design. P-09: System models. Implementation support. P-10: Evaluation techniques. P-11: Application areas. Groupware. CSCW. P-12: Multimodal communication. Speech. Natural user interfaces. P-13: Handwriting recognition. Computer vision. P-14: Pervasive computing. Virtual reality. Hypertext. P-15: Multimedia. WWW. Animation. Digital video. Computer-assisted learning.
Practical teaching
W-01: Examples of human-computer interaction. W-02: Devices for human-computer interaction. W-03: Principles of user interface. Examples of the WIMP paradigm. W-04: Methodology for user interface design. W-05: Examples and pitfalls. W-06: Cognitive system architectures. W-07: Help system design. W-08: Examples of decomposition (HTA). W-09: Examples of knowledge-based analysis (TAKD). W-10: Examples of entity-relationship model (ATOM) analysis. W-11: Examples of dialog design. W-12: Examples of multimodal communication. W-13: Examples of natural user interfaces. W-14: Examples of virtual reality. V-15: Examples of designing a WWW application with a focus on the user interface.

4. Teaching methods:

Lectures, exercises, practical work, consultations
Lectures are conducted according to the ex cathedra model, the teacher uses a mandatory prepared presentation that is shown in the classroom via a projector. The teacher uses a blackboard and a marker for individual teaching units as needed. Exercises are conducted in a regular classroom, with the teacher showing the prepared presentations as well as specific tools via a projector. The teacher uses a blackboard and a marker for individual assignments. The teacher instructs students to set up the necessary tools on their own computers and, according to the blended learning approach model, students work on their own computers in the classroom and at home. Practical work is conducted according to the model of defining a project assignment, forming project teams and then developing them by students, through regular consultations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical teaching	Yes	60.00	Written exam	Yes	40.00

Literature

NO..	Authors	Title	Publisher	Year
1	Dix, Finlay, Abowd, Beale	Human-Computer Interaction, Third Edition	Prentice Hall	2004
2	Jakob Nielsen	Usability Engineering	Morgan Kaufmann	1993
3	Shneiderman, Plaisant	Designing the User Interface	Addison Welsey	2010

Teaching subject	
Subjecst designation:	01.EP0002
Number of ECTS:	6

Client-side web technologies and scripting languages

Program(s) in which it is performed	IST - Information Systems and Technologies, Compulsory subject
UNO subjects	
Teachers:	Barać M. Dušan Despotović-Zrakić S. Marijana Vukimirović B. Dragan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The main goal of the course is to introduce students to the principles of web application design and development and to master the technologies for developing client-side web applications.

2. Educational outcomes (acquired knowledge):

Students mastered the knowledge and skills of designing and developing client-side web applications (front-end).

3. Course content/structure:

Theoretical teaching
Fundamentals of web programming. Key principles and concepts. Fundamentals of client-side web application development. Problems and challenges of the presentation, application and session layers of the reference OSI model. Modern web application architectures and the role of client technologies. HTML5. CSS3. Exchange of messages with different layers of a web application. XML technologies for storing, processing and visualizing presentation layer messages. JSON. JSON API. RESTful architectures. Scripting languages. Fundamentals of JavaScript. ES6. DOM. JS libraries. jQuery. AJAX. Development frameworks. MVC. AngularJS. ReactJS. VueJS. Application of development frameworks in application development. Two-way data binding, event management, message rendering, components, directives, working with DOM elements, Dependency Injection. Introduction to progressive web applications (PWA). Analysis of web browser features and support for advanced functionalities of current client technologies. Review of good practices in client-side web application development. Testing and securing client-side web applications. Introduction to architectures of complex e-business applications. Technical and organizational aspects of application, service and process integration. API. Introduction to web services. Comparative review of technologies for developing information systems in the Internet environment.

Practical teaching
Technologies for storing, processing and presenting presentation layer inputs. XML DOM. HTML5. CSS3. CSS preprocessors. Front-end frameworks and libraries Bootstrap. Foundation. Semantic. Introduction to scripting languages. Fundamentals of JavaScript language. Grammar and types. Control flow. Loops and iterations. Functions, expressions and operators. Text formatting. Regular expressions. IIFE and anonymous functions. Structures. Collections. Objects. Prototype inheritance. Modular pattern. JSON. JSON API. AJAX. Visualization. ChartJS. DataTables. JavaScript libraries. JQuery. Versioning like Yes. Git. JavaScript compilers and package management. JavaScript frameworks: Angular, VueJS, React.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	B.Frain	Responsive Web Design with HTML5 and CSS: Develop future-proof responsive websites using the latest HTML5 and CSS techniques, 3rd Edition	Packt Publishing	2020
2	M. Haverbeke	Eloquent JavaScript	No Starch Press	2018
3	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Klijentske veb tehnologije i skriptni jezici, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs	-	2021

Teaching subject		Programming languages for analytics
Subjecst designation:	01.IS0018	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Turajlić S. Nina Jovanović Z. Miloš Delibašić B. Boris

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring knowledge of modern programming languages suitable for data analysis and processing.

2. Educational outcomes (acquired knowledge):

Students have acquired the necessary knowledge to program basic list analysis processes.
Students apply appropriate list transformations and list analysis.
Students use list processing tools and techniques in an appropriate programming language.

3. Course content/structure:

Course content
Theoretical teaching
P-01. Introduction to programming languages used for analytics and their characteristics.
P-02. Control structures.
P-03. List structures for list analysis.
P-04. Accessing lists.
P-05. Higher-order functions.
P-06. Statistical and analytical functions.
P-07. Working with missing lists.
P-08. List cleaning.
P-09. List aggregation.
P-10. List visualization – for one attribute.
P-11. List visualization – for two or more attributes.
P-12. Working with text lists.
P-13. Collecting lists from the Internet (crawling).
P-14. Web services.
P-15. Analytics packages. Introduction to predictive analytics in a software environment.

Practical teaching
Exercises follow Lectures. In the exercises, students gain practical knowledge of the concepts and features of a selected language or set of languages through the design and writing of programs for data analysis and processing.

4. Teaching methods:

Lectures are implemented through a combination of classical teaching, case studies and guest Lectures by experts from practice. Exercises are implemented in the classical way by solving problems by writing programs in the appropriate programming language.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical work	Yes	50.00	Written exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Cady, F.	The Data Science Handbook	John Wiley & Sons	2017
2	José Unpingco	Python Programming for Data Analysis	Springer	2021
3	Sebesta R.W.	Concepts of Programming Languages, 12th Edition	Pearson	2019
4	Петровић М., Турајлић Н.	Материјали у е-форми са сајта is.fon.bg.ac.rs	ФОН	2019

КЊИГА ПРЕДМЕТА - Информациони системи и технологије

Teaching subject		Introduction to business analytics
Subjecst designation:	01.000049	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Jeremić M. Veljko Kuzmanović S. Marija Panić V. Biljana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to introduce students to the importance and role of analytics in business.

2. Educational outcomes (acquired knowledge):

After passing the exam, students will be able to:
1. Recognize situations in which data analysis is necessary, identify problems, create reports, make predictions and optimize in order to improve business;
2. Understand the role of business analytics methods and techniques in complex business systems;
3. Become familiar with tools that can be used in business analytics;
4. Think analytically and critically and work in a team.

3. Course content/structure:

Theoretical teaching: The concept and importance of business analytics. The evolution of business analytics. Business analysis and business analytics. The role of a business analyst and a business analyst. Scope of business analytics. Descriptive, diagnostic, predictive, prescriptive and cognitive analytics - concepts and examples of application. The place and role of business intelligence in business analytics. Aspects of business analytics: theoretical, methodological, managerial, information or information technology. Analytics tools - types, sources... Challenges in business analytics - major tools... . Tools for business analytics. Areas of application of business analytics - business analytics in marketing, finance, accounting, human resources, supply chains and the like. Ethics in business analytics.

Practical teaching (auditorium and laboratory exercises): Illustrative examples of business analytics applications. Business analytics in finance, accounting, human resources, supply chains. Introduction to business analytics tools. Application of MS Excel in business analytics – introduction to basic functions for systematization, analysis and visualization of inputs. Introduction to the possibilities of using MS Excel to solve optimization problems.

4. Teaching methods:

Lectures followed by appropriate presentations. Exercises based on illustrative and real examples, through interactive work with students in case study analysis. Practical exercises in the computer room.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Oral exam	Yes	30.00
Colloquiums	Yes	20.00			
Seminar paper	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Author group	Introduction to Business Analytics - Script	Faculty of organizational sciences	2020
2	Кузмановић, М., Николић, Д. М., & Савић, Г.	Business Analytics in Finance, Chapter 8 in Financial Management, Control, and Managerial Accounting	ФОН	2018
3	J. R. Evans	Business Analytics: Methods, Models and Decisions	Pearson	2017
4	-	Lectures materials		2020

Teaching subject	**Data structures and algorithms**
Subjecst designation: 01.IS0002	
Number of ECTS: 6	
Program(s) in which it is performed	IST - Information Systems and Technologies, Compulsory subject
UNO subjects	
Teachers:	Turajlić S. Nina Petrović V. Marko

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introducing students to the concept of incentive structures, their efficient implementation on a computer, and algorithms for manipulating them

2. Educational outcomes (acquired knowledge):

In solving practical problems, students will analyze, select, and successfully apply the instruction structures and algorithms that are most suitable for solving the problem.

3. Course content/structure:

Theoretical teaching
Abstractions in programming. The concept of array structures. Types of array structures. Linear structures. Stack, Queue, List. Definition via ATP. Linear structures. Implementation via arrays and dynamic structures. Optional types. Generic structures.
Analysis of algorithm efficiency. Searching linear structures: sequential, binary, exponential and interpolation search. Sorting algorithms: selection, replacement, insertion, Shell method, merge method and quick sort. Hybrid algorithms.
Functional types. Specialization of complex types (covariance and contravariance). Iterators. Asynchronous functions. Processing of array flows (stream processing). Introduction to reactive programming.
Trees. Basic terms. Trees. Binary trees Searching binary trees Searching multi-branch trees. B, B* and B+ trees. Searching by transforming key into address. Graphs and networks. Examples of algorithms over graphs. Structures and algorithms over strings.

Practical teaching
Implementation of procedural abstractions. Implementation of the index abstraction. Implementation of linear structures. Searching linear structures. Solving problems in the field of linear structures. Presentation of sorting algorithms. Implementation of trees. Solving problems in the field of trees. Exercises with tree transformations. Exercises with AVL trees. Exercises with B-trees. Implementation of search by transforming key into address. Graphs and networks.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Laboratory exercises based on illustrative and practical examples, through interactive work with students.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	50.00	Practical exam	Yes	40.00
			Oral exam	Yes	10.00

Literature

NO..	Authors	Title	Publisher	Year
1	С. Нешковић	Data structures, script	ФОН	2019
2	С. Нешковић, Д. Стојимировић	Collection of tasks from data structures and algorithms, scripts	ФОН	2019
3	Нешковић С., Стојимировић Д.	Slides from Lectures in e-form and source code for examples from the course page	ФОН	2020
4	Robert Sedgewick, Kevin Wayne	Algorithms, Fourth Editiony	Addison Wesley, ISBN-13 : 978-0321573513	2011

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	Thomas H. Cormenetal	Introduction to Algorithms, Third Edition	The MIT Press, ISBN: 978-0-262-03384-8	2009

Teaching subject		Databases
Subjecst designation:	01.IS0003	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Marjanović M. Zoran Aničić M. Nenad Babarogić S. Slađan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Gaining fundamental knowledge about databases and database management system

2. Educational outcomes (acquired knowledge):

Students will analyze directory requirements, design a directory database, review the architecture and components of the database, use query languages to access database directories, and build an application to update and display directory database directories..

3. Course content/structure:

Theoretical teaching
Introduction: Database management systems and database models. Object-relational model: Model concepts. Object-relational model: Limitations. Operations. Examples. Relational model. SQL: Structure. SQL: Limitations. SQL: Operations. NoSQL databases. Object-relational model. Active databases. XML as a database model. Functions of database management systems. Database design: System and user requirements analysis. Conceptual modeling. Database design: Relational normalization. Exam preparation.

Practical teaching
Database management systems and database models. Object-relational model: Formulation of simple models. Object-relational model: Formulation of complex models. Relational model: Relational algebra. Relational calculus. SQL: Structure. SQL: Limitations. SQL: Operations. SQL: Definitions. Object, object-relational, and active databases: Examples. XML as a database model. JSON. Application of NoSQL databases. Database design: System analysis and user requirements. Conceptual modeling. Database design: Relational normalization. Exam preparation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations and illustrative and real examples. Laboratory exercises based on illustrative and real examples, accompanied by appropriate electronic presentations through interactive work with students, as well as independent work of students.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	20.00	Written exam	Yes	65.00
Tests	Yes	15.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Лазаревић Б., Марјановић З., Аничић Н., Бабарогић С.	Databases	ФОН	2018
2	Ullman J., Widom J.	FirstCourseinDatabaseSystems, 3rdedition	Pearson	2014
3	Connolly T., Carolyn B.	Data base Systems: A Practical Approach to Design, Implementation, and Management, 6thedition	Pearson	2015
4	Elmasri, Ramez	Fundamentals of data base systems, 7th edition	Pearson	2017

Teaching subject		Cloud infrastructure and services
Subjecst designation:	01.EP0003	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Bogdanović M. Zorica Labus B. Aleksandra Vukimirović B. Dragan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of this course is to introduce students to the technical and organizational aspects of cloud computing, through the analysis of models, technical solutions, risks and security aspects of cloud technologies. In addition to resource virtualization services, special attention is paid to the concepts of application virtualization and cloud services for collecting, searching and processing large amounts of data in e-business (big data).

2. Educational outcomes (acquired knowledge):

Students are trained to design cloud infrastructure and implement e-business applications using cloud services.

3. Course content/structure:

Theoretical teaching
Introduction to cloud computing. The concept and concepts of resource virtualization. Application virtualization and separation of applications from IT infrastructure. Comparison of application virtualization and IT infrastructure virtualization. Types of hardware virtualization: full virtualization, hardware-assisted virtualization, paravirtualization, partial virtualization. Hypervisors. Processor virtualization: concepts and software. Network virtualization. Operating system virtualization. File system virtualization. Database virtualization. Cloud computing standards. Cloud infrastructure design. Private, public and hybrid cloud. Infrastructure as a service. Platform as a service. Software as a service. Introduction to microservice architectures. Docker as an infrastructure for e-business applications. Managing applications in Docker containers. Service orchestration, application deployment automation, scaling and management. Kubernetes. Continuous application delivery, Git. IT automation, Ansible. Cloud infrastructure management. Services of global cloud providers: AWS, Microsoft Azure, Google. Cloud services for collecting, searching, processing and using large amounts of data in e-business (big data). Security in the cloud environment. Risk management and specifics of designing e-business business processes on cloud infrastructure. Development of e-business applications in a cloud computing environment. Scaling applications in a cloud environment. Migration from traditional to cloud infrastructure. Examples of the use of cloud computing services in e-business of enterprises.
Practical teaching
Virtualization platforms: Virtualization in the Linux operating system. Qemu. KVM. Libvirt. Creating virtual machines. Managing virtual machine resources. Performance management. Backup of virtual machines. Cloning, snapshots and recovery from backups. Network virtualization in the Linux operating system. File system virtualization, Gluster. Database virtualization. Introduction to non-relational cloud databases. MongoDB. Application deployment and execution tools: Docker, Kubernetes. Automation of virtual machine and microservice deployment: Ansible tool. Introduction to frameworks for managing large amounts of data in the cloud: ApacheSpark. Cloud infrastructure management: VM-ware, MS Hiper-V, OVirt,OpenStack, OpenNebula. Amazon cloud services.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Раденковић, М. ДеспотовићЗракић, З. БогYесновић, Д. Бараћ, А. Лабус	Електронско пословање, поглавље 2. Инфраструктура електронског пословања, пп. 19-52	Faculty of Organizational Sciences, Belgrade	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Despotović-Zrakić, M., Milutinović, V., & Belić, A.	Handbook of Research on High Performance and Cloud Computing in Scientific Research and Education, chapters 1-7 (pp. 1-194).	Hershey, PA: IGI Global. doi:10.4018/978-1-4666-5784-7. ISBN: 978-1-4666-5784-7.	2014
3	J. Buelta	Hands-On Docker for Microservices with Python: Design, deploy, and operate a complex system with multiple microservices using Docker and Kubernetes	Packt Publishing	2019
4	A. Artasanchez	AWS for Solutions Architects: Design your cloud infrastructure by implementing DevOps, containers, and Amazon Web Services	Packt Publishing	2021
5	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Cloud infrastruktura i servisi, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021

Teaching subject		Basics of financial management
Subjecst designation:	01.D00006	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Benković S. Sladjana Milosavljević S. Miloš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Mastery of the concepts, models and principles of financial management and the ability to fully understand the importance and role of a financial manager.

2. Educational outcomes (acquired knowledge):

After completing the course, students are expected to possess advanced professional knowledge related to the theories, principles and processes of financial management, Yes solve complex investment and financing problems, and Yes analyze and evaluate the theory and practice of financial management.

3. Course content/structure:

Theoretical teaching
Introduction to financial management. Fundamentals of financial management systems in an enterprise. Institutional and economic environment. Fundamentals and principles of the functioning of financial markets. Fundamentals of financial planning and analysis. Fundamentals and principles of investment policy. Management of working capital of an enterprise. Fundamentals and principles of financing policy and dividend policy.
Practical teaching
Financial objectives of an enterprise. Introduction to operational financial operations. Enterprise as a participant in the financial market. Practice of financial planning. Analysis of financial statements. Fundamentals of investment project evaluation. Principles of cash flow analysis and financial planning. Tools for structuring sources of financing.

4. Teaching methods:

Teaching is conducted through Lectures, exercises and consultations. Students are actively involved in the teaching process through interactive discussions, exercises, homework assignments, case studies, and workshops.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Жаркић Јоксимовић Невенка, Слађана Бенковић, Милош Милосављевић	Финансијски менаџмент	Faculty of organizational sciences , Београд	2013
2	Бенковић Слађана	Оперативно финансијско пословање	Faculty of Organizational Sciences, Belgrade	2006
3	Brigham E.	Financial Management: Theory & Practice	Cengage Learning	2013

Teaching subject		Accounting
Subjecst designation:	01.D00005	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Kneževeić P. Snažana Dmitrović M. Veljko

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Mastering basic accounting concepts and categories in order to understand the movement of funds and sources of funds of a company, the occurrence and coverage of the realization of income and expenses, and the determination of financial results and cash flow.

2. Educational outcomes (acquired knowledge):

Ability to apply accounting concepts
Acquiring the skill of understanding business transactions of a company
Skill in preparing financial statements of a company

3. Course content/structure:

Theoretical teaching
The concept and content of accounting. Accounting information system in a modern environment. Approach to double-entry bookkeeping. Accounting records. Accounting coverage of acquisition of funds. Accounting coverage of costs and expensesYes. Accounting coverage of incomeYes. Pre-closing entries and book closing. Methods of calculating periodic results. Distribution of periodic results and loss coverage. Accounting management.

Practical teaching: Exercises, Other forms of teaching, study research work
Coverage of acquisition and investment of financial resources. Coverage of investments in materials, small inventory and packaging. Coverage of purchase of goods. Coverage of costs of materials, costs of small inventory and packaging and costs of wagesYes. Including the purchase value of goods sold. Including financial and other expenses. Accrual of expenses. Including income of a manufacturing and trading company. Accrual of income. Correction of the balance sheet. Developing active-passive accounts. Expenditure and sale of fixed assets. Preparation of the closing sheet. Preparation of financial statements. Application of Excel in accounting.

4. Teaching methods:

Teaching is conducted through Lectures, exercises and consultations. Students are actively involved in the teaching process through interactive discussions, exercises, homework assignments, case studies, and workshops.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Written exam	Yes	40.00
			Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Robert Libby, Patricia Libby and Frank Hodge	Ebook for Financial Accounting, 10th Edition		2020
2	Donald E. Kieso, Jerry J. Weygandt, Terry D. Warfield	Intermediate accounting	John Wiley & Sons, Inc	2019

Teaching subject		Financial management and accounting
Subjecst designation:	01.000055	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Benković S. Sladjana Dmitrović M. Veljko

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to enable students to acquire highly specialized advanced academic knowledge related to the theory and principles of financial management and accounting, and to enable them to comprehensively understand the financial decision-making process (investment and financial decisions) and accounting policies and procedures.

2. Educational outcomes (acquired knowledge):

After completing the course curriculum, the student will have advanced professional knowledge related to:
- Procedures and policies for recording financial transactions and creating financial statements, and critical consideration of the quality of the financial information thus obtained.
- Knowledge of the principles and processes of financial management, solving business problems related to investing and financing, recognizing the risks of the organization's operational financial operations, i.e. will be able to monitor and critically analyze financial operations based on information from financial statements предузећа.

3. Course content/structure:

Theoretical teaching
Financial function in an enterprise. Financial management system in an enterprise. Institutional and economic environment. Financial markets. Financial planning. Financial analysis. Investment policy. Risk and investment decisions. Working capital management. Liquidity management. Short-term financing. Long-term financing. Financing policy. Dividend policy.
Practical teaching: Exercises, Other forms of teaching, study research work
The concept and content of accounting. Accounting records. Accounting coverage of financial assets. Accounting coverage of costs and expensesYes. Accounting coverage of incomeYes. Pre-closing entries and book closing.

4. Teaching methods:

Teaching is conducted through Lectures, exercises and consultations. Students are actively involved in the teaching process through interactive discussions, exercises, homework assignments, case studies, and workshops.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Written exam	Yes	40.00
			Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Жаркић Јоксимовић Невенка, Слађана Бенковић, Милош Милосављевић	Финансијски менаџмент	Faculty of organizational sciences , Београд	2013
2	Жаркић Јоксимовић Невенка, Богојевић Арсић Весна, Вељко Дмитровић	Рачуноводство	Faculty of Organizational Sciences, Belgrade	2020
3	Жаркић Јоксимовић Невенка, Богојевић Арсић Весна, Бенковић Слађана, Шикањић Бранко	Збирка заYestака из рачуноводства	Faculty of Organizational Sciences, Belgrade	2010

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Giles S. Richard	Accounting& Finance, 4th edition	The Institute of Commercial Management, Macmillan Press, Ltd.	2020
5	McLaney Eddie, Atrill Peter	Accounting & Finance: An Introduction	Pearson	2020

КЊИГА ПРЕДМЕТА - Информациони системи и технологије

Teaching subject		Statistics
Subjecst designation:	01.Z00016	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Radojičić A. Zoran Jeremić M. Veljko Maričić M. Milica Milanović B. Nemanja

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introduction to basic statistical analysis methods and training in the application of these methods in solving practical problems.

2. Educational outcomes (acquired knowledge):

The contents of this course equip students to model and solve practical problems using statistical analysis methods.

3. Course content/structure:

Theoretical teaching
P01: Descriptive statistics. P02: Descriptive statistics (continued). P03: Statistical inference, population, sample. P04: Statistics and their distributions. P05: Evaluation theory, criteria for selecting grades. P06: Maximum likelihood method. P07: Confidence intervals. P08: Hypothesis testing, parametric tests. P09: Parametric tests (continued). P10: Analysis of variance. P11: Nonparametric tests. P12: Nonparametric tests (continued). P13: Regression models. P14: Least squares method. P15: Testing hypotheses about the parameters of a regression model.
Practical teaching
V01: Descriptive statistics. V02: Descriptive statistics (continued). V03: Statistical inference, population, sample. V04: Statistics and their distributions. V05: Rating theory, criteria for rating selection. V06: Maximum likelihood method. V07: Confidence intervals. V08: Hypothesis testing, parametric tests. V09: Parametric tests (continued). V10: Analysis of variance. V11: Nonparametric tests. V12: Nonparametric tests (continued). V13: Regression models. V14: Least squares method. V15: Hypothesis testing on the parameters of a regression model.

4. Teaching methods:

The classic way, using a blackboard and a computer.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	40.00	Oral exam	Yes	60.00

Literature

NO..	Authors	Title	Publisher	Year
1	Вуковић Н.,Булајић М.	Основе статистике	Faculty of Organizational Sciences, Belgrade	2014
2	Булајић, М., Вукмировић, Д., Радојичић, З., Јеремић, В., Ђоковић, А., Комарчевић, С., Доброта, М., Миленковић, Н., Маричић, М.	Збирка решених заYестака из Статистике	Faculty of Organizational Sciences, Belgrade	2017

Teaching subject	
Subjecst designation:	01.IS0004
Number of ECTS:	6

Languages and environments for IS development

Program(s) in which it is performed	IST - Information Systems and Technologies, Compulsory subject
UNO subjects	
Teachers:	Aničić M. Nenad Petrović V. Marko Babarogić S. Slađan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring fundamental knowledge regarding modern programming languages and software environments for the development of information systems, as well as practical knowledge related to their use and integration in the implementation of IS.

2. Educational outcomes (acquired knowledge):

Students will possess advanced professional knowledge related to critical thinking in problem analysis and the application of modern IS development environments.

3. Course content/structure:

Theoretical teaching
Trends in IS development. Overview of current programming languages and IS development environments. Traditional and SinglePageweb applications. Versioning as Yes. Basic Javascript concepts. DOM manipulation and events. Objects and functions. Asynchronous calls: Promises, async/await, AJAX. Client-side environments: React, Angular, Vue.js. Rest API and selected RPC approaches. Basics of Typescript. Server-side environments and languages: Node.JS, Java, PHP, .NET Core. Persistence mechanisms: Hibernate, JPA, Entity, Doctrine.

Practical teaching
Implementation of basic JavaScript concepts. HTML/CSS. Implementation of DOM manipulation and event handling. Implementation of objects and functions. Asynchronous calls: Promises, async/await, AJAX. Application of versioning as Yes. Practical work with client-side IS development environments: React, Angular, Vue.js. Rest API and selected RPC approaches. Fundamentals of Typescript language. Practical work with server-side environments and languages: Node.JS, Java, PHP, .NET Core. Application of persistence mechanisms: Hibernate, JPA, Entity, Doctrine.

4. Teaching methods:

Lectures are held with appropriate electronic presentations. Laboratory exercises are based on demonstrating different environments and programming languages with the application of knowledge when working on specific case studies.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	50.00	Written exam	Yes	40.00
			Oral exam	Yes	10.00

Literature

NO..	Authors	Title	Publisher	Year
1	Flanagan, D.	: The Definitive Guide: Master the World's Most-Used Programming Language	O'Reilly Media, 7th ed	2020
2	Simpson, K.	You Don't Know J sseries, 1st ed.	O'Reilly Media	2020
3	3. Аничић Н., Петровић М., Турајлић	Презентације у е-форми са сајта is.fon.bg.ac.rs	ФОН	2020

Teaching subject		Designing of information systems
Subjecst designation:	01.IS0005	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Aničić M. Nenad Marjanović M. Zoran Babarogić S. Slađan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Gaining knowledge about conventional and object-oriented models and approaches for the analysis and logical design of information systems.

2. Educational outcomes (acquired knowledge):

Students will analyze and specify user requirements, present conclusions, model databases and applications, using patterns and CASE tools.

3. Course content/structure:

Theoretical teaching
Introductory course. Development planning. Requirements analysis - functional analysis. Logical design of system structure and dynamics using MOV. Conventional models for analysis and logical design. SSA. MOV. Review of other conventional models. Object-oriented approach to logical modeling of IS. Requirements analysis - use cases. System sequence diagrams. Conceptual system model. Class diagrams. Patterns in IS modeling. Description of system dynamics. Logical design of the database. MDA. MDD. OCL. QVT. DDD. Transformation of conventional into a relational model. CASE tools. Meta-modeling. Review of methodologies and standards in IS development. Exam preparation.

Practical teaching
Analysis and design of IS. Functional decomposition. SSA-simple examples. SSA-complex examples, glossary of references. PMOV. IDEF1X, IE. Use cases. Class diagrams. Patterns in the analysis phase. Multi-tier application architecture. Sequence diagrams - simple examples. Sequence diagrams - complex examples. State transition diagrams. Final class diagram. Transformation of conceptual models. Exam preparation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real-life examples, through interactive work with students.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Written exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	Valacich, Joseph S., George, Joey F.	Modern systems analysis and design, 9th Edition	Pearson	2020
2	George, Joey F., Batra, Dinesh, Valacich, Joseph S., Hoffer, Jeffrey A.	Object-oriented systems analysis and design	Pearson Prentice Hall	2004
3	Larman C.	Applying UML and Patterns-An Introduction to Object-Oriented Analysis and Design, 3th ed.	Prentice Hall PTR	2004
4	Марјановић З., Аничић Н., Бабарогић С.	Материјали и скрипте са Lectures и вежби	ЛАБИС, ФОН	2020
5	Марјановић З., Аничић Н., Бабарогић С.	Prezentacije u e-formi sa sajta is.fon.bg.ac.rs		2020

Teaching subject		Operations Research 1
Subjecst designation:	01.000001	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Kuzmanović S. Marija Savić I. Gordana Martić M. Milan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes
2,	Z00006	Mathematics 2	Yes	Yes

Conditions:

1. Educational goal:

The goal of this course is to train students in mathematical modeling of business and organizational systems and solving practical linear programming problems by applying optimization methods and using modern software tools.

2. Educational outcomes (acquired knowledge):

After passing the exam, students will be able to:
1. understand the field of application of operations research,
2. recognize optimization problems, define and formulate appropriate mathematical models,
3. select and apply exact and approximate methods for solving optimization problems,
4. use software for solving optimization problems,
5. analyze results and create reports with recommendations understandable to decision makers.
6. think analytically and critically and work in a team.

3. Course content/structure:

Theoretical teaching: Introduction to operations research (OR) and mathematical programming: OR methodology, mathematical model, feasible solution, optimal solution, local and global optimum. Linear programming (LP) and its properties. Geometric interpretation of LP. General, symmetric, standard and canonical form of LP problems. Simplex method. Possible outcomes of the simplex method. Dual LP problem, its properties and application possibilities. Open and closed transportation problem (TP). Some special TP problems. Heuristic methods - basic concepts and approaches (local search, Genetic algorithms, Simulated hardening, Tabu search, etc.). Standard combinatorial optimization problems (assignment, knapsack, shortest path, spanning tree, traveling salesman, routing, etc.) and their solution by exact and approximate (heuristic) methods. Integer programming and solution methods (branch and bound method). Application of OI in business analytics.

Practical teaching (auditorium and laboratory exercises): Basic concepts of mathematical modeling. Modeling of standard problems in management (assortment optimization, nutrition problem, ...). Formation of some specific mathematical models of LP. Graphical method of solving LP problems. Simplex method - basic steps. Simplex method - more advanced techniques. Transportation problem: models and obtaining an initial solution. TP solution methods. Specific applications of TP in management. Modeling and solving the shortest path problem using the Jxtrine algorithm. Modeling and solving the spanning tree problem using the Prim algorithm. Modeling and solving the routing problem using the Clark-Wright algorithm. Modeling and solving the traveling salesman problem using the NNS algorithm. Optimization software (Excel Solver, Lingo). Solving a case study using software and creating reports.

4. Teaching methods:

Classical method (ex cathedra) with the use of a blackboard, computer, projector, solving short case studies and one hour of practical exercises per week in the computer room.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	5.00	Oral exam	Yes	40.00
Colloquiums	Yes	40.00			
Project assignment	Yes	15.00			

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
1	С. Крчевинац и др	Операциона истраживања 1	FON, Belgrade	2013
2	М. Мартић и др	Операциона истраживања 1 – збирка заYестака	FON, Belgrade	2013
3	М. Вујошевић	Линеарно програмирање	FON, Belgrade	2013
4	J.A. Lawrence, B.A. Pasternack	Applied Management Science	John Wiley & Sons Inc.	2002

Teaching subject		Computer networks and telecommunications
Subjecst designation:	01.IT0003	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Minović V. Miroslav Milovanović M. Miloš Milenković Ć. Ivan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal is to understand the functioning of computer networks and telecommunications systems, as well as to acquire practically applicable knowledge necessary for the design and implementation of distributed information systems.

2. Educational outcomes (acquired knowledge):

Students will gain the basic knowledge necessary to understand computer networks and skills that they can apply to programming network applications for the Internet and local computer networks.

3. Course content/structure:

Theoretical teaching
P-01: Computer networks and the Internet. P-02: Application layer. Application layer protocols. Web and HTTP. P-03: Application layer. File transfer protocol: FTP. E-mail on the Internet. DNS - Directory service on the Internet. P-04: Application layer. P2P. Socket programming using TCP. Socket programming using UDP. Building a simple Web server. P-05: Transport layer. Transport layer services. Multiplexing and demultiplexing. Connectionless message transfer: UDP. P-06: Transport layer. Packet-based message transfer. P-07: Transport layer. Connection-oriented message transfer: TCP. Principles of congestion management. Congestion management in TCP. P-08: Network layer. Network service model. Virtual circuit. Yestagram network. P-09: Network layer. Router. Internet protocol. Routing algorithms. P-10: Network layer. Routing on the Internet. Broadcast and multicast routing. P-11: Data link layer. Data link layer services. Error detection and correction techniques. P-12: Data link layer. Multiple access protocols. Data link layer addressing. P-13: Data link layer. Ethernet. Hub, bridge and switch. P-14: Data link layer. PPP protocol. ATM network. P-15: Data link layer. MPLS.
Practical teaching
V-01: Internet protocol layers. Overview of protocols by layer. V-02: Network protocols. Working with tools for listening to network traffic. Wireshark. Traffic analysis of frequently used application layer protocols. V-03: Network application architectures. Client-server. P2P. Sockets. Transport layer services. V-04: SMTP. Telnet. Putty. Analysis of the SMTP protocol. V-05: Wireshark. Transport layer protocol traffic analysis. V-06: Wireshark. Network layer protocol traffic analysis. V-07: Wireshark. Data link layer protocol traffic analysis. V-08: Development of a simple network application. Using sockets to use TCP and UDP protocol services. V-09: Development of a chat application. Definition and implementation of a communication protocol. V-10: Computer network administration. Hardware and network devices. V-011: Computer network administration. Basic configuration of network devices. V-012: Computer network administration. IP addresses. Principles of IP address assignment. V-013: Computer network administration. Routing protocols. Routing protocol configuration. V-014: REST paradigm. Basic concepts. V-015: REST service development.

4. Teaching methods:

Lectures, exercises, lab. exercises, Practical work. Lectures are conducted according to the ex cathedra model, the teacher uses a mandatory prepared presentation that is shown in the classroom via a projector. The teacher uses a blackboard and a marker for individual teaching units as needed. Exercises are conducted in a regular classroom, where the teacher shows prepared presentations as well as specific tools via a projector. The teacher uses a blackboard and a marker for individual tasks. The teacher instructs students Yes to set up the necessary tools on their own computers and, according to the blended learning approach model, students work on their own computers in the classroom and at home. Laboratory exercises are conducted in computer labs, where the teacher shows prepared presentations as well as specific tools via a projector, while students follow the exercises using computers in the classroom. Practical work takes place according to the model of defining a project proposal, forming project teams and then developing them by students, through regular consultations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	20.00	Written exam	Yes	50.00
Project development	Yes	30.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Kurose, Ross	Umrežavanje računara: Od vrha ka dnu	CET, Beograd	2018

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Dušan Starčević i saradnici	Računarske mreže i telekomunikacije – praktikum	FON, Beograd	2013
3	White Curt M.	Data communications and computer networks: a business user's approach	Thomson cop. Bosto	2007

Teaching subject		Software design
Subjecst designation:	01.SI0004	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Vlajić S. Siniša Milić Ž. Miloš Savić S. Dušan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Gaining knowledge of basic principles, strategies and methodologies for software design. Reviewing principles and techniques for designing user interfaces, application logic and databases. Adopting one of the software design methodologies using architecture and design patterns. Getting to know and using advanced concepts of modern object-oriented programming languages (Java or C#).

2. Educational outcomes (acquired knowledge):

Students' competences: a) design software in accordance with modern software development methodologies b) implement software systems using modern object-oriented programming languages (Java or C#).

3. Course content/structure:

Theoretical teaching
Software design basics. Design context in the software development life cycle (Uniform software development process, Larman's software development method,...). Software design strategies and methods. Architecture design. User interface design. Application logic design. Database design. Algorithm design. Architecture and design patterns. Notations and tools in software design. Implementation technologies. Working with students on the logical structure of the seminar paper.

Practical teaching: Exercises
Working environments for writing programs. Concurrent programming – Threads. Networking – sockets. Calling of the used methods (RMI). Protection. Working with the database. Connecting the GUI to the database over the network. Reflection. JAXP and JAXB XML technologies. Procedure for writing seminar papers with examples.

4. Teaching methods:

The professor will theoretically explain each of the thematic units discussed and, through practical examples, will explain their application in the development of software systems. The assistants will elaborate on the thematic units that the professor has presented through laboratory exercises. For each thematic unit, the assistants will prepare specific examples that they will show and explain to the students in the computing center. Students should independently do the exercises, which will be prepared by the assistants, from most of the thematic units discussed.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminars	Yes	30.00	Computer exam	Yes	30.00
			Oral exam	Yes	40.00

Literature

NO..	Authors	Title	Publisher	Year
1	Синиша Влајић, Душан Савић,Војислав Станојевић, Илија Антовић, Милош Милић	Пројектовање софтвера – напредне Јава технологије	Златни пресек, https://www.researchgate.net/publication/303858129_Projektovanje_softvera_-_Napredne_Java_tehnologije_Software_design_-_Advanced_Java_Technologies , Београд	2008

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Синиша Влајић, Ћирић Видојко и Душан Савић	Пројектовање програма (Практикум – програмски језик JABA)	http://silab.fon.bg.ac.rs/wp-content/uploads/2016/05/OsnovniKonceptiJave-ProjektovanjeSoftvera.pdf Београд	2003
3	IvarJacobson, GradyBooch, JamesRumbaugh	The Unified Software Development Process	Rational Software Corporation, Addison-Wesley	1999
4	Craig Larman	Applying UML and Patterns	PrenticeHall, New Jersy	1998
5	Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides	Design patterns	Addison : Wesley	1999
6	Cay S. Horstmann, Gary Cornell	Core JAVA 2, Volume II – Advanced Features	Sun Microsystem Press, California, USA	2000
7	Синиша Влајић	Пројектовање софтвера, књига у припреми	https://www.researchgate.net/publication/303858135_Projektovanje_softvera_-_skripta ФОН	2022

Teaching subject		Systems theory
Subjecst designation:	01.US0001	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Dragović T. Ivana Poledica M. Ana Milošević D. Pavle

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to introduce students to the fundamental concepts, methods and techniques required for modeling and controlling various systems, as well as to introduce them to new trends in the development of intelligent control systems..

2. Educational outcomes (acquired knowledge):

Students are trained to:
Yes understand the modeling process;
Yes apply methods and techniques for modeling and managing systems;
for qualitative and quantitative analysis of system models;
for program implementation in an appropriate software package.

3. Course content/structure:

Theoretical teaching
System, system model, state, input and output. Introduction to system modeling, types of systems and applications in various fields. Signal representation, types of signals. Continuous and discrete signals, discretization. Signal analysis, characteristic signals, filters and applications in text, image, speech, video processing, etc. Dynamics of time-continuous and discrete systems. Input-output model of the system (black box model). System analysis in the time and frequency domain. System response, transfer function and transfer function algebra. State properties and model in state space. Model translation, analog model and block diagram. System model properties, linearity and stationarity. System model linearization. System model properties, controllability and discretion. Concept and types of system stability. Systems with and without feedback. Learning models. Computational intelligence techniques and intelligent control systems. Applications in various domains.

Practical teaching
Solving practical problems in the above areas and program implementation in the appropriate software package (MATLAB).

4. Teaching methods:

The course is designed as a combination of traditional and electronic learning. Lectures, laboratory exercises, on-site education, case studies, consultations, mentoring.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Written exam	Yes	40.00
Colloquiums	Yes	20.00	Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Петровић, Б., Поледица, А., Драговић, И., Ракићевић, А., & Милошевић, П.,	Управљање системима Практикум у MATLAB-у.	Београд: ФОН	2021
2	Петровић, Б. Ј.	Теорија система	Београд: ФОН	1998
3	Chen, C.-T.	Linear System Theory and Design	Oxford: Oxford University Press	1998
4	Gajic Z., & Lelic, M.	Modern Control Systems Engineering	Upper Saddle River: Prentice-Hall	1996

Teaching subject		Advanced Java technologies
Subjecst designation:	01.SI0006	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Antović D. Ilija Milić Ž. Miloš Savić S. Dušan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None

1. Educational goal:

Gain knowledge of advanced Java technologies used in web application development. Create Java web applications using various Java technologies (frameworks and libraries).

2. Educational outcomes (acquired knowledge):

Training students to independently design and implement robust and modular Java web applications using various software technologies.

3. Course content/structure:

Theoretical teaching
Introduction. Defining basic terms. Java technologies for web application development. Servlets. Java Server Pages. Standard tag libraries. Web application architectures. Frameworks for web application development. Technologies for accessing data stores. Object-relational mapping. Transaction management and caching. Middle-tier design. Integration frameworks. Web user interface. Frameworks for developing web user interfaces. Fundamentals of Java web application security.
Practical teaching
Development of Java web applications using Servlet and JSP technologies. Application of standard tag libraries in developing user interfaces in Java. Creating your own tag library. Application of boostrap and javascript libraries. Application of Model View Controller in developing Java web applications (Spring MVC). Application of Inversion of control/ Dependency injection in developing Java web applications. Java technologies for accessing data stores (ORM, JPA, Spring ORM, Spring JDBC, Spring Data). Designing the middle tier of a Java web application (Spring framework/EJB). Designing the user interface (JSP, JSTL, Spring tags, designing your own tags). Frameworks for developing user interfaces (Angular/React/…). Authentication and authorization. Tools for versioning software components. Tools for versioning relational databases (Liquibase, Flyway). Tools for automating software development.

4. Teaching methods:

• The professor will theoretically explain each of the considered thematic units and through practical examples will explain their application in the development of complex software systems.
• The assistants will elaborate the thematic units that the professor has presented through laboratory exercises. For each thematic unit, the assistants will prepare specific examples that they will show and explain to the students in the computing center.
• Students should Yes independently do the tasks, which will be prepared by the assistants, from most of the considered thematic units.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project/Seminar paper	Yes	30.00	Written exam	Yes	40.00
			Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Joel Murach, Michael Urban	Java Servlets and JSP, 3rd edition	Mike Murach& Associates	2014
2	Iuliana Cosmina, Rob Harrop, Chris Schaefer, Clarence Ho , Pro Spring 5	An In-Depth Guide to the Spring Framework and Its Tools, 5th Edition	Apress	2017
3	Craig Walls	Spring in Action, Fifth Edition	Manning Publication	2018
4	Dinesh Rajput	Spring 5 Design Patterns	Packt Publishing	2017

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	Синиша Влајић, Душан Савић,Војислав Станојевић, Илија Антовић, Милош Милић	Пројектовање софтвера – напредне Јава технологије	Златни пресек, https://www.researchgate.net/publication/303858129_Projektovanje_softvera_-_Napredne_Java_tehnologije_Software_design_-_Advanced_Java_Technologies , Београд	2008
6	Синиша Влајић, Ћирић Видојко и Душан Савић	Пројектовање програма (Практикум – програмски језик JABA)	http://silab.fon.bg.ac.rs/wp-content/uploads/2016/05/OsnovniKonceptiJave-ProjektovanjeSoftvera.pdf , Београд	2003

Teaching subject		Computer systems protection
Subjecst designation:	01.IT0004	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Simić B. Dejan Jovanović D. Bojan Bogićević Sretenović S. Marija

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Students will be introduced to the basic concepts of protecting applications and computer systems. Describing security threats, vulnerabilities, risk assessment, attacks, as well as computer system protection techniques using specific examples. Training students to assess risks and apply appropriate protection techniques and methods, primarily in the Internet environment, working with tools for detecting vulnerabilities in modern systems and applying preventive protection.

2. Educational outcomes (acquired knowledge):

Students will acquire the necessary basic knowledge and skills in the field of email protection, information systems, web applications and computer systems using concrete examples.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to the protection of YesYes and computer systems. P-02: Security threats, vulnerabilities, risk assessment and attacks. P-03: Analysis of attack methodologies and protection models. P-04: Introduction to cryptography and principles of various symmetric algorithms (DES, TripleDES, AES). P-05: Asymmetric cryptographic algorithms (RSA, Diffie-Hellman) and hash functions (SHA-1, SHA-256, SHA-384, SHA-512). P-06: Digital signature and digital certificates. P-07: PKI systems. P-08: Email protection. P-09: Access control mechanisms. P-10: VPN protocols and their application. P-11: Computer network protection. P-12: Network barriers. P-13: Web application protection. P-14: Protection of electronic payment systems. P-15: Review of previous lessons and preparation for the exam.
Practical teaching
Exercises, Other forms of teaching, Study research work P-01: Basic concepts in the protection of emails and computer systems. P-02: Examples of attacks on computer systems and methods of social engineering. P-03: Risk management methods. P-04: Examples of the application of symmetric cryptographic algorithms. P-05 Examples of the application of asymmetric cryptographic algorithms. P-06: Examples of the application of hash functions, digital certificates and digital signatures. P-07: Examples of the application of PKI systems. P-08: Examples of the use of protected e-mail. P-09: Kerberos. P-10: Examples of the application of VPN technology. P-11: Authentication methods in computer networks. V-12: Application of network barriers. V-13: Examples of web application protection. V-14: Examples of application of protection in electronic payment systems. V-15: Review of completed exercises and preparation for the exam.

4. Teaching methods:

Lectures, exercises, Practical work, consultations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical part	Yes	70.00	Written exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	William Stallings	Network Security Essentials: Applications and Standards, 6th edition	Pearson	2017
2	William Stallings	LawrieBrown,Computer Security – Principles and Practice, Fourth edition	Pearson Education Limited	2018
3	Paul C. Van Oorschot	Computer Security and the Internet: Tools and Jewels	Springer	2020
4	William Stallings	Cryptography and Network Security – Principles and Practices, Seventh edition	Pearson	2017
5	Dejan Simić	Материјал у електронском облику, слајдови са часова Lectures	ФОН	2020

Teaching subject		Operations Research 2
Subjecst designation:	01.000007	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Makajić-Nikolić D. Dragana Panić V. Biljana Stanojević J. Milan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00010	Probability theory	Yes	Yes

Conditions:

1. Educational goal:

The goal of this course is to train students to model business and organizational systems and solve practical problems under conditions of uncertainty by applying optimization and other quantitative methods using modern software tools.

2. Educational outcomes (acquired knowledge):

After passing the exam, students will be able to Yes
1. recognize, model and solve problems under conditions of uncertainty,
2. use network planning techniques to manage project time, costs and resources and to control project implementation,
3. use software for planning and project management and software for analyzing and solving stochastic problems,
4. analyze results and create reports with recommendations understandable to decision makers,
5. think analytically and critically and work in a team.

3. Course content/structure:

Theoretical teaching: Decision-making and optimization under conditions of uncertainty – basic concepts. Project planning and management – basic concepts and phases. Network planning – structure analysis. Network planning – deterministic and stochastic time analysis (CPM and PERT). Network planning – cost analysis (PERT-costs and LP). Network planning – resource leveling. Multi-stage decision-making – basic concepts. Dynamic programming – recurrent relations. Modeling and solving multi-stage processes by dynamic programming. Modeling stochastic processes – exponential distribution, Markov models. Analysis of systems with waiting lines. Reliability optimization. Classical inventory management models. Stochastic inventory management models. Game theory – basic concepts and types of games. Modeling and solving games.

Practical teaching (auditorium and laboratory exercises): Project structure analysis (AOA and AON types of network diagram). Project duration analysis with deterministic activity duration (CPM). Project duration analysis with stochastic activity duration (PERT). Project duration reduction using the PERT-cost method. Modeling and solving the problem of optimal equipment replacement and resource allocation using dynamic programming. Modeling stochastic processes using the Markov model. Determining the performance of a system with queues. Solving the nonlinear classical inventory management model and its extensions. Modeling and solving the deterministic and stochastic model of the newspaper production problem. Modeling strategic interactions and determining equilibrium. Project management software (MS Project). Solving case studies using the software and creating reports.

4. Teaching methods:

Classical method (ex cathedra) using a blackboard, computer, projector, solving short case studies and solving project problems in teams using a solver for solving mathematical models

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	5.00	Oral exam	Yes	40.00
Colloquiums	Yes	40.00			
Project assignment	Yes	15.00			

Literature

NO..	Authors	Title	Publisher	Year

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
1	С. Крчевинац и др	Операциона истраживања 2	FON, Belgrade	2013
2	М. Мартић и др	Операциона истраживања 2 – збирка заYестака	FON, Belgrade	2013
3	J.A. Lawrence, B.A. Pasternack	Applied Management Science	John Wiley & Sons Inc.	2002
4	М. Вујошевић	Методе оптимизације у инжењерском менаџменту	FON, Belgrade	2012

Teaching subject		Programming languages
Subjecst designation:	01.IS0006	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Turajlić S. Nina Petrović V. Marko

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Within this course, students acquire the necessary theoretical and practical knowledge about the fundamental concepts of modern programming languages. In addition, students also gain elementary knowledge of programming interpreters.

2. Educational outcomes (acquired knowledge):

The acquired knowledge about the concepts and characteristics of modern programming languages enables students to choose appropriate languages and their application in the design and development of software applications.

3. Course content/structure:

Theoretical teaching
Introduction to programming languages. Syntax, semantics and implementation of programming languages. Lexical and syntactic analysis. Language implementation: implementation methods. Abstractions in programming languages. Base abstractions. Structural abstractions. Procedural abstractions. Initialization abstractions. Overview and analysis of language paradigms. Fundamental concepts of object-oriented programming languages. Fundamental concepts of functional and logical programming languages.
Practical teaching
Exercises follow Lectures. In the exercises, students gain practical knowledge about the concepts and characteristics of different language paradigms through designing and writing programs in a selected set of languages.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. In laboratory exercises, students gain practical knowledge about the concepts and characteristics of different language paradigms through designing and writing programs in a selected set of languages.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	45.00	Exam	Yes	45.00
Practical work	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Вучковић М.	ФунYesментални концепти програмски језика	Lectures у е-форми, са сајта предмета	2020
2	Вучковић М., Петровић М., Турајлић Н.	Практикум из програмских језика	у е-форми са сајта предмета	2020
3	Sebesta R.W.	Concepts of Programming Languages, 12th Edition	Pearson	2019

Teaching subject		Server-side web technologies
Subjecst designation:	01.EP0004	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Labus B. Aleksandra

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The main goal of the course is to introduce students to the principles of web application design and development with a focus on server technologies, as well as practical mastery of back-end development technologies.

2. Educational outcomes (acquired knowledge):

Students acquire knowledge and skills related to the design and development of server-side web applications and services.

3. Course content/structure:

Theoretical teaching
Fundamentals of server-side web application development. Key principles and concepts of application development in a distributed environment. The role of server technologies in modern web system architectures. Exchange of messages with different layers of a web application. RESTful architectures. Web services. Connectors and adapters. API development. API management platforms. Comparative review of server-side technologies: PHP, Python, ASP, Java, JavaScript, NodeJS. Development frameworks. Application of development frameworks in application development and review of current solutions. Routing management. ORM. Storage and transfer of messages in a web environment. Comparative analysis of concepts and current solutions for managing relational and non-relational message databases. Server-side XML extensions of standard message databases. XML enabled message databases. Native XML databases. Hybrid XML databases. XML technologies. XPATH. XQUERY. DOM and XML document manipulation. JSON format for message serialization. Service-oriented architecture. Web services. SOAP. REST. Process-oriented software development. Events and processes. Process coordination and synchronization. Application servers. Session management and caching. Server-side optimization of web applications. Fundamentals of web application security.
Practical teaching
Introduction to server-side web technologies and scripting languages. PHP. Basic syntax, variables, operators, flow control and iteration, functions and built-in functions. PHP advanced functions for handling cookies. PHP advanced functions for managing sessions. Using sessions on the example of forms and web applications. Object-oriented programming in PHP. Implementation of the message layer. PHP and working with message databases. MySQL and CRUD operations in PHP. Storing and transferring emails in a web environment. Document-oriented email models. NoSQL and MongoDB. Storing dynamic emails. Asynchronous server calls and real-time email updates. PHP, AJAX and MySQL. Safety and security in PHP applications. XML technologies. Server-side XML extensions of standard email databases. XPATH. XQUERY. DOM and manipulation of XML documents. JSON format for email serialization. Manipulation of JSON documents. Web services. Development and documentation of your own REST service. Public web services. Application web servers. Implementation of business logic. Web application development. PHP application development with MVC architecture. Web application development frameworks: Symfony, Laravel,NodeJS.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	F. Adel	Architecture of complex web applications: With examples in Laravel(PHP)	independently published	2019
2	Despotović-Zrakić, M., Milutinović, V., & Belić, A.	Handbook of Research on High Performance and Cloud Computing in Scientific Research and Education	Hershey, PA: IGI Global. doi:10.4018/978-1-4666-5784-7. ISBN: 978-1-4666-5784-7	2014

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Serverke veb tehnologije, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021

Teaching subject		Analysis and logical design of IS (project)
Subjecst designation:	01.IS0007	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Aničić M. Nenad Babarogić S. Slađan Bjeladinović Lj. Srđa

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

During this course, students will learn to analyze and logically design information systems, using appropriate conventional and object-oriented methods and models.

2. Educational outcomes (acquired knowledge):

Students will be able to independently analyze and classify user requirements, model databases and applications, using patterns and CASE tools, through work in a project group.

3. Course content/structure:

Acceptance of project topics. First level of SSA. SSA - final decomposition. SSA introductory vocabulary. PMOV - proposal. PMOV - final version. Translation of PMOV into a relational model. IDEF1X. Conceptual class diagram. Use case diagram. Detailed use case specification. Sequence diagrams. Final class diagram. Joint project review.

4. Teaching methods:

Students, divided into groups of 3 to 5 students, jointly apply the acquired knowledge on a selected and approved topic. Each group has its own mentor (professor, assistant professor, teaching assistant or associate professor) who, every week, in a predetermined time period for the student (1 hour), controls and helps in correcting the results of the analysis and logical design of the IS of the specific domain of the group.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Project defense	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Valacich, Joseph S., George, Joey F.	Modern systems analysis and design, 9th ed.	Pearson	2020
2	George, Joey F., Batra, Dinesh, Valacich, Joseph S., Hoffer, Jeffrey A.	Object-oriented systems analysis and design	Pearson Prentice Hall	2007
3	Larman C.	Applying UML and Patterns-An Introduction to Object-Oriented Analysis and Design, 3th ed.	Prentice Hall PTR	2012
4	Аничић Н., Бабарогић С., Бјеладиновић С.	Материјали и скрипте са Lectures и вежби, ЛАБИС	ФОН	2000
5	Аничић Н., Бабарогић С., Бјеладиновић С.	Презентације у е-форми са сајта is.fon.bg.ac.rs	ФОН	2019

Teaching subject		ETL and warehouses
Subjecst designation:	01.IS0019	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Luković S. Ivan Petrović V. Marko

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Within this course, students acquire basic theoretical and practical knowledge about data warehouses and data extraction, transformation, and loading (ETL) processes.

2. Educational outcomes (acquired knowledge):

The acquired knowledge about the concepts and characteristics of data warehouses enables students to use, design, and develop data warehouses and ETL processes.

3. Course content/structure:

Theoretical teaching
Basic concepts. Data warehouses in the context of business intelligence. Components of the logical architecture of the data warehouse. Characteristics of the data warehouse. Reference architectures of the data warehouse system. Physical architecture of the data warehouse. Data warehouse structure models. Data traceability. Data preprocessing. Data integration. Data exchange. ETL processes. Modern approaches to data warehouse development. Data processing in data warehouses.
Practical teaching
Exercises follow Lectures. In the exercises, students gain practical knowledge about the concepts and characteristics of the data warehouse and the processes of data extraction, transformation and filling.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real-life examples, through interactive work with students.
After that, students work independently on a selected and approved topic.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Inmon, W. H.	Building the Data Warehouse. Fourth Edition.	John Wiley & Sons	2005
2	Kimball, R., & Ross, M.	The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling. Third Edition.	John Wiley & Sons.	2013
3	Сукновић М., Делибашић Б.	Пословна интелигенција и системи за подршку одлучивању	Faculty of organizational sciences, Универзитета у Београду	2010

Teaching subject		Numerical analysis
Subjecst designation:	01.000056	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Boričić Joksimović B. Marija

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes

Conditions:

1. Educational goal:

Mastering numerical methods used to solve problems in mathematical analysis, linear algebra, and practical problems. Understanding comparative methods for solving numerical problems in the context of the advantages and disadvantages of the method.

2. Educational outcomes (acquired knowledge):

Students will be trained in the application of numerical methods and their software implementation.

3. Course content/structure:

Theoretical teaching Absolute and relative error of an approximate number. Errors of approximate values of a function. Inverse problem of error estimation. Numerical solution of nonlinear equations. Fixed point theorems. Vector and matrix norms. Simple iteration method for solving systems of linear algebraic equations. Jacobi method. Gauss–Seidel method. Solving systems of nonlinear equations. Interpolation. Error estimation of polynomial interpolation. Newton's second interpolation polynomial for equidistant nodes. Inverse interpolation. Approximation of functions. Numerical differentiation. Numerical integration. Rectangle methods. Trapezoid methods. Simpson's method. Numerical solution of ordinary differential equations. Picard's method. Euler's method. Runge–Kut methods.
Practical teaching Implementation of numerical methods in MATLAB and use of well-known software packages.

4. Teaching methods:

Classic method and Beamer presentation. In addition to theoretical and practical classes, there is one more class per week, which can be classified as other classes, during which students test numerical methods in a numerical methods software package.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	30.00
Practical teaching	Yes	40.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Раде П. Лазовић	НУМЕРИЧКЕ МЕТОДЕ	FON, Belgrade	2013
2	Раде П. Лазовић	Нумеричка анализа, преглед теорије, примери, заYесци	FON, Belgrade	2009
3	C. F. Gerald, P. O. Wheatley	Applied Numerical Analysis	California Polytechnic State University	2004
4	Ђурица С. Јованов	Нумеричка анализа, теорија, алгоритми, примери	FON, Belgrade	2005

Teaching subject		Linear statistical models
Subjecst designation:	01.000047	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Radojičić A. Zoran Đoković M. Aleksandar Milanović B. Nemanja

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introduction to the methods of multivariate statistical analysis and how to apply the appropriate method in solving problems in practice. Analysis of inputs is discussed, with an emphasis on the preparation and interpretation of model transformation results, model evaluation methods, algorithms and program packages for multivariate statistical analysis.

2. Educational outcomes (acquired knowledge):

Training in conducting statistical research and applying modern statistical methods to various areas of life and work. Application and use of the statistical package SPSS.

3. Course content/structure:

Theoretical teachingP01: Generalized matrix and solving systems of linear equations. P02: Multidimensional normal distribution. P03: Principal component analysis. P04: Testing and selection of principal components. P05: Interpretation of principal components and analysis in the SPSS package. P06: Factor analysis. P07: Factor rotation. Orthogonal and non-orthogonal rotation methods. P08: Factor scores and methods of their calculation and application in the SPSS package. P09: Cluster analysis. P10: Hierarchical clustering methods. P11: Non-hierarchical clustering methods and cluster analysis in the SPSS package. P12: Discriminant analysis. P13: Problems of applying multivariate analysis. P14: SPSS: Application and use of statistical packages in the analysis of data from the point of view of multivariate analysis. P15: Practical examples and case studies in the field of multivariate statistical analysis.
Practical teaching: V01: Elements of matrix algebra. V02: Types of items and measurement scales. V03: Parameters and estimates of multivariate distributions. V04: Multivariate normal distribution. V05: Mean tests. V06: Linear combinations of variables. V07: Using SPSS packages. V08: Practical application of principal component analysis in SPSS. V09: Practical application of factor analysis in SPSS. V10: Practical application of cluster analysis in SPSS. V11: Practical application of quick cluster analysis in SPSS. V12: Practical application of discriminant analysis in SPSS. V13: Solving problems in the field of multivariate analysis. V14: Discussion of various case studies. V15: Workshop - Practical work.

4. Teaching methods:

The classic way, using a blackboard and a computer. Practical teaching within the computer center and working on computers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	25.00
Colloquiums	Yes	20.00	Oral exam	Yes	25.00
Practical teaching	Yes	5.00			
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Ковачић З.	Мултиваријациона анализа, 3. изYесње	Економски факултет	2010
2	Булајић М, Јеремић В., Радојичић З.	Advance in Multivariate Data Analysis – Contributions to Multivariate Data Analysis	ФОН	2012
3	Pallant J.	SPSS: priručnik za preživljavanje, prevod 4. izdanja	Mirkoknjiga	2011
4	Радојичић З.	Линеарни статистички модели, скрипта	ФОН	2013

Teaching subject		Artificial intelligence
Subjecst designation:	01.SI0005	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Devedžić B. Vladan Tomić B. Bojan Ševarac V. Zoran

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Introduction to the concepts, methodologies and techniques of artificial intelligence.

2. Educational outcomes (acquired knowledge):

Students will gain an overview of artificial intelligence methodologies and techniques, insight into the areas it encompasses, as well as practical applications of artificial intelligence. All of this enables deepening of knowledge in specialized courses related to individual areas of artificial intelligence..

3. Course content/structure:

Theoretical teaching
Introduction. The concept of intelligence. The concept of an intelligent agent. The concept of an intelligent system. Intelligent search techniques. Knowledge representation techniques. Intelligent reasoning techniques. Techniques for representing uncertain knowledge and intelligent reasoning with such knowledge. Learning techniques. Perception, communication (vision, speech, natural language understanding) and performing actions. Robotics. Typical applications of artificial intelligence.
Practical teaching
Work in computer laboratories. Implementation of programs (in a selected programming language) that illustrate all the important concepts introduced in the lectures. Use of selected software tools and program libraries related to artificial intelligence and the development of intelligent systems

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software tools. Exercises in computer laboratories, in small groups. Part of the exercises are performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Computer exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	Russell, S. J., Norvig, P., & Davis, E.	Artificial intelligence: a modern approach. 3rd ed.	Upper Saddle River, Nj: Prentice Hall.	2020
2	Poole, D.L., Mackworth, A.K.	Python code for Artificial Intelligence: Foundations of Computational Agents		2019

Teaching subject		Optimization methods
Subjecst designation:	01.D00007	
Number of ECTS:	6	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Stanojević J. Milan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	000001	Operations Research 1	Yes	Yes

Conditions:

1. Educational goal:

Yes students apply optimization methods to decision-making processes in some characteristic areas: supply chain management (at the strategic and tactical levels), determining the topologies of computer, telecommunication and road networks, decision-making with the presence of multiple criteria, decision-making under conditions of uncertain and incomplete information. Using optimization software.

2. Educational outcomes (acquired knowledge):

After passing the exam, students will be able to: recognize some specific but very common optimization problems, define and formulate appropriate mathematical models, select and apply exact or approximate algorithms to solve these problems, use advanced software to solve them, and analyze and critically present the results to decision makers.

3. Course content/structure:

Theoretical teaching: Optimization on networks - characteristic problems: optimization of roads with different types of criteria (length, capacity and road reliability), determination of routes on road networks, determination of flow in networks. Location problems: Location problems: discrete location problems; continuous location problems; location-allocation problems; location on networks. Multi-criteria optimization: basic concepts; methods for determining efficient solutions (a priori approach); methods for determining the set of efficient solutions (a posteriori approach). Decision-making under conditions of incomplete and incomplete inputs (stochastic and fuzzy programming). Heuristic methods and metaheuristics. Application of optimization in the science of locations.

Practical teaching (auditorium and laboratory exercises): Solving optimization problems in the areas covered in theoretical teaching using known methods: by direct application of the method ("manually") and using commercial and open source software.

4. Teaching methods:

Classical method (ex cathedra) with the use of a blackboard, computer, projector, solving case studies and at least one hour of practical exercises per week in the computer lab.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Written exam	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	М. Вујошевић, М. Станојевић, Н. Младеновић	Методе оптимизације – мрежни, локацијски и вишекритеријумски модели	Друштво операционих истраживача, Београд	1996
2	Д. Цветковић и др.	Комбинаторна оптимизација	Друштво операционих истраживача, Београд	1997
3	М. Вујошевић	Методе оптимизације у инжењерском менаџменту	FON, Belgrade	2012
4	R. Fourer, D.M. Gay, B.W. Kernighan	AMPL: A Modeling Language for Mathematical Programming	Duxbury Press / Brooks /Cole Publishing Company	2002
5	A. Makhorin	Modeling Language GNU MathProg Language Reference	Free Software Foundation	2013

Teaching subject		Modeling of business processes
Subjecst designation:	01.IS0011	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Aničić M. Nenad Petrović V. Marko

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Understanding and using the theoretical foundations and practical knowledge necessary for modeling business processes and learning the basic techniques for their effective automation.

2. Educational outcomes (acquired knowledge):

Students will be able to Yes analyze, identify and describe business processes using appropriate formal methods, and then Yes use modern software systems Yes define how to automate them.

3. Course content/structure:

Theoretical teaching
The concept of business processes (BP). Organizational systems modeling. Theoretical foundations of BP modeling. Petri nets, State transition diagrams, Object life cycles. UML Activity diagram. BPMN standard: process, collaboration, choreography and conversation diagrams. Fundamentals of business process modeling methodology. Business process analysis. Hierarchical decomposition. Business process specification. Other standards in business process modeling. Specification of flexible and loosely structured business processes - CMMN standard language. Specification of business decisions and rules - DMN standard language.
Process-based information systems. Business process management systems. Methods of implementing business processes.

Practical teaching
Examples of BP. Relationship to other management disciplines. Petri nets and UML State transition diagram. UML Activity Diagram. Examples in PP modeling. Business process analysis. PP specification. Examples of BPMN PP models: process, collaboration, choreography and conversation diagrams. Examples of CMMN and DMN models. Use of software tools for specification and automation systems. Example of PP implementation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real examples, through interactive work with students. Case studies of business process implementation.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	40.00	Written exam	Yes	50.00
Written exam	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Michael Havey	Essential Business Process Modeling, ISBN: 978-0596008437	O'Reilly Media	2005
2	Jakob Freund, Bernd Rucker	Real-Life BPMN, 4th Edition	Independently published,, ISBN-13: 978-1086302097	2019
3	OMG	Business ProcessModelAnd Notation	OMG	2014
4	OMG	Case Management ModelandNotation	OMG	2016
5	OMG	DecisionModeland Notation	OMG	2021

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
6	С. Нешковић, Н. Аничић, Д. Стојимировић	Слајдови caLectures у електронској форми	ФОН	2020
7	Bruce Silver	Bpmn Method and Style, 2nd Edition, with Bpmn Implementer's Guide: A Structured Approach for Business Process Modeling and Implementation Using Bpmn 2.0, 9/17/11 Edition	Cody-Cassidy Press, ISBN: 978-0982368114	2011
8	Bruce Silver	DMN Method and Style: A Business Pracitioner's Guide to Decision Modeling, 2nd Edition	Cody-Cassidy Press, ISBN-13 : 978-0982368176	2018

Teaching subject		Internet technologies
Subjecst designation:	01.EP0005	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Despotović-Zrakić S. Marijana Barać M. Dušan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the course is to introduce students to and gain practical experience in working with Internet technologies, architectures, and development models for complex, distributed, and scalable e-business applications.

2. Educational outcomes (acquired knowledge):

Students acquired knowledge and mastered skills in the field of Internet technologies and their application in the design and implementation of distributed and scalable e-business applications.

3. Course content/structure:

Reference models and standards of computer networks: OSI, TCP/IP, IPv4, IPv6. Network, transport and application layer services. Collaboration and communication services, VoIP, video conferencing. Identity management services. Internet as an infrastructure for secure transmission and delivery of information. Digital certificates and public key infrastructure. Software development and troubleshooting in the application layer of the TCP/IP model. XML technologies for storing, processing and visualizing presentation layer messages. CSS, AJAX, JSON. Reliability, scalability, redundancy and distribution of software in the Internet environment. Approaches to software development in the Internet environment:
1) Event-based software development. Internal and external, synchronous and asynchronous events. Message as a notification mechanism. Message exchange according to the request-response model. Message channels. Communication from one to many services, sending messages to a channel. Subscription to a channel and processing received messages. Coordination and synchronization over messages. Moving messages from a message base to message streams. Apache Kafka.
2) Service-oriented software development. Service properties. Stateless and stateful services. Service types: RPC, SOAP, XML web services, REST. Load distribution (sharding). Proxy and reverse proxy, caching and replication. Microservices and microservice architecture. Managing messages in a microservice architecture. Isolated persistence and consistency of messages. Local transactions and microservice states. CAP theorem. Sequences of local transactions, SAGA. Microservice deployment, Docker. Continuous delivery and automatic updating of microservices. GIT, GIT tag-initiated delivery.
3) Process-oriented software development. Business process modeling, BPML. Choreography and orchestration, BPEL. Decision-making in distributed transactions: distributed (choreography) and centralized (orchestration). Implicit and explicit orchestration. Environments for applications based on process-oriented software: application servers.
Practical teaching
Internet technologies and methods of developing information systems in the Internet environment. Development of MVC applications. Storage and transmission of messages in the presentation layer: XML, JSON, AJAX. Implementation of business logic, PHP. Implementation of the message layer: MySQL, MongoDB. Service-oriented architecture. Web services. REST. Development of event-driven applications: graphical user interface, server application or multiplayer computer game, in a protected software environment (Python, PHP-FPM, NodeJS, JavaScript). Implementation of a set of microservices for a single business process (PHP, Javascript) and deployment in a production environment (Docker).

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Раденковић, М. ДеспотовићЗракић, З. БогYesновић, Д. Барађ, А. Лабус	Електронско пословање, поглавље 2: Инфраструктура електронског послвања, пп.19-52	ISBN 978-86-7680-304-0; Faculty of Organizational Sciences, Belgrade	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Despotović-Zrakić, M., Milutinović, V., & Belić, A.	Handbook of Research on High Performance and Cloud Computing in Scientific Research and Education	Hershey, PA: IGI Global	2014
3	Б.Раденковић, М.Деспотовић-Зракић, З.БогYесновић, Д.Бараћ, А.Лабус, Ж.Бојовић	Интернет интелигетних уређаја, део 1. Теоријске основе интернета интелигентних уређаја	ISBN:978-86-7680-304-0; тираж 500, одобрени универзитетски уџбеник, FON, Belgrade	2017
4	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Internet tehnologije, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs	-	2021
5	Martin, R.C	Clean architecture: a craftsman's guide to software structure and design	Prentice Hall	2017

Teaching subject	**The law and ethics of data processing**
Subjecst designation: 01.000057	
Number of ECTS: 5	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject
UNO subjects	
Teachers:	Krivokapić B. Đorđe Miladinović M. Slobodan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Training students with acquired knowledge in the field of law and ethics to successfully, legally and ethically manage data processing and be able to apply technical and organizational measures to control potential risks and threats that may arise as a result of modern data processing technologies.

2. Educational outcomes (acquired knowledge):

Improved knowledge, abilities and skills of students regarding technical, ethical and legal aspects of data processing. Identification, understanding and elimination of legal and ethical risks during the development and implementation of information systems and technologies.

3. Course content/structure:

Theoretical teaching
1. Legal and institutional framework and sources of law, Regulatory forces, Regulation of technology, information systems and data processing
2. Data economy, data as a new currency – socio-economic and technological foundations of the fourth industrial revolution
3. Ownership of data, Copyright, Legal protection of data collections
4. Protection of personal data, GDPR, Privacy, Personal data, Data processing of personal data, Actors in the process of processing personal data, Controller and Processor, Trustee – obligations and responsibilities
5. Principles of processing personal data, Legal basis for processing personal data, Citizens' rights in relation to the processing of personal data, Person for the protection of personal data, Export and import of personal data – cross-border business
6. Mapping of flows data in the organization, Personal data protection impact assessment
7. Organizational measures: records of processing operations, harmonization of processes, organizational structure and regulatory acts; Technical measures: Security of personal data, Privacy by Design and Privacy by Default, pseudo-anonymization, cryptographic protection
8. Protection of personal data in the field of artificial intelligence: profiling and automatic processing
9. Damage to reputation on the Internet, Management of reputation systems, Legal risks of applying ranking systems
10. Access to information of public importance and the right to use public sector information, Open records, Open records portal, Right to open records
11. Legal framework of information security, Processing of records in critical infrastructure systems, Obligations to report incidents
12. Contractual transfer and exchange of records
13. Ethical challenges of record processing and machine learning
14. Protection against discrimination in the application of artificial intelligence
15. Ensuring the responsible development of artificial intelligence in accordance with international ethical standards
Practical teaching: Exercises, Case studies
Вежбе прате наставне јединице предвиђене преYesвањима кроз решавање Case study и укључују стицање практичних знања попут: претраживање базе правних прописа „Параграф“, претраживање јавних база поYestака попут: Агенције за привредне регистре, ЗавоYes за интелектуалну својину и других.

4. Teaching methods:

Classic Lectures. Conversational method, demonstrative method. Exercises in the computer laboratory through solving case studies, learning through collaborative work on solving practical problems, independent research by students and solving problems based on the received proposals, consultations in the development of a project proposal and independent work by students through learning and development of a project proposal. Exercises are carried out through the e-learning application MOODLE.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Oral exam	Yes	30.00
Practical teaching	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Кривокапић Ђ., и други	Водич кроз отворене поYestке	УНДП Србија	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Кривокапић Д., AYesмовић А., Тасић Д., Петровски А., Кривокапић Ђ.	Водич кроз Закон о заштити поYestака о личности и ГДПР: Тумачење новог правног оквира	Мисија ОЕБС у Србији и SHARE ФонYeзција, Нови Сад, Србија	2019
3	КривокапићЂ., Кривокапић Д.	Утицај ГДПР-а на ИТ сектор у Србији, Зборник радова научно-стручног скупа Информатика 2018: Нови трендови у развоју информационих система	FON, Belgrade	2018
4	Кривокапић Д., Кривокапић Ђ. и други	Водич кроз ГДПРи заштиту поYestака о личности: Моји поYesци, моја права	SHARE ФонYeзција, Нови Сад, Србија	2018
5	Ризмал И., Радуновић В., Кривокапић Ђ.	Водич кроз информациону безбедност у Републици Србији	Мисија ОЕБС-а у Србији и ЦЕАС	2017
6	Тодоровић И., Комазец С, Кривокапић Ђ., Кривокапић Д	Project Management in the Implementation of General Data Protection Regulation (GDPR)	European Project Management Journal, Volume 8, Issue 1	2018
7	Кривокапић Д., Кривокапић Ђ., Комазец С., Тодоровић И.	Impact of GDPR on Business: Focus on Data Controllers and Processors not Established within the EU		2018
8	Кривокапић Д., Кривокапић Ђ., Комазец С., Тодоровић И., Петровски А., Ерцеговић К.	Водич за органе власти - заштита поYestака о личности	SHARE ФонYeзција, Нови Сад, Србија	2016
9	Кривокапић Ђ., Комазец С, Тодоровић И, Кривокапић Д	Mapping Personal Data Flow and Regulatory Compliance in Serbian Public Institutions	Management - Journal of Sustainable Business and Management Solutions in Emerging Economies, Univerzitet u Beogradu, Fakultet organizacionih nauka	2016
10	Кривокапић Ђ., AYesмовић Ј	Impact of General Data Protection Regulation on Children's Rights in Digital Environment	Универзитет у Београду, Правни факултет	2016
11	Кривокапић Ђ.	Сукоб закона и надлежности који произлази из повреде репутације путем Интернета		2016

Teaching subject		Environmental risk management
Subjecst designation:	01.000059	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Petrović B. Nataša Makajić-Nikolić D. Dragana

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Providing knowledge in the field of ecology and environmental risk management, highlighting their importance due to the growing concern of individuals, businesses, governments and societies regarding the state of the environment and guiding them towards the best ways of managing and relating to the environment.

2. Educational outcomes (acquired knowledge):

Application of qualitative and quantitative approaches in characterizing risks to the environment and human health. Analysis of key areas of uncertainty in predicting environmental risks. Assessment of environmental risk and public health risks. Application of principles and methods of risk assessment and environmental risk. Practical application of risk methods in making business decisions under conditions of business and environmental uncertainty.

3. Course content/structure:

Theoretical teaching
Definition of risk, elements of risk, management under conditions of uncertainty and risk. Fundamentals of environmental risk management. Environmental problems. Global environmental problems/ecological crises. Sustainable development. Reducing environmental risks through the application of environmental design/ecological design. Identification of environmental risks. Hazard analysis. Methods and techniques for assessing environmental risks: fault tree analysis, FMEA and E-FMEA, HAZOP, Event tree. Environmental risks in industry. Global warming/climate change: implications for risk management. Global sustainable science. Sustainable risk management techniques. Growth of environmental and social responsibility.
Practical teaching
Exercises are carried out in accordance with the theoretical teaching plan, with emphasis on a more detailed introduction to existing standards and the use of available software tools for solving theoretical and practical examples.

4. Teaching methods:

Lectures, Auditory exercises, case analysis from practice, laboratory exercises in classrooms with computers, project/seminar papers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	30.00
Practical teaching	Yes	10.00			
Seminars	Yes	50.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Ericson II, C. A.	Hazard analysis techniques for system safety, 2nd Edition	Wiley	2015
2	Hallenbeck, W. H.	Quantitative Risk Assessment for Environmental and Occupational Health.	CRC Press	2018
3	Laboy-Nieves, E. N, Goosen, M. F. A., & Emmanuel, E.	Environmental and Human Health: Risk Management in Developing Countries	CRC Press, New York	2010
4	Makajic-Nikolic, D., Petrovic, N., Cirovic, M., Vujosevic, M., & Presburger-Ulnikovic, V.	The model of risk assessment of greywater discharges from the Danube River ships	Journal of Risk Research, 19(4), 496-514	2016
5	Paolo, R.	Environmental and Health Risk Assessment and Management: Principles and Practices	Springer	2006

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
6	Makajić-Nikolić D. Disaster Risk Reduction. In: Leal Filho W., Azeiteiro U., Azul A., Brandli L., Özuyar P., Wall T. (eds)	Climate Action. Encyclopedia of the UN Sustainable Development Goals	Springer, Cham, 2020. doi: 10.1007/978-3-319-71063-1_65-1	2020

Teaching subject		Algorithm theories elements
Subjecst designation:	01.000058	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Stojanović A. Milica Nikolić T. Nebojša

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes

Conditions:

1. Educational goal:

Presentation of the basic elements of algorithm theory and the principles of creating algorithms for solving problems in various fields (graph theory, algebra, geometry, the field of sequences and sets) as well as complexity analysis.

2. Educational outcomes (acquired knowledge):

Students will explore strategies for constructing and analyzing algorithms and recognize NP-complete problems.

3. Course content/structure:

Theoretical teaching 1. Introductory concepts and examples of algorithms. 2. Construction of algorithms using mathematical induction. 3. Analysis of algorithms. 4. Checking correctness. 5. Time and space complexity of algorithms. Polynomial algorithms. 6. Deterministic and non-deterministic Turing machines. 7. P and NP classes of problems. 8. Algorithms on graphs: tours and shortest paths. 9. Hamiltonian contours and transport networks. 10. Geometric algorithms: polygon problems. 11. Problems of coloring areas and planes 12. Algebraic algorithms: problems with polynomials. 13. Algorithms for sorting and comparing strings. 14. Compression of the inputs

Practical teaching:Exercises, Other forms of teaching, Study research work
Independent creation and implementation of algorithms in the area of study in the course. Conducting complexity analysis of different algorithms.

4. Teaching methods:

Mentoring or the classic way.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	15.00	Written exam	Yes	25.00
Seminars	Yes	35.00	Oral exam	Yes	25.00

Literature

NO..	Authors	Title	Publisher	Year
1	М. Живковић	Алгоритми	Математички факултет, Београд	2000
2	A.A. Markov, N.M. Nagorny	The Theory of Algorithms	Springer	2010
3	З. Огњановић, Н. Крцавац	Увод у теоријско рачунарство	FON, Belgrade	2004

Teaching subject		Decision theory
Subjecst designation:	01.000009	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Suknović M. Milija Delibašić B. Boris Obradović B. Zoran

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Students are able to:
• independently apply multi-criteria decision-making methods in solving business problems of the organization.
• independently model the risk of quantitative criteria.
• model the utility of decision makers according to various criteria.
• use advanced academic knowledge for quantitative modeling of the group decision-making process.
• model decision-making rules obtained from experts and learn them from scratch.

2. Educational outcomes (acquired knowledge):

Students possess advanced academic and professional knowledge in the field of multi-criteria decision-making. Students independently apply multi-criteria decision-making methods in solving business problems of the organization. They independently analyze, evaluate and model the risk of quantitative criteria. They model the utility of the decision-maker according to various criteria. They quantitatively model the decision-making process of a group. They apply decision-making rules obtained from experts and Yes learn them from scratch using algorithms. They use methods, techniques, tools and software for modeling decision-making problems. Students demonstrate a positive attitude towards the application of quantitative methods and decision-making models within the organization.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to decision making,
P-02: Multi-attribute decision making methods and evaluation of obtained solutions with case studies,
P-03: IKOR method with case studies,
P-04: Utility theory and utility analysis with case studies,
P-05: AHP method with case studies,
P-06: Promethee methods with case studies,
P-07: Combining decision making methods in decision support systems,
P-08: Risk analysis,
P-09: Decision analysis,
P-10: Application of expert rules in decision models – DEX method,
P-11: Learning decision models from scratch – Decision trees algorithm ID3,
P-12: Group decision making,
P-13: Computational Social Decision Making Choice),
P-14: Combining Decision Methods in Decision Support Systems,
P-15: Exam Preparation.
Practical teaching
V-01: Refreshing necessary knowledge,
V-02: Basic methods of multi-attribute decision-making,
V-03: MethodYes IKOR and set of compromise solutions,
V-04: Utility in decision-making,
V-05: MethodYes AHP,
V-06: MethodYes Promethee,
V-07: Review exercises,
V-08: Risk analysis in the methodYesma multi-attribute decision-making,
V-09: Decision analysis in the methodYesma multi-attribute decision-making,
V-10: Application of expert rules in decision-making models – DEX methodYes,
V-11: Learning decision-making models from scratch – Decision trees algorithm ID3,
V-12: Group decision-making and resource allocation models,
V-13: Methods for decision-making in society,
V-14: Review exercises,
W-15: Exam preparation.

4. Teaching methods:

Lectures are implemented through a combination of classical teaching, case studies and guest lectures by experts from practice. Exercises are implemented in the classical way through solving problems, but also through the presentation of software tools for decision-

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Сукновић М., Делибашић Б., Јовановић М., Вукићевић М., Радовановић С.	Одлучивање	ФОН	2021
2	Сукновић М, Делибашић Б, Јовановић М, Вукићевић М, Радовановић С.	Одлучивање - практикум	ФОН	2019
3	Сукновић, М., Делибашић, Б., Јовановић, М., Вукићевић, М.	Презентације и материјали са сајта:http://odlucivanje.fon.bg.ac.rs/predmeti/osnovne-studije/teorija-odlucivanja/	ФОН	2021
4	Ishizaka A, Nemery P	Multi-Criteria Decision Analysis: Methods and Software	Wiley	2013

Teaching subject		Organizational design
Subjecst designation:	01.000010	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Čudanov J. Mladen Jevtić N. Miloš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to train and equip students to design organizations through acquiring knowledge about the basic elements and models of organizations, typical and contemporary models of organizational structure, dimensions and factors of organizational structure and the process of designing organizational structures, as well as to develop appropriate skills in the application of practical methods of organization design.

2. Educational outcomes (acquired knowledge):

Acquiring advanced academic and professional knowledge in the field of organizational systems design and developing skills for finding appropriate solutions for the successful functioning of organizational systems operating in a modern environment. Applying theoretical organizational models in solving practical problems in the process of designing organizational systems. Training students to design and improve organizational structure, business processes, as well as various systems in the organization (reward systems, employment, promotion, development, etc.). Independent management of organizational development projects and improvement of organizational systems.

3. Course content/structure:

Theoretical teaching
Fundamentals of organizational design. Elements of organization. Organizational models. Organizational structure – definition. Dimensions of organizational structure – division of labor, departmentalization, decentralization, coordination, formalization. Design procedure and factors of organizational structure construction. Process approach to organizational design. Organizational structure models. Network models of organizational structure. Transaction costs Outsourcing. Human factor in organization and organizational culture.

Practical teaching:Exercises, Other forms of teaching, Study research work
Methods of collecting and analyzing data. Division of labor – specialization. Coordination in organization. Departmentalization and grouping of activities. Decentralization and decision-making in organization. Rules for drawing organizational charts. Process approach to organizational design. Basic determinants of the enterprise – vision, mission, goals. Modern models of organizational structure. Control centers. Simulation of business processes on selected case studies. Methods of researching organizational culture.

4. Teaching methods:

Monologue method, demonstrative method, case study, learning through collaborative work on solving practical problems, independent research by students and problem solving based on the obtained points.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	30.00	Oral exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	Јашко, О., ЧуУеснов, М., Јевтић, М. & Кривокапић, Ј.	Организациони дизајн: приступи, методе и модели	Belgrade, Serbia: Faculty of Organizational Sciences	2017
2	Јашко, О., ЧуУеснов, М., Јевтић, М. & Кривокапић, Ј.	Пројектовање организације	Belgrade, Serbia: Faculty of Organizational Sciences	2013
3	Дулановић, Ж. & Јашко, О.	Организациона структура и промене	Belgrade, Serbia: Faculty of Organizational Sciences	2007

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Mintzberg, H.	The Structuring of Organizations	UpperSaddleRiver, NewJersey, USA: Prentince-Hall, Inc.	1979
5	Kates, A. & Galbraith, J.R.	Designing Your Organization	SanFrancisco, USA: Jossey-Bass	2007
6	Recardo, R. J.	Organizational Design: A Practical Methodology and Toolkit	Amherst, Massachusetts, USA: HRD Press, Inc.	2015

Teaching subject		Corporate communications
Subjecst designation:	01.000020	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Kostić-Stanković M. Milica Cicvarić Kostić M. Slavica Vlastelica L. Tamara

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	D00003	Marketing	Yes	Yes

Conditions:

1. Educational goal:

The aim of the course is to introduce students to the concept, goals, activities and instruments of corporate communications and to train students to analyze the effectiveness of corporate communications instruments, as well as to develop competencies for planning, organizing and evaluating internal and external corporate communications, through interactive lectures, simulations, case studies and workshops.

2. Educational outcomes (acquired knowledge):

Students distinguish the function, goals and instruments of marketing and corporate communications and possess academic and professional knowledge for planning the above processes. They are able to Yes apply research results in defining a corporate communications strategy. They have the necessary knowledge to develop a corporate communications plan and individual plans for functional areas of corporate communications. Students know Yes analyze the specificities of traditional and digital media and assess their effectiveness in corporate communications. They are trained to develop a corporate communications budget and apply models for measuring and evaluating the effects of a corporate communications campaign. Students have developed skills in effective media performance and writing for the media. They understand the social responsibility of corporate communications and know Yes apply ethical standards in internal and external communication.

3. Course content/structure:

Theoretical teaching
The emergence and development of corporate communications as a management function. Defining and characteristics of the concept of corporate communications. The relationship between corporate and marketing communications. The role of corporate communications in the organization. Corporate communications as a process. Goals and objectives of corporate communications. Ethics and social responsibility of corporate communications. Corporate communications in the international environment. Activities and instruments of corporate communications. Building corporate identity, image and reputation. Internal communication. Media relations. Digital media in corporate communications. Organization of special events. Sponsorship. Lobbying. Production of promotional and informational materials. Investor relations. Corporate communications in crisis situations. The process of planning corporate communications. Planning a corporate communications campaign. Organizing the corporate communications function. Business negotiation. Verbal and non-verbal communication. Professional behavior. Business protocol.

Practical teaching
Analysis of practical examples and case studies in the field of corporate communications. Defining the corporate communications process using the example of a specific organization from the environment. Analysis of examples of ethical and unethical corporate communications practices. Solving corporate communications problems in an international environment. Practical skills in building corporate identity, image and reputation. Simulation of organizing a press conference and other media events. Writing a press release. Public speaking exercises. Corporate communications planning workshops. Budgeting for corporate communications programs. Models for measuring and evaluating corporate communications. Simulations and analysis of the efficiency and effectiveness of organizing various corporate communications activities.

4. Teaching methods:

Lectures, demonstrative method, case studies, learning through collaborative work on solving practical problems, independent research by students and problem solving based on the assignments received, independent work by students through learning and preparation of seminar papers and project assignments.

Knowledge scores (maximum number of points 100)					
Pre-exam obligations	**Required**	**Points**	**Final exam**	**Required**	**Points**
Lecture activity	Yes	10.00	Oral exam	Yes	40.00
Colloquiums	Yes	30.00			
Project/Seminar paper	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Костић-Станковић М., Филиповић В., & Властелица, Т.	Односи с јавношћу	Београд: Faculty of organizational sciences	2020
2	Лалић Д., Властелица Т.	Корпоративне комуникације за пример	Факултет техничких наука, Нови Сад	2019
3	Лалић Д., Властелица Т.	Примери добре праксе односа с јавношћу	Факултет техничких наука, Нови Сад	2016

Teaching subject		Supply chains analitics
Subjecst designation:	01.000052	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Cvetić B. Biljana Panić V. Biljana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	000001	Operations Research 1	Yes	Yes
2,	Z00010	Probability theory	Yes	Yes
3,	Z00016	Statistics	Yes	Yes

Conditions:

1. Educational goal:

The goal of this course is to train students in the analytical study of supply chains and the creation of business decisions and reports.

2. Educational outcomes (acquired knowledge):

After passing the Exam, students will be able to:
1. understand and apply methods and techniques of business analytics in supply chains,
2. analyze data on supply chain operations,
3. predict future values of supply chain performance,
5. recognize optimization problems in supply chains, formulate and solve appropriate mathematical models and make appropriate business decisions,
6. use supply chain analytics software,
7. analyze results and create business reports,
8. think analytically and critically and work in a team.

3. Course content/structure:

Theoretical teaching: Introduction to supply chains - basic concepts. Descriptive analytics in the supply chain. Predictive analytics in the supply chain. Prescriptive analytics in the supply chain. Demand forecasting and ways to overcome the bullwhip effect in the supply chain. Procurement planning. Inventory analytics. Process planning and reporting. Transportation optimization. Risk management in supply chains. Measuring supply chain performance. Software support for supply chain analytics. Advanced analytics in the supply chain.
Practical teaching(Auditory exercises): The role and importance of analytics in the supply chain. Methods and techniques of descriptive analytics (e.g. supply chain mapping). Predictive analytics methods and techniques (e.g. time series, linear and nonlinear regression). Prescriptive analytics methods and techniques in supply chain optimization. Demand forecasting methods in supply chains. Supplier analytics and procurement planning. Stochastic inventory management models. Game theory methods for product pricing. Transportation optimization and routing. Models for measuring supply chain performance. Big data analytics in supply chains. Methods for handling missing orders. Systematization, analysis and visualization of orders and creation of business reports. Supply chain analytics software.

4. Teaching methods:

Classical method (ex cathedra) using a blackboard, computer, projector, solving short case studies

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity in practical classes	Yes	20.00	Oral exam	Yes	30.00
Lecture activity	Yes	20.00			
Project assignment	Yes	30.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Васиљевић, Д., Цветић, Б., Јеснловић, М.	Logistics and Supply Chain Management, second supplemented and expanded edition	FON, Belgrade	2018

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	S. Chopra and P. Meindl	Supply chain management: Strategy, planning, and operation (7th Edition)	Pearson	2019
3	L. Krajewski, L. Ritzman and M. Malhotra	Operations management, Processes and Supply Chains (12th Edition)	Pearson	2016
4	R. Saxena, A. Srinivasan	Business Analytics: A Practitioner's Guide	Springer	2013
5	J. R. Evans	Business Analytics: Methods, Models and Decisions	Pearson	2013
6	N. R. Sanders	Big Data Driven Supply Chain Management: A Framework for Implementing Analytics and Turning Information Into Intelligence	Pearson	2014

Teaching subject		Digital transformation and information society
Subjecst designation:	01.000045	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Jednak J. Sandra Miladinović M. Slobodan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Understanding the economic and sociological aspects of the global digital transformation on society, economy and market

2. Educational outcomes (acquired knowledge):

Understanding the effects of information and communication technologies on society and the economy. Introduction and evaluation of economic and sociological changes in the digital environment. Application of knowledge for managing and adapting business in the conditions of digital change. Understanding and analysis of the information society, knowledge-based economy, digital economy, platform economy and digital transformation.

3. Course content/structure:

Theoretical teaching: Scientific and technological development and social changes. Theoretical concepts of social networks. Social networks and new patterns of power. Transformation of work in the information society. Information technologies and social capital. Information-controlled society. Information society - economic and institutional aspects and indicators of development. The role of the technological revolution on macroeconomic performance and the market environment (digital economy). Knowledge-based economy - economic challenges and opportunities in the global and European market. Modern forms of business through digital platforms (platform economy). Competition and markets in the digital environment. Taxation problems in the digital environment. Digital transformation - basics, creating a strategy for digital business transformation, changing business operations and transforming industries.
Practical teaching: Exercise classes follow the methodological units Lectures.

4. Teaching methods:

Lectures, exercises, case studies, consultations. Students are stimulated and activated through interactive teaching.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminar paper	Yes	30.00	Seminar paper defense and Oral exam	Yes	20.00
			Written exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Једнак, С.	Развој економије засноване на знању: изазови и могућности	Задужбина Андрејевић	2012
2	Крагуљ, Д.	Економија - Основи микроекономске и макроекономске анализе - оYesбрана поглавља	изYesње аутора, Београд	2020
3	Andersson, P., Movin, S., Mähring, M., Teiglan, R., Wennber, K.	Managing digital transformation	SSE Institute for Research, Stockholm School of Economics	2018
4	Rogers, D.	The Digital Transformation Playbook: Rething your business for the Digital Age	Columbia Business School Publishing	2016
5	Миладиновић, С.	Прекаризација раYes и прекаријат о последице савременог развоја	Удружење Технологија и друштво: Институт „Михајло Пупин“, Центар за истраживање развоја наука и технологија	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
6	Миладиновић, С.	Дигитална писменост - од привилегије до нужности	Аудиовизуелни архив и дигитални центар САНУ: Институт за упоредно право	2019
7	Томић - Петровић, Н. М .; Миладиновић, С.М.	Возила без возача – pro et contra	Социолошки преглед	2019
8	Миладиновић, С.	Тамна страна социјалног капитала	Нова српска политичка мисао	2011
9	Миладиновић, С.	Информационо-комуникационе технологије у функцији стварања социјалног капитала, у Владимир Урошевић (ур): Везе сајбер криминала са нерегуларним миграцијама и трговином људи	Министарство унутрашњих послова Републике Србије	2014
10	Петровић, Д.	У међумрежју: Интернет и нови обрасци друштвености.	Београд: Саобраћајни факултет: Филозофски факултет	2008
11	Kastels, M.	Moć komunikacija	Beograd: Clio: RTS	2014
12	Castells, M.	Informacijsko doba: ekonomija, drustvo, kultura.	Zagreb: Golden marketing,Domaći i inostrani članci iz časopisa	2000
13	-	Домаћи и иностранu чланци из часописа по договору		-

Teaching subject		Advanced .NET technologies
Subjecst designation:	01.SI0009	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Lazarević D. Saša

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Understanding advanced concepts of the .NET Core platform. Proficiency in various implementation models and technologies. Training students to independently implement complex applications using .NET Core technologies and database management systems such as MS SQL Server.

2. Educational outcomes (acquired knowledge):

Students acquire the knowledge and skills necessary to design and implement applications using advanced .NET Core technologies and advanced capabilities of MS SQL Server.

3. Course content/structure:

Theoretical teaching:
Features and architecture of the .NET Core platform and its basic concepts.
Features and architecture of the MS SQL Server database management system and its basic and advanced concepts.
Delegates and events. Collections, reflection and generic types. Application of <eng>LINQ technologies when working with collections.
Technologies for accessing and managing items from the address store. Application of LINQ technologies when working with items from the address store and collections that use lazy loading.
Asynchronous programming on the .NET Core platform.
Implementation of web applications: ASP.NET Core MVC.
Implementation of web services: ASP.NET Core Web API.
Implementation of the presentation layer using .NET Core technologies.
Authentication and authorization in ASP.NET Core applications.
Implementation of Data Access Layer (DAL) using MS SQL Server.

Practical teaching: Exercises are fully aligned with the tests.

4. Teaching methods:

Classic Lectures. Exercises in the computer classroom, teaching units are covered through practical study examples.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminars	Yes	30.00	Project defense	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	B. Wagner	Effective C#,Third Edition	Addison-Wesley Professional	2016
2	B. Wagner	More Effective C#, Second Edition	Addison-Wesley Professional	2017
3	D. Esposito, A. Saltarello	Microsoft .NET: Architecting Applications for the Enterprise, Second Edition	Microsoft Press	2014
4	J. Flanders	RESTful .NET	O'Reilly Media	2008
5	S. J. Metseker	Design Patterns in C#	Addison-Wesley	2004
6	S. McConnell	Code Complete: A Practical Handbook of Software Construction	Microsoft Press	2004

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
7	S. Wiltamuth, A. Hejlsberg	C# Language Specification	msdn.microsoft.com	2020
8	D. Sarka, W. Durkin, M. Radivojević	SQL Server 2017 Developer's Guide: A professional guide to designing and developing enterprise database applications, 2nd ed	Packt Publishing	2018

Teaching subject		Quality basics
Subjecst designation:	01.D00001	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Filipović V. Jovan Đurić B. Mladen

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

To students master the basic concepts and terminology of quality, in order to create a foundation for building upon through future courses.

2. Educational outcomes (acquired knowledge):

Students' ability to: a) understand basic concepts in the field of quality management and standardized management systems b) understand the context of current and future applications - opportunities and limitations in the application of basic concepts. c) master the terminology in the field of quality management and standardized management systems.

3. Course content/structure:

Theoretical teaching
Stakeholders and interested parties; Basic concepts in quality management; Strategic view of quality management; Overview of the history of quality; Main philosophical directions in quality management; “Geography” of quality management – approaches in Japan, the USA and the UK; Improving process quality (incremental improvements, leapfrog improvements); The quality function and its relationship with other functions in the organization; Conformity assessment and quality costs; Principles of total quality management (TQM); Quality as the basis for business standardization; Integrated management system
Practical teaching
Presentation of goals and methods of work in exercises. Presentation of goals, methods of work and expected results from the project project Workshop 1: Stakeholders and interested parties; Workshop 2: Kano model; Workshop 3: Deming concepts; Workshop 4: Quality trilogy; Workshop 5: Basic concepts of quality management systems; Workshop 6: Dimensions of quality; Workshop 7: Costs of quality; Workshop 8: Process approach; Workshop 9: Relationship between quality and other functions in the organization; Workshop 10: Case study; Workshop 11: Presentation of project works.

4. Teaching methods:

Lectures, exercises, case study analysis, analysis of application of models and standards

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	25.00	Written exam	Yes	50.00
Project/Seminar paper	Yes	25.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Филиповић, Ј. и Ђурић, М.	Основе квалитета	FON, Belgrade	2009
2	L.D. Goetsch, L., D., & S.B. Davis.	Quality Management for Organizational Excellence (7th. ed.)	New,Jersay: Pearson	2016

Teaching subject	**Human resources management**
Subjecst designation: 01.D00002	
Number of ECTS: 5	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject
UNO subjects	
Teachers:	Ivanović R. Tatjana Anđelković Labrović Z. Jelena

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring advanced knowledge of human resource management theories, principles and activities so that students can understand the complexity and specificities of human resource management, as well as equipping students with the critical analysis and evaluation of various human resource management activities in the modern work environment.

2. Educational outcomes (acquired knowledge):

Students are able to recognize and explain theoretical concepts of human resource management, recognize the possibilities of practical application and the importance of effective implementation of human resource management activities for successful business.
Students are able to Yes apply the acquired knowledge and skills necessary for further development and improvement in the field of human resource management (in a practical or scientific-research sense), effectively solve problems related to human resource management and improve communication, presentation and teamwork skills.

3. Course content/structure:

Theoretical teaching
Introduction to the subject: basic concepts and tasks in the field of human resources management; Coordination of personnel activities; Ensuring equal employment opportunities; Employee health and safety; Job and job design; Job and job analysis; Human resources planning and recruitment; Human resources selection; Employee orientation and training; Employee development and career planning; Employee evaluation; Compensation and benefits; Human resources research and personnel information system; Electronic human resources management; Unions and collective bargaining; The future of human resources management.
Practical teaching
Introduction to the subject; Tasks in the field of human resources management; Different generations in the work environment; Employee motivation; Discrimination in the work environment; Abuse at work; Stress and burnout; Analysis and design of jobs and work schedules; Human resource planning; Review exercises; Methods of recruitment and selection of human resources; Compiling a resume for a job; Orientation, training and development of employees; Career planning; Employee evaluation; Compensation: Salaries and awards; Compensation: Benefits; Review exercises.

4. Teaching methods:

Lectures, exercises, interactive teaching: workshops, exchange of ideas and knowledge through group discussion, learning by example through case studies, mentoring and teamwork on the preparation of seminar papers on an agreed topic, presentation method.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity in practical classes	Yes	5.00	Oral exam	Yes	40.00
Colloquiums	Yes	40.00			
Seminar paper	Yes	15.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Р. Орлић, Т. Ивановић	Менаџмент људских ресурса	FON, Belgrade	2019

Teaching subject		Big data infrastructure and services
Subjecst designation:	01.EP0014	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Bogdanović M. Zorica Vukimirović B. Dragan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to train students to independently design, implement and use big data infrastructure, services and solutions in e-business.

2. Educational outcomes (acquired knowledge):

Students are trained to independently design, implement and use big data systems in e-business.

3. Course content/structure:

Theoretical teaching
The role of big data in business operations. Big data infrastructure and services in e-business. Designing information systems in a big data environment. Non-relational databases. Transition from a relational to a non-relational database model. Introduction of controlled redundancy. Abstractions of the relational model to a table (big table model) and to a binary relation (key value model). Scalable and distributed processing of databases in a big data environment. MapReduce. Big data solutions in the Apache Hadoop ecosystem. Big SQL concepts and solutions. Big data analytics and knowledge discovery. Big data analytics in real time. In-database analytics. Infrastructure for real-time analytics, Apache Spark. Application of big data in: e-commerce, internet marketing, e-government, e-health, e-banking. Analysis of large website logs. Email analysis from large electronic stores. Big data in mobile business. Social network analysis. Sentiment analysis. Multimedia and unstructured email analysis in electronic business. Application of big data for collecting and analyzing sensor emails in smart environments. Email management in big data environment. Privacy and security issues. Trends in big data.
Practical teaching
Designing big data solutions for enterprises. Development of big data solutions over non-relational email databases. MongoDB. Cassandra. Redis. Real-time big data processing: Apache Spark, Twitter Heron. Implementation of real-time streaming jobs. Resource management of big data infrastructure. Hadoop ecosystem for big data: hdfs, Hbase, Yarn, mapreduce, Pig, Hive, Ambari, Zookeeper. Big data analytics. Apache Mahout. Spark MLlib. Development of personalized solutions in a big data environment. Development of a search system for e-commerce. Apache Solr. Development of big data solutions for systems based on mobile and Internet of Things technologies. Analysis of social networks in Python. Visualization of messages. Design of projects and evaluation of developed solutions.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б.Раденковић, М.Деспотовић-Зракић, З.БогЧesновић, Д.Бараћ, А.Лабус	Електронско пословање, поглавље 20. Трендови у технологијама електронског пословања, пп. 275-282	ФОН	2015
2	Milovanović S., Bogdanović Z., Labus A., Barać D., Despotović-Zrakić, M.	An approach to identify user preferences based on social network analysis. Future Generation Computer Systems, 93, 121-129	ISSN 0167-739X	2019
3	T. White	Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale	O'Reilly Media	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	M. Bonzanini	Mastering Social Media Mining with Python	Packt Publishing	2016
5	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Big data infrastruktura i servisi, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021
6	Kleppmann, M.	Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems	O'Reilly Media; 1 edition, ISBN-10: 1449373321.	2017

Teaching subject		Data analysis in e-business
Subjecst designation:	01.EP0012	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Vukimirović B. Dragan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to acquire the necessary knowledge and skills for analyzing invoices in the field of e-business using modern analytical methods. Through the e-business process, companies must ensure the use of invoices that are up-to-date and accurate, which is achieved by regularly monitoring their quality. The main goal of invoice analysis is to: make the process of managerial decision-making in e-business more efficient, increase operational efficiency, better understand the available invoices, comply with regulations and increase revenue.

2. Educational outcomes (acquired knowledge):

By mastering the subject matter, students acquire the basic knowledge and skills necessary for independent analysis of messages generated in the online environment, especially on social media and social networks.

3. Course content/structure:

Theoretical teaching
E-business metrics. Life cycle of lists – list collection. List types and measurement scales. List representation methods: tabular and graphical displays, multimedia list representation. List validation: methods for determining the reliability, accuracy and quality of lists, metalists, sampling. Sources of bias in lists. List editing: coding, procedures for identifying missing values, analysis of extreme values. List transformation and synchronization: recoding, merging and separating variables, normalization, imputation, weighting. Analysis of unstructured lists. Analysis of structured lists. List management: defining frameworks and platforms (data governance 2.0). The process of managing files, organization of storage and access to files, legal and ethical codes. Reporting methods: visualization – infographics, dashboard.
Practical teaching
Practical teaching follows the theoretical teaching and consists of exercises and case study analysis related to the use of real files. Exercises are performed using specialized software packages and tools: SPSS, R, Python, Excel and Google Sheets.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Oral exam	Yes	30.00
Colloquiums	Yes	20.00			
Practical teaching	Yes	35.00			
Seminar paper	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Albright, S.C, W. L. Winston	Business Analytics, Data Analysis and Decision Making, Sixth Edition	Cengage Learning	2017
2	Baker, S and P. Sjoberg	Intelligent Data Governance For Dummies, Hitachi Vantara Special Edition, John Wiley & Sons, Inc.	Hoboken, New Jersey	2018
3	Beręsewicz, M., R. Lehtonen, F. Reis,L. di Consiglio and M. Karlberg	An overview of methods for treating selectivity in Big data sources	Publications Office of the European Union, Luxembourg	2018

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Cleff, T.	Exploratory Data Analysis in Business and Economics, An Introduction Using SPSS, Stata, and Excel	Springer	2014
5	Hemann, C., K. Burbary	Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World: Making Sense of Consumer Data in a Digital World (Que Biz-Tech), 2 edition	Que Publishing	2018
6	Holmes, M. H.	Introduction to Scientific Computing and Data Analysis, editors: Timothy J. Barth Michael Griebel, David E. Keyes, Risto M. Nieminen, Dirk Roose And Tamar Schlick	Springer International Publishing Switzerland	2016
7	Kamki, J.	Digital Analyitics, Data Driver Decision Making in Digital World	Notion Press	2016
8	McKinney, W.	Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython	O'Reilly Media, Inc.	2018
9	Milton, M.	Head First Data Analysis	O'Reilly Media, Inc.,	2009
10	Pimpler, E.	Data Visualization and Exploration with R. A practical guide to using R, R Studio, and Tidyverse for data visualization, exploration, and data science applications	Geospatial Training Services, Boerne, TX	2017
11	Rafter, C.	A complete guide to cleaning and preparing data for analysis using Excel™ and Google Sheets™, Inzata Analytics	DSM Media	2019
12	Sleeper, R.	Practical Tableau	O'Reilly Media, Inc.	2018
13	Wexler, S., J. Shaffer and A. Cotgreave	The Big Book of Dashboards, Visualizing Your Data Using Real-World Business Scenarios	John Wiley & Sons, Inc	2017
14	Yockey, R. D.	SPSS demystified, A Step-by-Step Guide to Successful Data Analysis For SPSS Version 18.0, Second Edition	Routledge, Taylor & Francis Group	2016
15	-	OYeзбрани стручни и научни радови		-

Teaching subject		E-education
Subjecst designation:	01.I00055	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Anđelković Labrović Z. Jelena Despotović-Zrakić S. Marijana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Presentation of the learning process, the specifics of technology-supported learning and ways to manage that process at the group and individual levels. Training students to design and implement e-learning systems using advanced internet technologies.

2. Educational outcomes (acquired knowledge):

Students are trained to design and implement e-learning systems. They are able to create learning content that meets didactic principles..

3. Course content/structure:

Theoretical teaching
Education, development and training. Classification of education. The concept and process of learning. Learning theories. Basic didactic principles. Development of e-education. Basic definitions. Strategies and models of e-education. Ecosystems of e-education. Personal learning environment. Components and services of e-education systems. Infrastructure for e-education. Development of cloud infrastructure and services for e-education. Portals for e-education. Blended learning. Adaptive electronic learning. Criteria and techniques of adaptation. Learning styles. Development of adaptive electronic courses. Project-based and problem-solving learning. Standards of e-education. Models of instructional design. Creation of content for teaching materials. Learning objects. Bloom's taxonomy. Methods and forms of teaching work. Course design. Lesson planning and organization of classes in an electronic environment. Platforms for managing e-learning systems. Moodle LMS. E-learning technologies. Learning through mobile technologies. Gamification. Learning through games. Collaborative learning. Application of social networks in e-learning. Student Relationship Management. Crowdsourcing. Flipped classroom. MOOC courses and platforms. Microlearning. Smart educational environments and classrooms. Augmented reality and ubiquitous computing in e-learning. Application of artificial intelligence in e-learning systems. Psychological aspects of electronic communication. Skills required for e-learning. Motivation for e-learning. Valuation and assessment of knowledge in e-learning. Student-teacher relationship. Problems of applying information technologies in education.
Practical teaching
Mapping the dimensions of the learning process. E-learning infrastructure. Course management systems. Moodle installation and configuration. Development of Moodle add-ons, Moodle API. Designing and using learning objects. Application of IEEE LOM, SCORM and LMS standards. Development of an adaptive e-learning system. Designing educational content using the concepts of learning through play and problem-based learning. Development of MOOC courses. Coursera, Udemy. Application of mobile technologies, services and applications in e-learning. Application of social media and networks in e-learning. Application of the concept of informal and informal e-learning. Application of the concept of crowdsourcing in the e-learning system. Implementation of the concept of augmented reality in e-education. Designing a smart educational environment. Creating personal e-learning environments using modern information technologies.

4. Teaching methods:

Lectures, Auditory exercises, case studies, discussions, creative workshops, exercises in classrooms with computers, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	60.00	Oral exam	Yes	40.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Раденковић, М. ДеспотовићЗракић, З. БогYесновић, Д. Бараћ, А. Лабус	Електронско пословање	Faculty of Organizational Sciences, Belgrade	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Despotović-Zrakić, M., Milutinović, V., & Belić, A.	Handbook of Research on High Performance and Cloud Computing in Scientific Research and Education	Hershey, PA: IGI Global	2014
3	Despotović-Zrakić, M., Marković, A., Bogdanović, Z., Barać, D., & Krčo, S.	Providing adaptivity in Moodle LMS courses	Journal of Educational Technology & Society	2012
4	Labus, A., Despotović Zrakić, M., Radenković, B., Bogdanović, Z., & Radenković, M.	Enhancing formal e-learning with edutainment on social networks	Journal of Computer Assisted Learning	2015
5	Zahirović Suhonjić, A., Despotović-Zrakić, M., Labus, A., Bogdanović, Z., & Barać, D.	Fostering students' participation in creating educational content through crowdsourcing	Interactive Learning Environments	2019
6	Bogdanović, Z., Barać, D., Jovanić, B., Popović, S., & Radenković, B.	Evaluation of mobile assessment in a learning management system	British Journal of Educational Technology	2014
7	Анђелковић Лабровић, Ј., Милосављевић, Г.	Могућности примене концепта личног окружења за е-учење 2.0	Андрагошке студије, 1, 175-194, UDK 37.018.43:004.738.5 , http://www.as.edu.rs/pdf/arti	2015
8	Петровић, Н., Анђелковић Лабровић, Ј.	Могућности приступа заснованог на поYесцима у управљању процесом учења	Андрагошке студије, 1, 135-155, doi:10.5937/AndStud1901135P , http://www.as.edu.rs/pdf/arti	2019
9	Petrović, N., AnđelkovićLabrović, J., Milinković, I. & Kovačević I.	Analitika podataka o angažovanosti u e-učenju	SPIN '19, Beograd, str. 583-590, http://spin.fon.bg.ac.rs/wp-content/uploads/2019/11/SPIN19_Zbornik_radova.pdf	2019
10	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet E-obrazovanje, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021

Teaching subject		Introduction to IS software architectures
Subjecst designation:	01.IS0008	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Turajlić S. Nina

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring theoretical foundations and practical knowledge necessary for understanding the concept of IS architecture, methods of documenting IS architecture, knowledge of the fundamental properties, advantages and disadvantages of certain characteristic IS architecture styles, as well as the basics of the process and methods of organizing IS architecture development.

2. Educational outcomes (acquired knowledge):

Students will be able to:
know the fundamental features, advantages and disadvantages of different IS architectures,
analyze and identify business situations in which specific architectures are applied,
define and describe the selected IS architecture for specific business situations, and
define the process and organization of the development of a specific IS architecture.

3. Course content/structure:

Theoretical teaching:
The concept and definition of software architecture and IS architecture. The importance of IS architecture.
IS architecture: business, logical and physical architecture. Architectural views. Zahman model.
IS architecture documentation. Standard languages for defining architecture. UML, ArchiMate.
Functional and non-functional user requirements. Qualitative characteristics of IS architecture.
Characteristic styles (patterns) for IS architectures. Client-server architecture. Two-tier, three-tier and multi-tier architecture. Component-based architecture. Message- and event-based architectures. Web architecture. Service-oriented architecture. Architectures based on virtual services (Cloudarchitecture). Micro-service architecture. Containers (Docker, Kubernetes). Serverless architectures. Architectures for big data (BigDataarchitecture). Architecture based on Internet devices (InternetofThingsarchitecture).
IS architecture development process. TOGAF standard. Unified process. Development organization.

Practical teaching:
Example of IS architecture. Examples of business, logical and physical architecture. Examples of architectural views. Illustration of using UML to define architecture. Example of qualitative characteristics of IS architecture. Overview and illustration of some characteristic IS architecture styles. Example of IS architecture development and organization of that development.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative, real-life examples and case studies, through interactive work with students. After that, students produce seminar papers in groups.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	50.00	Exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Richards M., Ford N.	Fundamentals of Software Architecture: An Engineering Approach, 1st Edition	O'Reilly Media	2020
2	Vernon V.	Strategic Monoliths and Microservices: Driving Innovation Using Purposeful Architecture, 1st Edition	Addison-Wesley Professiona	2021
3	Lankhorst M.	Enterprise Architecture at Work: Modelling, Communication and Analysis (The Enterprise Engineering Series), 3rd Edition	Springer	2012
4	Cervantes H., Kazman R.	Designing Software Architectures: A Practical Approach (SEI Series in Software Engineering)	Addison-Wesley Professional	2016

Teaching subject		IS implementation (project)
Subjecst designation:	01.IS0010	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Babarogić S. Slađan Bjeladinović Lj. Srđa

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	IS0007	Analysis and logical design of IS (project)	Yes	Yes

Conditions:

1. Educational goal:

Acquiring practical knowledge regarding the implementation of a specific IS in a modern software environment based on an object-oriented IS specification.

2. Educational outcomes (acquired knowledge):

Students will expand their knowledge through the implementation of an information system in a current software environment using components and patterns.

3. Course content/structure:

Theoretical teaching:
Introductory teaching. Traditional and SPA web applications. Overview of the J2EE development environment. Advanced technologies of Java/Java EE development environments. Overview of the .NET development environment. Advanced technologies of the .NET development environment. React.js programming library. Angular development framework. Web services. REST, GraphQL, gRPC.

Practical teaching:
Determining visibility, creating detailed class diagrams. Organizing UML packages of project and implementation models. Designing a persistence framework using patterns. Mapping model elements into program code. Creating a class definition based on detailed class diagrams. Creating methods based on interaction diagrams and state transition diagrams. Implementation using JavaScript, React.js/Angular, and Java/Java EE/Microsoft .NET environments.

4. Teaching methods:

Students will use a modern development environment to implement a project that covers the scope of previously attended courses. In the first 6 weeks, classes will be held where the elements of the software architecture to be implemented will be explained, as well as an overview of current modern software development environments. In the next 9 weeks, students independently apply the acquired knowledge to the implementation of the IS with revision by a mentor (assistant or teaching associate) at defined project checkpoints.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Project defense	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	-	Материјали и скрипте са Lectures и вежби, ЛАБИС	ФОН	2020
2	Babarogić S., Bjeladinović S.	Prezentacije u e-formi sa sajta is.fon.bg.ac.rs	FON	2020
3	Larman C.	Applying UML and Patterns-An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3rd ed.	Prentice Hall PTR	2012

Teaching subject		Programming 3
Subjecst designation:	01.SI0011	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Đurić O. Dragan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Mastering advanced programming techniques and using innovative programming languages.

2. Educational outcomes (acquired knowledge):

Students' ability to program at an advanced level using innovative methods, techniques, and programming languages, and proficiency in advanced software programming environments.

3. Course content/structure:

Theoretical teaching
Review of advanced programming concepts using the Clojure programming language on the Java platform. Interactive programming and REPL. Functional programming. Higher-order functions. Mapping and reduction. State and identity. Project organization. Evaluation, functions, and macros. Concurrent programming. Asynchronous programming. Multiparameter polymorphism. Macros and metaprogramming. Other current programming methods and techniques.
Practical teaching
Use of various software tools for program development using Clojure and other selected programming languages. Create basic demonstration programs using these languages. Review exercises 1. Write specific programs that demonstrate more advanced work using these languages. Review exercises 2. Write applications. Review exercises 3. Prepare for Exam 1. Prepare for Exam 2.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software tools. Exercises in computer laboratories, in small groups. Part of the exercises is performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Computer exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	-	course website with numerous links to solved examples, websites of programming languages and corresponding programming libraries studied within this course		2020
2	Daniel Higginbotham	Clojure For the Brave and True	No Starch Press	2015
3	Russ Olsen	Getting Clojure	Pragmatic Programmers	2018

Teaching subject		Programming data repository
Subjecst designation:	01.SI0008	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Lazarević D. Saša

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Introduction to key concepts, problems and solutions in accessing files and programming various file repositories (file libraries and file databases). Understanding and applying principles, rules and methods of:
• accessing files in a software system and
• programming file repositories.
Training in:
• developing data-intensive applications: analyzing, designing, implementing, testing, installing and administering applications;
• evaluating data-intensive applications: measuring application performance and optimizing them; applying basic software metrics.

2. Educational outcomes (acquired knowledge):

Students' ability to program various data repositories and develop data-intensive applications.

3. Course content/structure:

Theoretical teaching:
1. C programming language (version C)
1.1. Streams and libraries;
1.2. DE SQLite <e/ng> and embedded <eng>SQL;
2. CIS programming language (version S#)
2.1. Streams and libraries;
2.2. DE SQLite and embedded SQL;
2.3. Binary and XML serialization;
2.4. Database access technology and object-relational mapping: ADO.NET & Entity Framework (Using .NET Data Provider /connecting to the database, querying, returning messages using DataAdapter/; Using DataSet /DataSet objects, DataRelation objects, sorting and searching, strongly typed DataSets, passing queries to the database/; EF) ;
2.5. Query technology: LINQ (Architecture, Lambda expressions, Late evaluation; LINQ and IEnumerable interface; LINQ and DataSets, LINQ and SQL, LINQ and XML; LINQ and updating messages; Standard LINQ operators);
3. Te-es-ku-el programming language (executed by T-SQL)
3.1. Management during program execution;
3.2. Nonmaterialized and materialized views;
3.3. Scalar and table functions;
3.4. Stored procedures and triggers;
3.5. Error handling;
3.6. Transaction management;
4. Data Access Layer design
5. Data-intensive application development
5.1. Development process: phases and activities; Problems;
5.2. Analysis and design;
5.3. Implementation and testing;
5.4. Case study.
Practical teaching: The exercises are fully aligned with the textbook, both in structure and content.

4. Teaching methods:

Lectures: Lectures ex cathedra and multimedia Lectures; solving case studies.
Exercises: working in a computer lab, solving problems, programming.

Knowledge scores (maximum number of points 100)					
Pre-exam obligations	**Required**	**Points**	**Final exam**	**Required**	**Points**
Lecture activity	Yes	10.00	Written exam	Yes	30.00
Colloquiums	Yes	30.00	Oral exam	Yes	20.00
Seminar paper	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Stephen Prata	C Primer Plus, 6/e	Addison-Wesley Professional	2013
2	Kamran Amini	Extreme C: Taking you to the limit in Concurrency, OOP, and the most advanced capabilities of C, 1/e	Packt Publishing	2019
3	Jay A. Kreibich	Using SQLite: Small. Fast. Reliable. Choose Any Three	O'Reilly Media	2012
4	Kleppmann, M.	Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems	O'Reilly Media; 1 edition, ISBN-10: 1449373321.	2017
5	S. Ceri, P. Fraternali, et al	Designing Data-Intensive Web Applications	The Morgan Kaufmann Series in Data Management Systems	2018
6	C. Nock	Data Access Patterns: Database Interactions in OO Apps	Addison-Wesley	2005
7	D. Esposito, A. Saltarello	Microsoft .NET: Architecting Applications for the Enterprise, 2/e	Microsoft Press	2014
8	D. Sarka, W. Durkin, M. Radivojević	SQL Server 2017 Developer's Guide: A professional guide to designing and developing enterprise database applications, 2/e	Packt Publishing	2018
9	D. Sceppa	MS ADO.NET Core Reference	Microsoft Press	2012
10	S. Stiefel, L. Oberg	App Development using C# and .NET	Prentice Hall PTR	2003
11	H. M. Deitel, P. J. Deitel, et al	Simply C# - An Application-Driven Tutorial Approach	Pearson	2003
12	Ian Griffiths	Programming C# 8.0: Build Cloud, Web, and Desktop Applications	O'Reilly Media	2020
13	Mark J. Price	C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development: Build applications with C#, .NET Core, Entity Framework Core, ASP.NET Core, and ML.NET using Visual Studio Code, 4/e	Packt Publishing	2019
14	Holger Schwichtenberg	Modern Data Access with Entity Framework Core: Database Programming Techniques for .NET, .NET Core, UWP, and Xamarin with C#	Apress	2018
15	Philip Conrod	Visual C# and Databases - Professional Edition	Kidware Software	2013
16	Bill Hamilton	ADO.NET 3.5 Cookbook: Building Data-Centric .NET Applications	O'Reilly	2008
17	Klaus Elk	SQL Server with C# Applications	CreateSpace Independent Publishing Platform	2018
18	Bipin Joshi	Beginning Database Programming Using ASP.NET Core 3: With MVC, Razor Pages, Web API, jQuery, Angular, SQL Server, and	Kindle Edition, Apress	2019

Teaching subject		Distributed computer systems
Subjecst designation:	01.IT0010	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Milovanović M. Miloš Jovanović D. Bojan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the program is to introduce Yes students to theoretical and practical approaches to the development of advanced distributed computing systems and application protocols on the Internet.

2. Educational outcomes (acquired knowledge):

Students will gain the basic knowledge and skills necessary for the development of advanced distributed computing systems and application protocols on the Internet.

3. Course content/structure:

Theoretical teaching
P-01: Introduction. P-02: Protocols and layers of the network model. P-03: Communication between connected systems. P-04: Naming resources. P-05: Synchronization of connected systems. P-06: Fault tolerance. P-07: Updating materials - Preparation for the colloquium. P-08: Security and protection of distributed systems. P-09: Distributed file systems. Consistency and replication. P-10: Distributed operating systems. P-11: Cluster computing systems. P-12: Service-oriented systems. P-13: Grid computing. P-14: Cloud computing. P-15: System virtualization.

Practical teaching
V-01: Introduction. V-02: Using Wireshark to monitor network traffic. V-03: Programming communication between affected processes. V-04: Configuring and setting up DNS services. V-05: Configuring and programming time synchronization. V-06: Programming distributed transactions. V-07: Designing a fault-tolerant system architecture. V-08: Updating the material - Preparation for the colloquium. V-09: Configuring and setting up a VPN network. V-10: Configuring and setting up a distributed file system. V-11: Configuring and setting up a distributed operating system. V-12: Configuring Apache servers as support for web services. V-13: Implementing grid computing on the PlanetLab platform. V-14: Implementing cloud computing on the Azure platform. V-15: Updating the material - Preparation for the Exam.

4. Teaching methods:

Lectures, exercises, Practical work, consultations, study research work, case studies
Lectures are conducted according to the ex cathedra model, the teacher uses a mandatory prepared presentation that is shown in the classroom via a projector. The teacher uses a blackboard and a marker for individual teaching units as needed. Exercises are conducted in a regular classroom, with the teacher showing the prepared presentations as well as specific tools via a projector. The teacher uses a blackboard and a marker for individual assignments. The teacher instructs students to set up the necessary tools on their own computers and, according to the blended learning approach model, students work on their own computers in the classroom and at home. Practical work is conducted according to the model of defining a project assignment, forming project teams and then developing them by students, through regular consultations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	50.00
Project development	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Andrew S. Tanenbaum, Maarten van Steen	Distributed Systems: Principles and Paradigms	Prentice Hall	2006
2	Dušan Starčević i saradnici	Računarske mreže i telekomunikacije – praktikum	FON	2013
3	James F. Kurose, Keith W. Ross	Umrežavanje računara: od vrha ka dnu	CET, Beograd	2018

Teaching subject		Multimedia production
Subjecst designation:	01.IT0011	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Štavljanin B. Velimir

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquire the knowledge and skills necessary to work in a multimedia production team. Understand the roles of the producer, director, and screenwriter as team leaders.

2. Educational outcomes (acquired knowledge):

Students will gain the necessary knowledge in the field of multimedia production.

3. Course content/structure:

Theoretical teaching
P-01: Multimedia industry. Market. Technologies. P-02: Multimedia studio. Devices. Integration. Use. P-03: Interactive design. Basic roles. Producer. Director. Scriptwriter. P-04: Multimedia system components. Design of multimedia systems for training and learning. Game design. P-05: Production basics. Instructions. Characteristics. Genres. P-06: Interactive design process. Design team. Concept writing. P-07: Competitive analysis. Top-level design. Cost/Benefit analysis. P-08: Functional specification. P-09: Development process overview. Clients. Development phases. P-10: Research phase. Qualification of client and implementer. Key points of the work. Determining the subject of work. Metrics. Preliminary implementation plan and budget. Proposals and bids. Contract. P-11: Design phase. Outputs of the design phase. Graphics. (Display surface. Icons. Font. Roles. Casting. Script. Palettes.) P-12 Sound. (Casting. Music. Sound effects.) Technical issues. (Tools. Technical parameters. Software and databases.) Role of the producer. Role of the director. Role of the scriptwriter. P-13: Prototype. Purpose of the prototype. Planning and realization of the prototype. Prototype testing. Use of test results. P-14: Production. Outputs of the production phase. Approval of production material. Production phase delays. Roles of the producer and director in the development phase. P-15: Alpha and beta discs. Gold master. Packaging design. Archiving.
Practical teaching
W-01: Introduction to multimedia production (Introduction to devices and tools) W-02: Forming project teams and defining project tasks W-03: Workshop: Role play and dividing the team into basic roles W-04: Workshop: Generating an idea for a production project and defining the basic components of the system - target group, content, interactive features, structure, controls, application layout W-05: User interfaces. Generations of user interfaces. Designing a user interface. Examples of user interfaces of interactive applications. W-06: Workshop: Writing a concept and competitive analysis (creating a competitive matrix) W-07: Workshop: Top-level design and cost-benefit analysis W-08: Workshop: Creating a functional specification W-09: Research. Researching the needs of users of the production project. Planning a research meeting. Analysis report. Preliminary development plan. Preliminary budget. V-10: Design. Background and screen design. Icon design. Character design and development. Script. V-11: Soundtrack. Character and voiceover recording. Music selection. Sound effects selection. Final plan and budget development. V-12: Prototype development. Graphics. Video. Sound. V-13: Production. V-14: Testing. V-15: Project proposal defense.

4. Teaching methods:

Lectures, exercises, Practical work, consultations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	30.00	Written exam	Yes	50.00
Seminar paper	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Starčević, D., Štavljanin, V.	Multimediji	FON, Beograd	2013
2	Elin, Larry	Designing and Developing Multimedia – A Practical Guide for the Producer, Director, and Writer	Allyn & Bacon, MA, USA	2001

Teaching subject		Advanced data analysis
Subjecst designation:	01.SI0012	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Jovanović M. Jelena

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0003	Programming 2	Yes	Yes

Conditions:

1. Educational goal:

To introduce students to current methods and techniques of advanced data analysis and their applications in various domains. To provide them with access to software libraries (Python, R) for the practical application of methods and techniques of advanced data analysis.

2. Educational outcomes (acquired knowledge):

Students will acquire the knowledge and skills necessary for the practical application of current methods and techniques of advanced data analysis, including: a) selecting a method for solving a real-world problem, and b) developing a program that implements the selected analysis methods.

3. Course content/structure:

Theoretical teaching
Preparation and transformation of texts. Exploratory analysis of texts. Identification of patterns in texts.
Sequence analysis: visualization and exploratory analysis of sequences; identification of patterns in sequences (sequential pattern mining); clustering of sequences
Text analysis: identification of text topics using statistical methods (topic modeling) and methods based on network analysis (community detection); clustering of text content
Practical teaching
Introduction to software libraries and tools relevant to each of the areas covered by theoretical teaching. Application of these libraries and tools for the implementation of programs (in the chosen programming language) based on the introduced theoretical concepts, methods and techniques.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software libraries. Exercises in computer laboratories. Exercises are partly carried out by the teacher and followed by the students, and partly based on the independent work of the students, individually or in groups, with the help of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	35.00	Exam	Yes	65.00

Literature

NO..	Authors	Title	Publisher	Year
1	G. Grolemund, H. Wickham.	R for Data Science	O'Reilly Media	2017
2	W. McKinney.	Python for Data Analysis, 2nd Edition	O'Reilly Media	2017
3	J. Silge and D. Robinson.	Text mining with R, A Tidy Approach	O'Reilly Media	2017
4	B. Bengfort, R. Bilbro, T. Ojeda	Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning.	O'Reilly Media	2018

Teaching subject		Biostatistics
Subjecst designation:	01.000048	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Ignjatović P. Marina Jeremić M. Veljko

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00010	Probability theory	Yes	Yes
2,	Z00016	Statistics	Yes	Yes

Conditions:

1. Educational goal:

Acquisition of skills to conduct incentive analysis based on a Bayesian approach. Students will be able to use the increasingly popular Bayesian approach to statistical inference and survival analysis models. Acquisition of skills to identify an appropriate model for solving a given problem, as well as the use of modern statistical software environments.

2. Educational outcomes (acquired knowledge):

The course content enables the student to gain experience in understanding the concepts of the Bayesian approach to statistical inference and biostatistical methods in modern statistical software environments, as well as the experience necessary for their application in solving real-world business problems.

3. Course content/structure:

Theoretical teaching
Bayes's theorem; Fundamentals of the Bayesian approach to statistical inference; Bayesian interval estimation model; Bayesian hypothesis testing approach; Bayesian approach and multivariate analysis; Markov chains and Monte Carlo; Bayesian networks; Introduction to survival analysis; Censored samples; Parametric approach, maximum likelihood;
Kaplan-Meier; Nelson-Allen; Cohort studies; Log-rank Tests and Mantel-Hanzell; Cox regression
Practical teaching
Bayes's theorem; Fundamentals of the Bayesian approach to statistical inference; Bayesian interval estimation model; Bayesian hypothesis testing approach; Bayesian approach and multivariate analysis; Markov chains and Monte Carlo; Bayesian networks; Introduction to survival analysis; Censored samples; Parametric approach, maximum likelihood;
Kaplan-Meier; Nelson-Allen; Cohort studies; Log-rank Tests and Mantel-Hanzell; Cox regression

4. Teaching methods:

group, individual and practical

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	60.00	Oral exam	Yes	40.00

Literature

NO..	Authors	Title	Publisher	Year
1	Kruschke, J.	Doing Bayesian data analysis: A tutorial with R, JAGS, and Stan.	Academic Press	2014
2	Donovan, T. M., & Mickey, R. M.	Bayesian Statistics for Beginners: A Step-by-step Approach	Oxford University Press	2019
3	Moore, D. F.	Applied survival analysis using R.	Switzerland: Springer	2016
4	Allison, P. D.	Survival analysis using SAS: a practical guide.	Sas Institute	2010

Teaching subject		Software patterns
Subjecst designation:	01.SI0007	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Vlajić S. Siniša

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Understanding patterns in a general sense in the context of software system development. Possibility of practical use of patterns in the design and implementation phases of a software system. Introduction to existing mathematical formalisms for describing patterns.

2. Educational outcomes (acquired knowledge):

Students' ability to use patterns in the design and implementation phases of a software system.

3. Course content/structure:

Theoretical teaching
The purpose of patterns and their place in the software development process. General form of patterns. Requirements gathering and analysis patterns. Design patterns (micro and macro architectural patterns). Implementation patterns. Testing patterns. Pattern formalization.

Practical teaching: Exercises
Design patterns, micro architectural patterns (GOF patterns), macro architectural patterns (MVC), implementation patterns.

4. Teaching methods:

•The professor will theoretically explain each of the considered thematic units and through practical examples will explain their application in the development of software systems.
• The assistants will Yes elaborate the thematic units that the professor has translated through laboratory exercises. For each thematic unit, the assistants will prepare specific examples that they will Yes show and explain to the students in the computing center.
• Students should Yes independently do the tasks that the assistants will Yes prepare

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Oral exam	Yes	50.00
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Синиша Влајић	Софтверски патерни	Златни пресек	2014
2	E. Gammaetal.	Design Patterns: Elements of Reusable Object-Oriented Software	Addison-Wesley	1995
3	M. Fowler	Patterns of Enterprise Application Architecture	Addison-Wesley	2003
4	M. Fowler	Analysis Patterns: Reusable Object Models	Addison-Wesley	1996
5	C. Larman	Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design	PrenticeHall	1998
6	F. Buschmannetal	Pattern-Oriented Software Architecture: A System of Patterns	John Wiley&Sons	1996

Teaching subject	**Multimedia**
Subjecst designation: 01.IT0006	
Number of ECTS: 5	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects	
Teachers:	Štavljanin B. Velimir Minović V. Miroslav

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring advanced knowledge about the characteristics of multimedia objects and systems. Training students to use tools and multimedia technologies when integrating multimedia entities into multimedia applications that will provide an optimal user experience.

2. Educational outcomes (acquired knowledge):

Analyzing the capabilities of multimedia entities and their classification. Creating and modifying multimedia entities (text, images, graphics, sound, video, animation). Planning, organizing and controlling the production process of a multimedia application. Integrating multimedia entities into multimedia applications. Evaluating the effects of multimedia applications on users.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to multimedia information systems. Definitions. Motivation and goals. Evolution of multimedia. Areas of application. P-02: Multimedia hardware technologies. Platforms. Peripherals. Interfaces. Storage and retrieval devices. Input devices. P-03: Multimedia hardware technologies. Output devices. Communications. Distributed multimedia systems. P-04: Multimedia building blocks, techniques. Text and typography. Graphics. Sound. Image. Animation Video. P-05: Compression standards 1 P-06: Compression standards 2 P-07: Design of multimedia information systems. Generic architecture of multimedia information systems. P-08: Design of multimedia information systems. Time-oriented media initiation model. P-09: Multimedia information systems design. Structured media objects. P-10: Multimedia databases. Working with text. Working with images. P-11: Working with videos. Searching and retrieving in multimedia information systems. Implementation. P-12 Multimedia software technologies. Basic tools. Instant multimedia tools. P-13: Authoring tools. P-14: Multimedia and the Internet. MIME. WWW. Hypertext. Hypermedia. P-15: Web page makers and editors. Plug-ins.
Practical teaching
W-01: Introduction to multimedia (media types, file formats, standards) W-02: Web technologies (review of current technologies, multi-layer architecture, HTML, scripting languages) W-03: Workshop: Dreamweaver (HTML, working with templates, behaviors, advanced techniques) W-04: Digital image (formats, Photoshop basics, advanced options, filters) W-05: Workshop: Photoshop (layers, masks, channels, actions) W-06: Multimedia databases (basic concepts, feature extraction, searching) W-07: Digital video W-08: Workshop: Premier (MPEG-4 standards compression, Authoring) W-09: MIME. W-10: Digital sound. W-11: Workshop: Audition W-12: WWW. Hypertext. Hypermedia V-13: Workshop: Dreamweaver (HTML, CSS) V-14: Multimedia Programming V-15: Workshop: Adobe AIR, Adobe Flex.

4. Teaching methods:

Lectures, exercises.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	30.00	Written exam	Yes	50.00
Project defense	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Starčević, D., Štavljanin, V., Minović, M.	Multimediji	FON, Beograd	2020
2	Havaldar, P., Medioni, G.	Multimedia Systems: Algorithms, Standards, and Industry Practices	Boston, MA: Course Technology, Cengage Learning	2010

Teaching subject		Organizational systems dynamics
Subjecst designation:	01.US0004	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Milošević D. Pavle Rakićević M. Aleksandar

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to introduce students to the dynamics and techniques of modeling organizational systems, as well as to apply the concepts of systems thinking in the development of business strategies.

2. Educational outcomes (acquired knowledge):

Students will be able to:
• analyze organizational systems using a systems approach;
• use models to study the dynamics and predict the behavior of organizational systems;
• develop indicators to monitor the characteristics of organizational systems;
• develop automated strategies for solving organizational problems, simulate their application and analyze performance.

3. Course content/structure:

Theoretical teaching
Dynamic systems. Stable and unstable systems. Oscillatory systems. Modeling process. Problem identification. Model construction. Input transformation. Model parameter selection. Model testing. Sensitivity analysis of model parameters. Model interpretation and verification. Graphical model analysis. Stable points. Model structure. Autoregressive models. Polynomial models. Moving average models. Technical indicators. Graphical patterns. Current modeling. Volatility modeling. Sentiment modeling. Forecasting. Controllers. Automation of business strategies.

Practical teaching
Solving practical problems and program implementation in an appropriate software package or programming language (MATLAB, Python). Project development/software solution over a selected set of inputs.

4. Teaching methods:

The course is designed as a combination of traditional and electronic learning: Lectures, laboratory exercises, online education, case studies, consultations, mentoring.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Project assignment	Yes	50.00
Homework	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Петровић Б., Поледица А., Драговић, И., Ракићевић, А., & Милошевић, П.	Управљање системима Практикум у MATLAB-у	Београд: ФОН	2021
2	Петровић, Б. Ј.	Теорија система	ФОН	1998
3	John, S.	Business Dynamics: Systems Thinking and Modeling for a Complex World	New York: McGraw-Hill	2000
4	Giordano, F. R., Weir, M. D., & Fox, W. P.	A First Course in Mathematical Modelling	Belmont: Brooks/Cole	1997
5	Kissell, R. L.	The Science of Algorithmic Trading and Portfolio Management	Amsterdam: Academic Press	2014

Teaching subject		Databases 2
Subjecst designation:	01.IS0013	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Marjanović M. Zoran Luković S. Ivan Bjeladinović Lj. Srđa

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	IS0003	Databases	Yes	Yes

Conditions: None.

1. Educational goal:

Gaining fundamental knowledge of procedural SQL enhancements, advanced SQL functions, and non-relational database management systems.

2. Educational outcomes (acquired knowledge):

Students will be qualified to use procedural extensions of SQL and advanced SQL functions in relational databases. They will master the architecture and components of non-relational database management systems, design non-relational data models and use appropriate query languages to access data, and implement applications to update and display database data.

3. Course content/structure:

Theoretical teaching
Introductory teaching. ECA rules and triggers. Procedural superstructure of SQL and stored procedures. PL/SQL and T-SQL. Accessing the database from the software environment. Advanced SQL and analytical functions of SQL. Query optimization. NoSQL databases. CAP. BASE. Key-value and column family of NoSQL databases. Document-based NoSQL databases. Graph databases. Query languages in NoSQL databases. Message Queue solutions. New SQL databases. Hybrid databases. Exam preparation.

Practical teaching

Relational databases and their extensions: Recapitulation. Triggers as a technique for implementing ECA rules. Procedural superstructure of SQL and stored procedures. PL/SQL and T-SQL. Accessing a database from a software environment. Advanced SQL and SQL analytical functions. Query optimization: Practical examples. NoSQL databases. Key-value and column families of NoSQL databases. Document-oriented MongoDB and MongoDB QL. Graph database Neo4J and Cypher QL. Implementing Message Queue solutions. New SQL and hybrid databases. Exam preparation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real-life examples, accompanied by appropriate electronic presentations through interactive work with students.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	20.00	Written exam	Yes	65.00
Tests	Yes	10.00	Oral exam	Yes	5.00

Literature

NO..	Authors	Title	Publisher	Year
1	Лазаревић Б., Марјановић З., Аничић Н., Бабарогић С.	Базе поYестака	ФОН	2018
2	-	SQL:2016 standard (ISO/IEC 9075:2016)	International Organization for Standardization	2016
3	McCreary, D., Kelly, A.	Making Sense of NoSQL 1sted.	Manning Publications	2013
4	Harrison, G.	Next Generation Databases 1st ed.	Apress	2015

Teaching subject		Internet marketing and social media
Subjecst designation:	01.EP0015	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Barać M. Dušan Janičić R. Radmila Labus B. Aleksandra

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to introduce students to internet marketing, to master internet marketing techniques and social media tools in the development and implementation of an internet marketing plan.

2. Educational outcomes (acquired knowledge):

Students are trained to independently develop and implement an internet marketing plan using internet marketing and social media technologies, techniques, and tools.

3. Course content/structure:

Theoretical teaching
Introduction to digital marketing. Models of business presence on the Internet. Internet marketing plan. Internet marketing strategies. Omnichannel marketing. Internet marketing techniques and tactics. SEO techniques. Content marketing. Email marketing. Viral marketing. Referral marketing. Affiliate marketing. Mobile marketing. Social computing. Social media. Application of social networks in business. Business models and services of social networks. Social media marketing. Analysis of social network referrals (Social network analysis). Services and applications for customer relationship management. Crowdsourcing. Business intelligence in Internet marketing. Big data analytics in Internet marketing. Application of artificial intelligence in Internet marketing. Blockchain in Internet marketing. Trends in Internet marketing: video marketing, gamification, virtual reality in Internet marketing, Internet of intelligent devices in marketing, neuromarketing.
Practical teaching
Internet marketing plan. Wordpress CMS. Application of internet marketing techniques in the Wordpress content management system. SEO techniques. Application of Google services in internet marketing. Development of plugins for Wordpress. Creation of marketing campaigns on social networks. Facebook API. Twitter API. YouTube API. Instagram API. Analysis of messages from social networks: Gephi, VOSviewer, UCINET. CRM. SuiteCRM. Email marketing campaigns. MailChimp. Customization of CRM systems. Salesforce. Crowdsourcing. Platforms for developing chatbots. Implementation of chatbots in e-commerce systems.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Раденковић, М. ДеспотовићЗракић, З. БогYесновић, Д. Барађ, А. Лабус	Електронско пословање, поглавља 12. Интернет маркетинг, 13. Друштвени медији, 14. Управљање односима са клијентима, пп. 169-209	ISBN 978-86-7680-304-0; Faculty of Organizational Sciences, Belgrade	2015
2	D. Barać, V. Ratković-Živanović, M. Labus, S. Milinović, A. Labus	Fostering partner relationship management in B2B ecosystems of electronic media	Journal of Business & Industrial Marketing	2017
3	Milovanović, S., Bogdanović, Z., Labus, A., Barać, D., & Despotović-Zrakić, M.	An approach to identify user preferences based on social network analysis	Future Generation Computer Systems	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Internet marketing i društveni mediji, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs	-	2021
5	Б. Раденковић, М. ДеспотовићЗракић, З. БогYesновић, Д. Бараћ, А. Лабус, Т. Наумовић	Интернет маркетинг и друштвени медији, уџбеник у припреми	Faculty of organizational sciences	2022

Teaching subject		Reporting and data visualization tools
Subjecst designation:	01.IS0020	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Jovanović Z. Miloš Panterlić M. Ognjen

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Lectures accompanied by appropriate electronic presentations. Laboratory exercises based on illustrative and practical examples, through interactive work with students.

2. Educational outcomes (acquired knowledge):

Students will be able to analyze report requirements, design the architecture and components of data sources, use query languages for data access, as well as tools for reporting and data visualization.

3. Course content/structure:

Теоријска настава
Methodology for developing a reporting subsystem. Advanced SQL. Analytical SQL functions. Reporting tools within modern SUBPs. External reporting tools. Program libraries for creating reports. Ad-hoc reporting tools. Introduction to data visualizations. Advanced data visualization techniques. Dashboards. Cleaning and preparing data. Data integration with external data sources. Exam preparation.

Practical teaching
Analysis of user requirements for reports. Advanced SQL. Analytical SQL functions. Using reporting tools within modern SUBPs and external reporting tools. Using program libraries to create reports. Using a selected tool for ad-hoc reporting. Introduction to list visualizations. Advanced list visualization techniques. Creating dashboards in a selected tool. Cleaning and preparing lists. Integrating lists with external list sources. Exam preparation.

4. Teaching methods:

Classical Lectures and Exercises

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	• Јовановић М.	Презентације у е-форми са сајта одлучивање.фон.бг.ац.рс	ФОН	2020
2	-	SQL:2016 standard (ISO/IEC 9075:2016)	International Organization for Standardization.	2016
3	Сукновић, М., Делибашић, Б.	Пословна интелигенција и Системи за подршку одлучивању	ФОН	2010
4	Лазаревић Б., Марјановић З., Аничић Н., Бабарогић С	Базе поYestака	ФОН	2018

Стручна пракса	
Subjecst designation:	01.IST-SP
Number of ECTS:	3

Intership

Program(s) in which it is performed	IST - Information Systems and Technologies, Compulsory subject
UNO subjects	
Teachers:	

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
0.00	0.00	0.00	0.00	6.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the internship is for the student to gain direct and practical insight into the way companies that develop software for various purposes are organized and to learn about the methods and techniques of software development, as well as the methods of applying available technologies, through specific cases.

2. Educational outcomes (acquired knowledge):

Students' ability to independently perform basic engineering tasks and apply previously acquired theoretical and professional knowledge to solve specific engineering problems. Understanding the methods of organizing work in companies that develop software for various purposes, knowledge of software technologies and basic methodological approaches in software development.

3. Course content/structure:

Due to the specificity of each company, as well as the diversity of tasks performed by student interns, the content of the internship is formed for each student individually, in agreement with the management of the company in which the internship is performed.

4. Teaching methods:

During the internship, the student-intern performs regular engineering tasks under the supervision of an instructor (who is employed by the company where the internship is being conducted), participates in working meetings and participates in the work of the team to which he is assigned. According to the instructor's proposal, he prepares the analysis, specification and implementation of specific cases, which he presents in the internship diary. Writing an internship diary in which the student-intern describes the tasks received and the tasks he performed during the internship.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminar paper	Yes	50.00	Seminar paper defense	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Group of authors (2021), Instructions for conducting professional practice and writing a SP diary, electronic document, FON, Belgrade	Group of authors (2021), Instructions for conducting professional practice and writing a SP diary, electronic document, FON, Belgrade		/

Teaching subject		Discovering legality in processes
Subjecst designation:	01.IS0022	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Panterlić M. Ognjen

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring theoretical foundations and practical knowledge necessary for the application of techniques for discovering patterns in event data, which are available in modern information systems, with the aim of enabling students to use modern models, algorithms and techniques for analyzing and improving existing processes.

2. Educational outcomes (acquired knowledge):

Students will be able to Yes identify and apply key concepts and techniques for discovering patterns in processes, will be trained to create process models, prepare reports in appropriate formats, and independently analyze processes using modern software tools.

3. Course content/structure:

Theoretical teaching
Business Process Management. Fundamentals of business process modeling. Languages for business process modeling. Petri nets. BPMN and CMMN standards. Basic concepts of process science. Methodology for discovering regularities in processes. Event log and XES standards. Sources of event log inputs. Quality of event log inputs. Techniques for discovering process models based on event logs. Techniques for checking the consistency of process models and event logs. Process analysis and process model improvement. Preparation for the Exam.

Practical teaching:
Process modeling – simple examples. Process modeling – complex examples. Extracting and preparing event log inputs. Presentation and application of algorithms for discovering process models. Analysis of the consistency of process models and event logs. Presentation of individual software tools for discovering regularities in processes. Preparation for Seminar paper. Process analysis using software tools. Seminar paper preparation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real-life examples, through interactive work with students. Students work independently on a selected and approved topic in the form of seminar work.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminar paper	Yes	40.00	Oral exam	Yes	60.00

Literature

NO..	Authors	Title	Publisher	Year
1	Wil van der Aalst	Process Mining: Data Science in Action, second edition	Springer-Verlag Berlin Heidelberg	2016
2	Marlon Dumas, Marcello La Rosa, Jan Mendling, Hajo A. Reijers	Fundamentals of Business Process Management,second edition	Springer-Verlag Berlin Heidelberg	2018
3	Josep Carmona, Boudewijn F. van Dongen, Andreas Solti, Matthias Weidlich	Conformance Checking: Relating Processes and Models	Springer International Publishing	2018
4	Andrea Burattin	Process Mining Techniques in Business Environments	Springer International Publishing	2015
5	Bruce Silver	BPMN Method & Style: With BPMN Implementer's Guide, second edition	Cody-Cassidy Press	2011

Teaching subject		Business intelligence
Subjecst designation:	01.PO0001	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Vukićević Ž. Milan Jovanović Z. Miloš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Training students to: (a) analyze business problems and identify the need for business intelligence systems; (b) solve complex organizational information problems, taking into account the protection of personal data and ethical dilemmas; (c) independently develop and use business intelligence systems, apply tools for ad-hoc analysis and create dashboards; (d) independently apply basic methods and techniques for discovering patterns in data; (e) apply, synthesize and evaluate clustering models, classifications, association rules and recommendation systems; (f) develop decision support systems and model the knowledge of decision makers.

2. Educational outcomes (acquired knowledge):

Training students to: (a) analyze business problems and identify the need for business intelligence systems; (b) solve complex organizational information problems, taking into account the protection of personal data and ethical dilemmas; (c) independently develop and use business intelligence systems, apply tools for ad-hoc analysis and create dashboards; (d) independently apply basic methods and techniques for discovering patterns in data; (e) apply, synthesize and evaluate clustering models, classifications, association rules and recommendation systems; (f) develop decision support systems and model the knowledge of decision makers.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to business intelligence,
P-02: Fundamentals and applications of OLAP systems and data warehouses,
P-03: Development of data warehouses,
P-04: Fundamentals of reporting systems,
P-05: Development of reporting systems,
P-06: Introduction and discovery of regularities in data with case studies,
P-07: Algorithms for discovering regularities in data - descriptive methods,
P-08: Algorithms for discovering regularities in data - predictive methods,
P-09: Methodology of the project for discovering regularities in data,
P-10: Artificial neural networks,
P-11: Recommendation systems,
P-12: Knowledge in business intelligence,
P-13: Business intelligence systems that combine domain knowledge and pYestke,
P-14: Workgroup Support Systems,
P-15: Ethical Dilemmas in Business Intelligence Development.
Practical teaching
B-01: Business intelligence systems,
B-02: Fundamentals of data warehouses,
B-03: Ad-hoc reporting and data visualization,
B-04: Dashboards,
B-05: Project claim defense,
B-06: Work environment for software for detecting patterns in data, data preprocessing and data visualization,
B-07: Classification process in software for detecting patterns in data,
B-08: Clustering process in software for detecting patterns in data,
B-09: Association rules in software for detecting patterns in data,
B-10: Project claim defense,
B-11: Development of recommendation systems in software,
B-12: Project claim defense,
B-13: System for DEXi decision support,
W-14: Defense of project claims,
W-15: Protection of personal claims in the field of business intelligence.

4. Teaching methods:

Lectures are delivered through a combination of classical teaching, case studies and guest lectures by practicing experts..

The exercises are implemented in the classic way through solving Yestasks, but also through the presentation of software tools for business intelligence.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Сукновић, М., Делибашић, Б., Јовановић, М., Вукићевић, М.	Наставни материјали са Интернет адресе: http://odlucivanje.fon.bg.ac.rs/predmeti/osnove ne-studije/poslovna-inteligencija/	ФОН	2021
2	Сукновић М., Делибашић Б.	Пословна интелигенција и системи за подршку одлучивању	ФОН	2010

Teaching subject		Mobile computing
Subjecst designation:	01.IT0009	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Milovanović M. Miloš Milenković Ć. Ivan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Describe to students the architecture of a mobile computer, identify key differences from conventional computer architectures, and explain the key segments of a mobile computer. Identify important factors that influence the development of mobile applications with special emphasis on computer networks.

2. Educational outcomes (acquired knowledge):

Upon completion of the course, students will be able to apply the acquired knowledge for the development of applications on mobile computing devices.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to mobile computing. P-02: Wireless communications. P-03: Cores in wireless networks. P-04: Cellular networks: cores and technologies. P-05: Mobile operating systems. (Android) P-06: Mobile operating systems. (iOS) P-07: Hardware components in mobile computing P-08: Internet of things P-09: Natural user interfacesP-10: Mobile applications. (Android) P-11: Mobile applications. (iOS) P-12: Mobile applications. (Hybrid technologies) P-13: Elements of computer graphics in mobile computing (Android). P-14: Elements of computer graphics in mobile computing. (iOS) P-15: Elements of computer graphics in mobile computing. (Hybrid technologies)
Practical teaching
Course content
V-01: Examples of mobile computing technologies. V-02: Working with typical mobile devices and platforms. V-03: Examples of designing and implementing a Wi-Fi network. V-04: Examples of working with Bluetooth V-05: Features of AndroidOS and working with the development environment. V-06: Workshop: Creating an AndroidOS application. V-07: Features of iOS and working with the development environment. V-08: Workshop: Creating an iOS application. V-09: Designing a natural user interface V-10: Workshop: Creating a user interface prototype. V-11: Developing network applications with mobile services. V-12: Developing applications using sensor technologies. V-13: Managing the user interface. (AndroidOS) V-14: Managing the user interface. (iOS) V-15: User Interface Management. (Hybrid Technologies)

4. Teaching methods:

Lectures, exercises.
Lectures are conducted according to the ex cathedra model, the teacher uses a mandatory prepared presentation that is shown in the classroom via a projector. The teacher uses a blackboard and a marker for individual teaching units as needed.
Exercises are conducted in a regular classroom, where the teacher shows prepared presentations as well as specific tools via a projector. The teacher uses a blackboard and a marker for individual tasks. The teacher instructs students Yes to set up the necessary tools on their own computers and, according to the blended learning approach model, students work on their own computers in the classroom and at home.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	20.00	Written exam	Yes	50.00
Project/Seminar paper	Yes	30.00			

Literature

NO..	Authors	Title	Publisher	Year
1	J. McWherter, S. Gowell	Professional Mobile Application Development	Wrox	2012
2	A.F. Molisch	Wireless Communications	Wiley	2010
3	Dr. K Venkata Nagendra	MOBILE APPLICATION DEVELOPMENT - PRACTICAL APPROACH	Notion Press,ISBN-10 : 1648927998	2020
4	Mahesh Panhale	Beginning Hybrid Mobile Application Development	Apress, ISBN-10: 1484213157	2016
5	Kurose, Ros	Умрежавање рачунара	ЦЕТ, Београд	2018

Teaching subject		Scientific computing basics
Subjecst designation:	01.MATPRO	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Nikolić T. Nebojša Džamić Ž. Dušan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Demonstrating scientific computing methods and their applications in mathematics, computer science, and other sciences.

2. Educational outcomes (acquired knowledge):

Students will apply mathematical methods and independently construct and implement basic numerical calculation algorithms.

3. Course content/structure:

Theoretical teaching:
1. Languages and systems for preparing documents with mathematical formulas.
2. Mathematical modeling of problems.
3. Computational complexity (time and memory).
4. Approximation.
5. Methods of linear algebra and applications.
6. Methods for calculating eigenvalues and vectors with applications.
7. Methods for differentiation and integration and their applications.
8. Methods for solving differential equations with applications.
9. Methods of mathematical optimization and applications.
10. Fourier transform and applications.
11. Basic concepts of signal processing.
12. Calculations and simulations on networks.
13. Preparation for the Exam.

Practical teaching: Creating, implementing and applying methods from the area being studied in the course.

4. Teaching methods:

The classic method using a blackboard and computer presentations. Part of the exercises would be held on a computer.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	25.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Turner, Peter R., Arildsen, Thomas, Kavanagh, Kathleen	Applied Scientific Computing	Springer	2018
2	Gareth Williams	Linear Algebra with Applications	Jones & Bartlett Learning	2017
3	Claus Führer, Jan Erik Solem, Olivier Verdier	Scientific Computing with Python 3	Packt Publishing	2016

Teaching subject		Intelligent systems
Subjecst designation:	01.SI0010	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Jovanović M. Jelena Tomić B. Bojan Ševarac V. Zoran

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0005	Artificial intelligence	Yes	Yes

Conditions:

1. Educational goal:

To introduce students to the basic concepts, methodologies, and technologies of intelligent software applications. To enable them to develop practical skills in applying techniques and tools for developing intelligent applications.

2. Educational outcomes (acquired knowledge):

Students will be able to Yes briefly explain the concepts and technologies that form the basis for the development of intelligent software applications. They will also acquire the practical skills necessary for the development of applications of this type.

3. Course content/structure:

Theoretical teaching
Machine learning: methods and techniques for creating regression and classification models; clustering methods and techniques; feature engineering methods and techniques.
Neural networks.
Rule-based knowledge representation. Rule-based inference.
Graph-based knowledge representation (network structure). Network knowledge bases and their application in intelligent systems.
Practical teaching
Introduction to software libraries (Python, Java, R) and tools relevant to each of the theoretical areas. Application of these libraries and tools for implementing programs (in the chosen programming language) based on the introduced theoretical concepts, methods and techniques.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software libraries. Exercises in computer laboratories. Exercises are partly carried out by the teacher and followed by the students, and partly based on the independent work of the students, individually or in groups, with the help of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	30.00	Written exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	G. James, D. Witten, T. Hastie, R. Tibshirani.	An Introduction to Statistical Learning: with Applications in R	Springer	2021
2	S. Guido, & A. Müller	Introduction to Machine Learning with Python	O'Reilly Media	2016
3	Russell, S. J., Norvig, P., & Davis, E.	Artificial intelligence: a modern approach. 3rd ed.	Upper Saddle River, Nj: Prentice Hall.	2015
4	-	Документација и туторијали за софтверске библиотеке и алате који се обрађују на вежбама.	-	2020

Teaching subject		Business Economics and Planning
Subjecst designation:	01.Z00015	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Ilić J. Bojan Milić M. Tanja Backović M. Nemanja

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring knowledge and skills in the field of business economics and business planning relevant to modern management.

2. Educational outcomes (acquired knowledge):

Mastering theoretical approaches, methods and models in the field of business economics and business planning and the ability to apply them in practice.

3. Course content/structure:

Theoretical teaching
The concept and essence of business economics; defining and understanding a company - economic aspects; changes related to modern business; size and growth of a business; a company "without borders". The concept, types and analysis of costs; cost functions; cost dynamics; cost elasticity; opportunity costs; newer categories of costs in business economics. Revenue and profit; revenue categories and revenue behavior; current approaches to profit generation; incremental profit. Prices and business success of a company; price and non-price factors of competitiveness; pricing strategies. Assessment of business efficiency; efficiency indicators; economies of scale and economies of variety. Measuring profitability; new approaches to measuring business performance; balanced scorecard; application of benchmarking methods. Economic aspects of business networking; information resources of a company and information costs; network economics. Business planning process; approaches to planning; strategic and operational planning; stakeholder analysis. Determining strategic and operational goals, calculating and implementing appropriate plans. Business planning process models; alternative strategies; creating competitive advantages. Information systems for business planning. Application of modern business planning methods and techniques related to environmental analysis. Business planning methods and techniques related to the development and implementation of a business plan. Change planning, culture and business planning. Practical aspects of developing a business plan for a new business venture.
Practical teaching
Exercises follow the content and structure of Lectures and include: analysis of cases from practice, application of methods for calculating categories from business economics, application of business efficiency indicators, application of new approaches to measuring business performance, business strategy planning, development of a business plan, creative workshops.

4. Teaching methods:

Lectures with student participation in interactive teaching, presentation of practical examples, case studies, creative workshops, exercises in solving specific management problems, consultations in the process of preparing seminar papers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	70.00
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Милићевић В., Илић Б.	Економика пословања	Faculty of organizational sciences, Универзитет у Београду, Београд	2014
2	Милићевић В.	Стратегијско пословно планирање – менаџмент приступ	Faculty of organizational sciences, Универзитет у Београду, Београд	2014

Teaching subject		Microservice architecture IS
Subjecst designation:	01.IS0009	
Number of ECTS:	5	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject	
UNO subjects		
Teachers:	Petrović V. Marko	

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions:

1. Educational goal:

Acquiring theoretical foundations and practical knowledge necessary for the development of IS microservice architecture

2. Educational outcomes (acquired knowledge):

Students will be able to:
- Define the fundamental features, advantages and disadvantages of microservices IS architecture
- Analyze and solve basic IS development problems in microservices architecture
- Work practically with individual tools and technologies of microservices IS architecture
- Define the process and organization of IS development in microservices architecture

3. Course content/structure:

Theoretical teaching:
A brief overview of classical monolithic IS architectures. Basic characteristics of microservice architecture (MA). Comparison of monolithic architecture and MA.
Basic aspects and problems of MA implementation. Access to microservices (API gateway). Service discovery. Inter-service communication. Management of decentralized applications and distributed transactions. "CAP" and "PACELC" theorems. Domain events and "Event sourcing" project pattern. Implementation of long-running transactions via the "Saga" pattern using orchestration or choreography. Handling partial outages and errors, "circuit breaker" pattern. Microservice installation strategies.
Tools and technologies for microservice development based on virtual (Cloud) services. Virtual infrastructure as executable code. Packaging microservices into containers and container management (Docker, Kubernetes).
Microservices analysis and design. Domain Driven Design. Defining the scope and identifying microservices. Basic project patterns for implementing microservices (transactional script, aggregated objects). Microservices implementation process through development and operation integration (<eng<DevOps</eng>).
Agile development, continuous integration and delivery (CI/CD). MA development organization. Migration of existing monolithic applications.

Practical teaching:
Examples of monolithic architecture, SOA and microservices architecture. Comparative analysis of advantages and disadvantages. Practical work with technologies and tools for MA development. Obtaining virtual resources. Practical work with Docker containers. Implementation of elements of the “Event Sourcing” and “Saga” project pattern. Example of MA development and organization of that development.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Laboratory exercises based on illustrative and real-life examples, through interactive work with students.
After that, students work independently or in groups on a selected and approved topic.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Richards M., Ford N.	Fundamentals of Software Architecture: An Engineering Approach, 1st Edition	O'Reilly Media	2020
2	Lankhorst M.	Enterprise Architecture at Work: Modelling, Communication and Analysis (The Enterprise Engineering Series), 3rd Edition	Springer	2012
3	Vernon V.	Implementing Domain-Driven Design, 1st Editionv	Addison-Wesley Professiona	2013

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Vernon V.	Strategic Monoliths and Microservices: Driving Innovation Using Purposeful Architecture, 1st Edition	Addison-Wesley Professiona	2021
5	Richards M.	Software Architecture Patterns, ISBN: 9781491924242	O'Reilly Media	2015
6	Richards C.	Microservices Patterns: With examples in Java, 1st Edition	Manning	2018

Teaching subject		Game theory
Subjecst designation:	01.I00016	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Kuzmanović S. Marija Martić M. Milan Panić V. Biljana

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to provide students with advanced academic knowledge of the concepts, principles, models, and techniques of game theory, to enable them to think about economic and social phenomena from the perspective of rational agents, and to enable them to apply game theory concepts to modeling and analyzing strategic interactions in real-world problems.

2. Educational outcomes (acquired knowledge):

Students' ability to:
1. Modeling real-world problems using static and dynamic games,
2. Solving models, interpreting and critically analyzing solutions in conditions of bounded rationality of agents,
3. Strategic information management and applying strategic moves in business and other interactions,
4. Using software for modeling and solving games.
5. Strategic, analytical and critical thinking in the context of economic and social phenomena and interactions

3. Course content/structure:

Theoretical teaching: P01-P02. Introduction and general principles: Subject and goal of studying game theory. Basic concepts of game theory. Strategic thinking. Understanding the rules of the game. Rationality and common knowledge. The concept of equilibrium. P03-P06. Concepts and techniques: Games with simultaneous moves (static games). The concept of dominance. Mixed strategies and unpredictability. Nash equilibrium. Games with sequential moves (dynamic games). Sequential rationality and backward induction. Combination games. P07-P10. General classes of games and strategies: Cooperative and non-cooperative games. Characteristic games. "Prisoner's dilemma" - solution and application. Games with incomplete information. Strategic use of information. Strategic moves and credibility. P11-P15. Applications of game theory: Applications in economics, marketing, finance, computer science, political science. Military applications. Other applications.

Practical teaching (Exercises and creative workshops): Modeling strategic interactions. Business games. Characteristic games: "prisoner's dilemma", coordination game, "battle of the sexes", "coward" game, "hawk and dove" game, ultimatum game, trust games, etc. Analogy of characteristic games with real situations through examples. Methods and techniques for determining Nash equilibrium and perfect subgame equilibrium. Interpretation of equilibrium. Software for solving and simulating static and dynamic games. Case studies: price wars, market entry, strategic investment, negotiation, auctions, etc.

4. Teaching methods:

Lectures accompanied by appropriate presentations and multimedia content.
Exercises based on illustrative and real-life examples.
Creative workshops based on interactive work with students through case study analysis, experimental games and simulation.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	40.00
Homework	Yes	30.00			
Colloquiums	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Кузмановић, М.	Теорија игара	FON, Belgrade	2017
2	Стојановић, Б.	Теорија игара - елементи и примена	Службени гласник	2005
3	Dixit A., and Skeath S.	Games of Strategy, 2nd edition	Norton, New York	2004
4	Dixit A., and Nalebuff B.	Thinking Strategically	Norton, New York	1991

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	-	Lectures and exercises material		2020

Teaching subject		Internet of Things
Subjecst designation:	01.EP0009	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Bogdanović M. Zorica Labus B. Aleksandra

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to introduce students to the hardware and software infrastructure of the Internet of Intelligent Devices, as well as the principles of developing IoT applications and services for smart environments.

2. Educational outcomes (acquired knowledge):

Students are capable of designing, developing and implementing infrastructure and services for smart environments..

3. Course content/structure:

Theoretical teaching
Introduction to the Internet of Intelligent Devices. Intelligent devices. Network protocols in the Internet of Intelligent Devices: IPv6, WiFi, Bluetooth, ZigBee, 6LoWPAN, LORA. Application layer protocols: HTTP, HTTPS, REST, Web Socket, CoAP, MQTT, XMPP, AMQP, LWM2M. Sensor networks. LoRa technologies. M2M communication. Cloud computing and the Internet of Intelligent Devices. Cloud platforms for managing IoT systems: Xively, ThingSpeak, IBM Watson IoT, Microsoft Azure IoT Platform, Kaa, Mainflux. Big data and the Internet of Intelligent Devices. Smart environments. Smart cities. Smart homes. Smart classrooms. Smart offices. Smart traffic. Smart industry. The Internet of Intelligent Devices in trade, logistics and marketing. IoT and neuromarketing. Smart agriculture. Smart power grids. The Internet of Intelligent Devices in e-health. Wearable computing. Crowdsensing. Smart e-government. Security in IoT systems. Blockchain and the Internet of Intelligent Devices.
Practical teaching
Introduction to the Linux operating system as a platform for developing smart environments. Raspberry Pi microcomputer. Arduino platform for working with analog sensors. Designing smart environments. Setting up hardware and software infrastructure for developing smart environments. Developing Python applications for controlling smart environments. Developing smart environments using the Arduino platform for working with analog sensors. Developing smart environments using the Raspberry Pi microcomputer. Arduino-Raspberry Pi communication and connection. Configuring a virtual environment for developing applications for managing intelligent devices. Developing web applications and services for managing smart environments. Cloud platforms for managing IoT systems. Project development for developing smart environments and web applications for managing smart environments.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б.Раденковић, М.Деспотовић-Зракић, З.БогYесновић, Д.Бараћ, А.Лабус, Ж.Бојовић	Интернет интелигентних уређаја	ISBN:978-86-7680 FON, Belgrade	2017
2	Б.Раденковић, М.Деспотовић-Зракић, З.БогYесновић, Д.Бараћ, А.Лабус	Практикум из интернета интелигентних уређаја, електронско изYесње	FON, Belgrade	2017

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materials for the subject Internet of intelligent devices, in e-form, from the e-learning portal moodle.elab.fon.bg.ac.rs		2021

Teaching subject		Development of advanced e-business applications - project
Subjecst designation:	01.EP0006	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Despotović-Zrakić S. Marijana Barać M. Dušan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to teach students to independently research and, through practical work, solve current problems in the development of complex e-business applications and services.

2. Educational outcomes (acquired knowledge):

Students are capable of independently designing and developing innovative software solutions in e-business.

3. Course content/structure:

Theoretical
Development of advanced, distributed, scalable and business web applications. Design and implementation of complex IT ecosystems. Specifics of software development in the Internet and cloud environment. Advanced concepts of web application development. Full stack application development. Agile methods in e-business application development. Overview of architectures of modern e-business applications. Event-based software development. Service-oriented architectures. RESTful web services. Microservice architecture, Docker. Enterprise bus architecture. Hexagonal architecture. Overview of environments for developing advanced e-business applications. DevOps methodology. Overview of tools by DevOps methodology phases. Software development and version management, Git, Jira. Build tools, Maven, Gradle. Application testing, tools for automated software testing. Delivery management, Jenkins. Deploying applications to production, Ansible. Monitoring and controlling application performance, Nagios, Grafana. Application optimization and dynamic adaptation to the requirements of the real operating environment. Application scaling and load balancing, Kubernetes. Distributed caching, distributed storage management. Cloud platforms for application development, PaaS. Google services in advanced e-business applications. Introduction to blockchain application development: distribution, security of data, consensus, smart contracts.
Practical
Designing advanced e-business applications. Tools and development environments. Tools for software version management and control. GiT, Jenkins. Refactoring. Tools for optimization of coYes. Frameworks and technologies for developing Full stack applications. Server side: PHP (Symfony, Laravel, CakePHP), Python (Django, Flask), Nodejs, Meteor. Client side: AngularJS, ReactJS, VueJS. Redux. Advanced JavaScript libraries. Data layer: SQL/NOSQL (MariaDB, MongoDB, Redis). GraphQL. Modern technology stacks. Integration of e-business services and applications. Web service brokers. JSON API. Google services. Introduction to blockchain application development.
Project development: design and development of a complex e-business application for a specific problem. The project includes: Project assignment, project solution documentation, implementation documentation and analysis of the achieved results. Project defense is carried out in front of subject teachers and students of the E-Business Technologies module. Project documentation is delivered to the students of the module, and the subject teacher appoints one student who will be the opponent and whose Yes will be Yes based on the thoroughly studied documentation, prepares comments, questions and, with the help of subject teachers, leads a discussion during the project defense.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	M.Despotović-Zrakić, V.Milutinović, A.Belić (Eds)	High performance and cloud computing in scientific research and education, monografija, poglavlja 1-6	IGI Global	2014
2	M. Haverbeke	Eloquent JavaScript	No Starch Press	2018

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	E. Bush	Full-Stack JavaScript Development: Develop, Test and Deploy with Mongodb, Express, Angular and Node on Aws	Red Sky	2016
4	T.Ziade	Python Microservices Development	Packt Publishing	2017
5	C.Macrae	Vue.js: Up and Running: Building Accessible and Performant Web Apps	O'Reilly Media	2018
6	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Razvoj naprednih aplikacija elektronskog poslovanja - projekat, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021
7	C. Perez Sanchez, P. Solar Vilarino	PHP Microservices: Transit from monolithic architectures to highly available, scalable, and fault-tolerant microservices	Packt Publishing	2017

Teaching subject		Development of mobile applications and services - project
Subjecst designation:	01.EP0013	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Barać M. Dušan Labus B. Aleksandra

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the course is to introduce students to the principles of designing, developing, and implementing mobile applications and services.

2. Educational outcomes (acquired knowledge):

Students acquire theoretical and practical knowledge necessary for the development and implementation of mobile business systems.

3. Course content/structure:

Theoretical teaching
Fundamentals of mobile technologies. Wireless transmission technologies. Mobile networks. 5G. GPS, QR, RFID, Bluetooth and NFC technologies. Ubiquitous computing, Context-Aware and Wearable computing. Augmented reality. Mobile operating systems: Android, iOS. Design and development of mobile business applications. Specifics of software development in a mobile environment. Mobile application architectures. Mobile applications in IT ecosystems. Mobile application life cycle. Development platforms, languages, tools and environments for mobile application development: Java, Kotlin, Android Studio, Swift, xCode. Mobile application optimization. Mobile business services. Web services in a mobile environment. Development of multiplatform applications. Progressive web applications (PWA). Security in mobile applications. Development of mobile applications in a cloud environment. Performance management of mobile applications.
Practical teaching
Design and development of mobile business applications. Methodologies for managing mobile application development. Modern mobile application architectures and IT ecosystems. Development environments for designing mobile applications. Fundamentals of mobile application development. Development of Android mobile applications. User interface elements. Dynamic adaptability and internationalization of interfaces. Structure and mutual communication of Android application components. Mechanisms for message persistence. Working with SQLite message databases. Fragmentation, modularity and interface reuse. Techniques for compressing information in a limited space. System events and notifications in Android. Native functionalities of mobile phones. Implementation of location services in Android mobile applications. Technologies for message transfer. XML and JSON formats for message transfer. Mobile applications in REST architectures. Firebase services in mobile application development. Integration of mobile applications with cloud services. Development of iOS mobile applications. iOS Swift. Hybrid applications. React Native. Ionic. PWA.
Project development: the project contains a Project assignment, project solution documentation, implementation documentation and analysis of the achieved results. The project defense is carried out in front of the subject teachers and students of the Electronic Business Technologies module. The project documentation is delivered to the module students, and the subject teacher appoints one student who will be the opponent and whose Yes will be Yes based on the thoroughly studied documentation, prepares comments, questions and, with the help of the subject teachers, leads a discussion during the project defense.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Раденковић, М. ДеспотовићЗракић, З. БогYесновић, Д. Бараћ, А. Лабус	Електронско пословање, поглавље 19. Мобилно пословање, пп. 261-272	ISBN 978-86-7680-304-0; Faculty of Organizational Sciences, Belgrade	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Barać, D., Radenković, M., & Jovanić, B.	Mobile Learning Services on Cloud. In Handbook of Research on High Performance and Cloud Computing in Scientific Research and Education, eds. M.Despotović-Zrakić, V.Milutinović, A.Belić, pp. 147-172	IGI Global	2014
3	Milutinović, M., Labus, A., Stojiljković, V., Bogdanović, Z., & Despotović-Zrakić, M.	Designing a mobile language learning system based on lightweight learning objects	Multimedia Tools and Applications	2015
4	R. Meier	Professional Android 4 Application Development, 4th edition		2018
5	M. Neuburg	iOS 12 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics, 1st Edition	O'Reilly Media	2018
6	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Razvoj mobilnih aplikacija i servisa - projekat, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021

¤	T
Subjecst designation:	01.IS0012
Number of ECTS:	5

Business information systems

Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects	
Teachers:	Panterlić M. Ognjen

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Understanding and implementing business information systems, mastering the basic concepts of ready-made integrated software solutions.

2. Educational outcomes (acquired knowledge):

The student will be able to Yes explain the characteristics of business information systems, analyze business systems and Yes select the appropriate ones for implementation. Distinguish and classify specific types of IS and their processes.

3. Course content/structure:

Theoretical teaching
Integrated order processing. IS development and marketing. IS procurement and storage, IS quality system. IS production and maintenance. IS finance and accounting, IS human resources, IS development – ERP packages. IS in services – specifics. IS supply chains. IS e-business and public sector. IS management. IT economics. Standards in IT business. Exam preparation.

Practical teaching:
Process modeling. Process modeling – more complex examples. Process modeling using software. Order dictionary. Order modeling. Order modeling – more complex examples. Order modeling using CASE tools. Using SQL query language. ERP MS NAV and SAP ERP – basic features. Independent work with ERP MS NAV and SAP ERP system. Preparation for Seminar paper. Using Power Designer. Seminar paper preparation. Written exam preparation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Laboratory exercises based on illustrative and real-life examples, through interactive work with students. Students independently prepare a defended project (Seminar paper).

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminar paper	Yes	40.00	Oral exam	Yes	60.00

Literature

NO..	Authors	Title	Publisher	Year
1	Огњен Пантелић, Ана Пајић Симовић	Збирка задатака из пословних информационих система	ИСБН 978-86-7680-355-2	2019
2	David, L. Olson, Subodh, K.	Enterprise Information systems	World Scientific	2010
3	David, L.Olson	Managerial issues of Enterprise resource planning systems	Univesity of Nebraska	2004
4	Bocij, P., Greasley, A., Hickie S.	Business information systems: technology, development and management for the modern business	Pearson	2019
5	Wigand, R., Mertens, P.	Introduction to Business Information Systems	Springer	2003
6	Огњен Пантелић	Power Designer – skripta	ФОН	2009
7	Пантелић О., Бјеладиновић С .	Материјали у е-форми са сајта is.fon.bg.ac.rs	ФОН	2019

Teaching subject		Interpersonal skills in organization
Subjecst designation:	01.I00068	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Kovačević Z. Ivana Anđelković Labrović Z. Jelena Ivanović R. Tatjana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Developing the interpersonal skills of an individual necessary for working in a modern work environment by applying the techniques necessary for understanding oneself, understanding others, understanding team work, and assuming a leadership role.

2. Educational outcomes (acquired knowledge):

Students understand the concept of self-awareness and are able to Yes apply self-reflection tools. They are able to Yes analyze and critically evaluate the behavior, attitudes, values, and needs of others. Through teamwork, they demonstrate communication skills, constructive participation in team work, and problem-solving techniques in group processes. They are able to Yes define their own leadership style, value leadership skills, and assess the importance of acquired personal competencies for managing interpersonal relationships in a business environment.

3. Course content/structure:

Theoretical teaching
Developing self-awareness: Understanding behavior, attitudes, values, and needs. Using self-reflection tools. Planning and goal setting.
Understanding the behavior of others: Developing communication skills (active listening, message formulation, constructive feedback, understanding the context of communication, controlling emotions). Individual differences in communication. Communication styles. Understanding nonverbal communication and unconscious messages. Communication skills in a digital environment. Developing skills for accepting diversity. Errors in perceiving other people.
Developing skills needed for working with others: Individual differences and adapting to team roles. Facilitation and inhibition of group processes and group dynamics. Group problem solving. Group decision-making. Conflict resolution.
Developing leadership skills: Motivating employees. Leadership styles. Mentoring and coaching. Meeting management. Empowering individuals through delegation. Leading virtual teams.

Practical teaching
Developing self-awareness: Applying self-reflection tools. Self-assessment exercises (Johari window, cognitive style, emotional reactions, personality traits). Goal-setting exercises.
Understanding the behavior of others: Recognizing personal communication style. Training in active listening, assertiveness and constructive feedback.
Developing skills needed to work with others: Group problem-solving and group decision-making exercises. Developing conflict resolution skills through role-playing.
Developing leadership skills: Practicing motivation techniques. Identifying leadership style. Simulating a business meeting.

4. Teaching methods:

Lectures, interactive teaching: workshop process, group discussion, case study, role playing, simulations, mentoring and teamwork.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical teaching	Yes	60.00	Written exam	Yes	40.00

Literature

NO..	Authors	Title	Publisher	Year
1	Janasz, D.	Interpersonal skills in organisation	Tata McGraw-Hill Education	2006
2	Robbins, S., & Hunsaker, P. L.	Training in interpersonal skills: Tips for managing people at work	Pearson Higher Ed	2011
3	Бојановић, Р.	Психологија међуљудских односа	ДПС, Београд	2009

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Вујић, Д	Компетенције за рад и руковођење	ДПС, Београд	2015
5	Дуцк, С.	Односи међу људима	НаклаYes, Слап. Загреб	2014

Teaching subject		Machine learning
Subjecst designation:	01.I00017	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject IST - Information Systems and Technologies, Compulsory subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Jovanović Z. Miloš Obradović B. Zoran

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Students are able to: (a) analyze a business problem and Yes apply machine learning algorithms to various business problems in a protected software environment; (b) interpret the results obtained by machine learning algorithms; (c) compare different machine learning algorithms and analyze their success; (d) apply machine learning models; (d) use programming languages and libraries for practical model development.

2. Educational outcomes (acquired knowledge):

Students possess advanced academic and professional knowledge in the field of machine learning. They independently analyze business problems and apply machine learning algorithms to different business problems in a protected software environment. They independently compare different machine learning algorithms and evaluate their success. Students create machine learning models and optimize the appropriate hyperparameters of these algorithms. They independently interpret the results obtained by machine learning algorithms and evaluate their applicability in an organizational environment. Students can Yes use programming languages and libraries to create machine learning models, Yes organize code, and work in a team to solve a common problem. Also, students have a positive attitude towards the importance of models and are aware of their implications in the wider environment.

3. Course content/structure:

Theoretical teaching
P-01: Introduction and applications of machine learning,
P-02: Classification problem and nearest neighbor algorithmYes,
P-03: Algorithm evaluation and overtraining problem,
P-04: Decision trees,
P-05: Naive Bayes algorithm,
P-06: Bayesian networks,
P-07: Logistic regression,
P-08: Artificial neural networks,
P-09: Algorithm ensembles 1,
P-10: Algorithm ensembles 2,
P-11: Estimation problem and algorithms,
P-12: Clustering problem and basic algorithms,
P-13: Improvements and advanced clustering algorithms,
P-14: New trends in machine learning
P-15: Applications of algorithms (analysis of text, images, human movements, recommendations)

Practical teaching
V-01: Mathematical foundations of machine learning,
V-02: Classification problem and nearest neighbor algorithmYes,
V-03: Algorithm evaluation and overtraining problem,
V-04: Decision trees,
V-05: Naive Bayes algorithm,
V-06: Bayesian networks,
V-07: Logistic regression,
V-08: Artificial neural networks,
V-09: Algorithm ensembles 1,
V-10: Algorithm ensembles 2,
V-11: Estimation problem and algorithms,
V-12: Clustering problem and basic algorithms,
V-13: Improvements and advanced clustering algorithms,
V-14: New trends in machine learning
V-15: Applications of algorithms (text, image, human movement analysis, recommendations)

4. Teaching methods:

Lectures are implemented through a combination of classical teaching, case studies and guest lectures by experts from practice. Exercises are implemented in the classical way through solving problems, but also using appropriate programming languages for machine learning. Auditory exercises and laboratory exercises are held in the computer room.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Делибашић Б., Сукновић М., Јовановић М.	Алгоритми машинског учења за откривање законитости у поYесцима	ФОН	2009
2	Сукновић, М., Делибашић, Б., Јовановић, М., Вукићевић, М.	Наставни материјали са Интернет адресе: http://odlucivanje.fon.bg.ac.rs/predmeti/osnovne-studije/masinsko-ucenje/	ФОН	2021
3	Николић М., Зечевић А.	Машинско учење	Универзитет у Београду - Математички факултет	2019
4	Bishop C.	Pattern Recognition and Machine Learning	Springer	2006

Teaching subject		Performance analytics - basic concepts
Subjecst designation:	01.000053	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Martić M. Milan Savić I. Gordana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	000001	Operations Research 1	Yes	Yes

Conditions:

1. Educational goal:

The goal is for students to become familiar with the basic concepts of performance analysis using Derivative Envelopment Analysis (DEA) as well as the application procedure, creating and solving models in a spreadsheet environment or using specialized software.

2. Educational outcomes (acquired knowledge):

After passing the Exam, students will be able to:
1. understand the field of performance analytics using mathematical modeling methods,
2. become familiar with the method and procedure for applying static DEA models,
3. create and solve DEA models in a spreadsheet environment and use specialized software,
4. collect and analyze data, analyze results and create reports with recommendations for performance improvement,
5. аналитички и критички размишљају и раде у тиму.

3. Course content/structure:

Theoretical teaching
1-2. Performance measures and methods. 3. Benchmarking and comparative performance analysis. 4. Quantitative models for performance assessment. 5. Input envelope analysis - DEA method. 6-7. Basic static DEA models. 8. Basic extensions of DEA models. 9. DEA models for ranking efficient units. 10. Procedure for applying the DEA method. 11. Analysis and interpretation of results. 12. DEA software. 13. 14. Applications in banking and healthcare. 15. Applications in education and other applications.
Practical teaching: Exercises and creative workshops
1-2. Defining performance measures. Procedure for defining performance measures and analysis of raw inputs. 3. Mathematical models LP (primal-dual complementarity) and application of MS Excel solver for solving. 4. Basic primary DEA models. 5. Input and output-oriented DEA models - graphical representation. 5. Basic CCR model and BCC model. 6. Model creation in a spreadsheet environment (VBA). 7. Target inputs and outputs. 8. DEA models for ranking efficient units, cross-efficiency matrix, 9. Specialized software for DEA. 10-11. Case study (practical analysis in a spreadsheet environment). 12-15. Practical applications (e.g. banking, healthcare, education, transport, R&D projects, IS, etc.).

4. Teaching methods:

Lectures are accompanied by appropriate presentations and illustrations. Exercises are based on the use of MS Excel (VBA) and specialized DEA software. Students will analyze data, obtain results and use them to improve performance through case studies and a final project.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	30.00
Practical teaching	Yes	10.00			
Project presentation	Yes	50.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Крчевинац С., Чангаловић М., Вујчић В., Мартић М., Вујошевић М.	Операциона истраживања 1	FON, Belgrade	2012
2	Мартић М.	Анализа обавијених поYестака са	FON, Belgrade	1999

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	Савић Г.	Компаративна анализа ефикасности у финансијском сектору	FON, Belgrade	2012
4	Cooper W, Seiford L, Tone K.	Introduction to Data Envelopment Analysis and its Applications, With DEA-Solver Software	Springer	2006
5	Zhu, J.	Data Envelopment Analysis A Handbook of Models and Methods. Springer.	Springer	2020

Teaching subject		Econometric models and forecasting
Subjecst designation:	01.000051	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Ignjatović P. Marina

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introduction to econometric models, regression analysis, simultaneous equation models and time series analysis, as well as problems related to these models. Application of statistical software packages for implementing econometric methods and models and time series analysis.

2. Educational outcomes (acquired knowledge):

The course highlights the broad possibilities of applying econometrics and time series analysis methods and models in various fields and equips students with the skills to apply them..

3. Course content/structure:

Theoretical teaching
Methodology of econometric research. Linear regression models (LRM); Least squares method (LSM); LRM with two variables; Parameter estimation using LSM; Hypothesis testing and confidence intervals for LRM parameters; LRM with several variables; Multicollinearity; Heteroskeletality; Autocorrelation; Simultaneous equations; Dummy variables; Logistic regression; Panel data; Random processes and time series; Stationary time series; Autocorrelation and partial autocorrelation function; Methods of analysis of stationary time series. AR models, MA models, ARMA models; Nonstationarity. Linear trend; Nonstationary time series; Unit root test; ARIMA models; Time series forecasting techniques.
Practical teaching
Linear regression models (LRM). Analysis in statistical software packages (ASSP); Least squares method (LSM). ASSP; LRM with two variables. Parameter estimation using LSM. ASSP; Hypothesis testing and confidence intervals for LRM parameters. ASSP; LRM with multiple variables; Multicollinearity. Heteroskeletality. Autocorrelation. ASSP; Simultaneous equations; Time series; Stationary time series; Autocorrelation and partial autocorrelation function. ASSP; Methods of analysis of stationary time series. AR models, MA models, ARMA models. ASSP; Nonstationarity. Linear trend. Nonstationary time series. Unit root test. ASSP; ARIMA models. ASSP; Time series forecasting techniques. ASSP.

4. Teaching methods:

on the computer, individual, group and practical work

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Colloquiums	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Hill, C., Griffiths, W., Lim, G.	Principles of Econometrics	Wiley	2018
2	Gujarati, D.	Basic Econometrics	McGraw-Hill Education	2008
3	Shumway, R,Stoffer, D.	Time Series Analysis and Its Applications: With R Examples	Springer	2017
4	Box G., Jenkins G., Reinsel G.	Time Series Analysis:Forecasting and Control	Wiley	2015

Teaching subject		Legal foundations of information systems
Subjecst designation:	01.000043	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Čudanov J. Mladen Krivokapić B. Đorđe

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions:

1. Educational goal:

Training students to understand the legal aspects of the application of information systems and phenomena related to computer networks.

2. Educational outcomes (acquired knowledge):

Students can use advanced knowledge, abilities, and skills in solving practical problems.

3. Course content/structure:

Theoretical teaching
The concept, development and importance of Computer and Cyber law. Information society. Application of information and communication technologies and human rights. Personal data. Privacy and data protection. Protection of privacy. Protection of organizational data. Protection of software and computer programs by intellectual property law: patent, trademark, copyright. law of unfair competition, copyright, trade secret. Protection of databases by related law, sui generis law, copyright and the right to protection against unfair competition. Abuse of intellectual property on the Internet. Computer crime: concept, types, characteristics. Cyber crime. Victims of computer and cyber crime. Digital evidence. Detection. Cyber forensics. Court proceedings. Legal aspects of electronic business.
Practical teaching: Exercises, Other forms of teaching, Study research work
The concept of Computer and Cyber Law. Personal data and protection. Commissioner for information of public importance and protection of personal data: rights, obligations and competences. Establishment of business organizations for the provision of information and communication services. Information and communication technologies and intellectual property. Patent registration. Copyright protection. Copyright agreement. Computer crime. Cyber crime. Cyber forensics. Collecting digital evidence. Forensic tools. Preparing digital evidence for court. Electronic business.

4. Teaching methods:

Discussion method, demonstration method, debate, case study, learning through collaborative work on solving practical problems, independent student research and problem solving based on the received proposals, consultations in developing a project proposal and independent student work through learning and developing a project proposal. Exercises are carried out via the e-learning application MOODLE.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	He	2.00	Tests	Yes	30.00
Project assignment	Yes	15.00	Oral exam	Yes	20.00
Case study	Yes	15.00			
Tests	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Дракулић М	Основи Компјутерског права	Друштво операционих истраживача Југославије – ДОПИС, Београд,	1996
2	Bainbridge D.	Computer Law	Harlow, Pearson Longman	2000
3	Младеновић Д., Дракулић М., Јовановић Д.	Међународно право и cyber ратовање	Војно дело, Year ЛХИИИ, пролеће/2012. стр. 9–39.	2012
4	Хестер М., Форд П.	Компјутери и етика у сајбер добу	Београд, Службени гласник	2009

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	Reed C	Computer Law	Oxford University Press, Oxford	2011

Teaching subject		Process analysis and Petri nets
Subjecst designation:	01.000050	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Makajić-Nikolić D. Dragana

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to enable students to model and analyze processes using techniques based on Petri nets using modern software tools.

2. Educational outcomes (acquired knowledge):

After passing the Exam, students will be able to:
1. recognize processes and their structure, dynamics and role in complex systems,
2. model processes using Petri nets,
3. simulate and analyze processes,
4. use software for modeling and analyzing processes using Petri nets,
5. analyze results and develop plans for process reengineering.

3. Course content/structure:

Theoretical teaching: Definitions and characteristics of processes. Process modeling. Dependency management and coordination mechanisms. Decomposition, specialization, synchronization. Conflicting and competing processes. Alternative process modeling techniques. Historical development, definition and dynamics of Petri nets. Classification of Petri nets. Colored Petri nets. Temporal and hierarchical Petri nets. Stochastic and phase Petri nets. Properties of Petri nets. Methods for analyzing Petri nets: invariants, incidence matrix, state equation, reachability tree. Simulation of Petri nets. Verification and validation of Petri net models. Overview of Petri net applications.

Practical teaching (auditorium and laboratory exercises):
Identification and analysis of processes. Types of dependencies in processes and types of coordination mechanisms. Decomposition and specialization of processes. Introduction to CPN Tools software. Creating Colored Petri Nets, declarations and descriptions on the net. Basic and derived types of lists. Complex types of lists. Control structures in Colored Petri Nets. Time types of lists. Distributions of random variables. Stochastic Petri Nets. Hierarchical Petri Nets. Simulation of Petri Nets. Monitors. Modeling and simulation of classical and real problems.

4. Teaching methods:

Classical method (ex cathedra) using a blackboard, computer, projector, solving short case studies in the computer room.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	30.00
Practical teaching	Yes	20.00			
Project assignment	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Jensen, K.	Coloured Petri nets: basic concepts, analysis methods and practical use (Vol. 1)	Springer Science & Business Media	2013
2	van der Aalst, W. M., & Stahl, C.	Modeling business processes: a petri net-oriented approach.	MIT press	2011
3	Макајић-Николић, Д.	Примена обојених Петријевих мрежа у реинжењерингу пословних процеса	FON, Belgrade	2002

Teaching subject		Digital economy
Subjecst designation:	01.000046	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Ilić J. Bojan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring knowledge and skills in the field of digital economy relevant from the aspect of the connection between trends in modern business and changes in the field of information and communication technologies.

2. Educational outcomes (acquired knowledge):

Competencies related to the complexity of business in the conditions of digitalization.

3. Course content/structure:

Theoretical teaching
Characteristics of the digital economy. Business virtualization. Specificities of the electronic market. Value engineering. Adaptive efficiency of the digital economy. Performance measurement in the digital economy. The importance of external benchmarking. Virtual value chain and the advantages of outsourcing. Information economics. The importance of information and communication technologies for creating competitive advantages. Network externalities and the application of project pricing methods. Methods of improving profitability in the digital economy. Application of software for simulating business results. Competitive strategies in the digital economy. Drawing up a business plan for a business venture in the conditions of the digital economy.

Practical teaching
Exercises follow the content and structure of Lectures and include: analysis of practical cases, value engineering - application of the Yes method, creative workshops, application of new approaches to measuring business performance in the conditions of the digital economy, exercises using the Internet, application of software in the digital economy.

4. Teaching methods:

Lectures with student participation in interactive teaching, presentation of practical examples, case studies, exercises using the Internet, creative workshops, application of software, exercises in solving specific business problems related to the digital economy, consultations in the process of preparing seminar papers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	70.00
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Милићевић В.	Интернет економија (делови књиге)	Faculty of organizational sciences, Универзитет у Београду, Београд.	2002
2	Илић Б., Милићевић В.	Менаџмент трошкова – стратегијски оквир, (делови књиге)	Faculty of organizational sciences, Универзитет у Београду, Београд	2009
3	Chaffey D.	E-Business and e-Commerce Management, Strategy, Implementation and Practice(делови књиге)	Prentice Hall, Financial Times, Harlow	2011
4	Øverby H. and Audestad J.,	Digital Economics: How Information and Communication Technology is Shaping Markets, Businesses, and Innovation (делови књиге)	CreateSpace Independent Publishing Platform	2018

Teaching subject	**Software quality basics**
Subjecst designation: 01.SI0013	
Number of ECTS: 5	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject
UNO subjects	
Teachers:	Milić Ž. Miloš

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introduction to software quality concepts, methodologies and techniques. Introduction to software quality standards. Application of software quality analysis tools. Developing a critical perspective on the software development process using methodologies, techniques, standards and tools for software quality analysis.

2. Educational outcomes (acquired knowledge):

Training students for independent software development by applying concepts, methods, techniques and tools for software quality analysis.

3. Course content/structure:

Theoretical teaching
Non-functional software requirements. Software quality standards: a) standards of international standardization organizations; b) standards of professional associations; c) industry standards. Software quality models. Software quality attributes (quality characteristics and subcharacteristics). Software metrics. Software quality standards in the function of improving software systems.

Practical teaching
Identification of non-functional software requirements and key software quality attributes. Development of software systems with a focus on quality. Application of standards and software quality models. Application of software metrics in the process of software quality evaluation. Application of tools for analyzing the quality of software systems. Practical work on a case study

4. Teaching methods:

Lectures in the classroom using computers, the Internet, integrated software environments and tools. Exercises in computer laboratories, in small groups. Part of the exercises is performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	30.00
Seminars	Yes	30.00	Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Kan, S. H.	Metrics and models in software quality engineering	Addison-WesleyLongmanPublishing Co., Inc.	2002
2	Tian, J.	Software quality engineering: testing, quality assurance, and quantifiable improvement	John Wiley&Sons	2005
3	Милић, М.	СтанYesрди квалитета софтвера у функцији поболјшања софтверских система.	Задужбина Андрејевић	2018

Teaching subject		Software development and maintenance
Subjecst designation:	01.SI0014	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Vlajić S. Siniša Lazarević D. Saša Milić Ž. Miloš

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Introduction to key concepts, problems and solutions in software development and maintenance. Understanding and applying principles and methods of software development and maintenance. Training in:
• software development: gathering requirements, analyzing, designing, implementing, testing, installing and administering applications;
• software evaluation: measuring application performance and optimizing them; applying basic software метрика.

2. Educational outcomes (acquired knowledge):

Students' ability to develop and maintain software.

3. Course content/structure:

Theoretical teaching:
1. Systems-theoretical approach to software development
1.1. The concept of a system; System classification; Cybernetic (managed) systems; Discrete stochastic systems;
1.2. Business systems and business systems management; Business systems modeling; Information system;
2. Software development
2.1. Phases (conceptualization, specification, implementation, exploitation) and activities (requirements, analysis, design, implementation, testing);
2.2. Conceptualization (problem formulation: collection and analysis of user requirements; model of the system under consideration /functions, classes of inputs and processes/);
2.3. Specification (problem solution model: specification of software requirements; software specification /structure, processes, I/O, architecture/);
2.4. Implementation (problem solving, i.e. software: infrastructure /HW, OS, network; PaaS/; physical and logical architecture; database implementation; program implementation; user interface implementation; software module/component testing; testing of the entire software system);
2.5. Operation (software use: software delivery, use and improvement);
3. Software maintenance
3.1. Basic concepts; Types of maintenance; Maintenance costs; Software evolution;
3.2. Maintenance process; Maintenance activities;
3.3. Maintenance techniques: reengineering, reverse engineering, migration, withdrawal;
3.4. Software maintenance tools;
3.5. Program maintenance and administration - example;
3.6. Database maintenance and administration - example;
4.Study example
Practical teaching: The exercises are fully aligned with the lessons, both in structure and content.

4. Teaching methods:

Lectures: Lectures ex cathedra and multimediaLectures; study examples.
Exercises: work in a computer classroom, solving problems, programming.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	30.00
Colloquiums	Yes	30.00	Oral exam	Yes	20.00
Seminar paper	Yes	10.00			

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
1	C. Althoff	Self-Taught Programmer: The Definitive Guide to Programming Professionally	Triangle Connection LLC	2016
2	M. Keeling	Design It!: From Programmer to Software Architect	Pragmatic Bookshelf	2017
3	R. C. Martin	Agile Software Development, Principles, Patterns, and Practices	PNIE, Pearson	2013
4	R. C. Martin, Micah Martin	Agile Principles, Patterns, and Practices in C#	Prentice Hall	2006
5	R. C. Martin	Clean Architecture: A Craftsman's Guide to Software Structure and Design	Prentice Hall	2017
6	R. C. Martin	Clean Code: A Handbook of Agile Software Craftsmanship	Prentice Hall	2008
7	R. C. Martin	Clean Agile: Back to Basics	Prentice Hall	2019
8	R. C. Martin	Clean Coder: A Code of Conduct for Professional Programmers	Prentice Hall	2011
9	Д. Иветић	Структурирани приступ програмирању	ФТН ИзYesваштво, Нови Сад	2005
10	B.W. Kernighan, R. Pike	The Practice of Programming	Addison-Wesley	1999
11	D. Sarka, W. Durkin, M. Radivojević	SQL Server 2017 Developer’s Guide: A professional guide to designing and developing enterprise database applications	Packt Publishing, 2/e	2018
12	Peter A. Carter	Pro SQL Server 2019 Administration: A Guide for the Modern DBA, 2/e	Apress	2019
13	Ian Griffiths	Programming C# 8.0: Build Cloud, Web, and Desktop Applications	O'Reilly Media	2020
14	Holger Schwichtenberg	Modern Data Access with Entity Framework Core: Database Programming Techniques for .NET, .NET Core, UWP, and Xamarin with C#	Apress	2018
15	Mark J. Price	C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development: Build applications with C#, .NET Core, Entity Framework Core, ASP.NET Core, and ML.NET using Visual Studio Code, 4/e	Packt Publishing	2019
16	Bipin Joshi	Beginning Database Programming Using ASP.NET Core 3: With MVC, Razor Pages, Web API, jQuery, Angular, SQL Server, and NoSQL, Kindle Edition	Apress	2019

Teaching subject		Neural networks
Subjecst designation:	01.US0002	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Dragović T. Ivana Poledica M. Ana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the course is to introduce students to basic theoretical concepts, different architectures and training methods, as well as to equip them with the skills to analyze, model and simulate systems using artificial neural networks.

2. Educational outcomes (acquired knowledge):

Students are trained to:
understand the theoretical concepts underlying neural networks;
apply input preprocessing techniques;
model systems using neural networks and adjust their parameters;
implement neural networks in a selected programming language and apply them to solving real-world problems in various fields

3. Course content/structure:

Theoretical teaching
Basic concepts, mathematical basis. Neuron model and architecture of artificial neural networks (activation functions and weighting coefficients). Perceptron, single-layer linear networks and multilayer networks. Learning process, supervised and unsupervised learning. Backpropagation algorithm. Input collection and preprocessing, techniques for processing non-numeric and missing values. Network performance optimization. Network testing and cross-validation. Recurrent neural networks. Associative learning (Hebb's rule and Kohonen's rule). Competitive learning (Hamming network). Radial (RBF) neural networks. Application of neural networks to solve regression, classification and clustering problems. Advantages and limitations, stability

Practical teaching
Solving practical problems from the above areas and program implementation in the appropriate software package or programming language (MATLAB, Python). Project development/software solution over the selected set of problems

4. Teaching methods:

The course is designed as a combination of traditional and electronic learning. Lectures, laboratory exercises, on-site education, case studies, consultations, mentoring.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Project assignment	Yes	70.00
Homework	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Петровић, Б., Поледица, А., Драговић, И., Ракићевић, А., Милошевић, П., Вукићевић А., & Зукановић, М.	Рачунарска интелигенција Практикум у MATLAB-у	Београд: ФОН	2021
2	Hagan, M., Demuth, H., Beale, M., & De Jesus O.	Neural Network Design (2nd ed.)	Martin Hagan	2014
3	Haykin, S.	Neural Networks (2nd ed.)	New York: Prentice Hall	1994

Teaching subject		Computational intelligence basics
Subjecst designation:	01.US0003	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Poledica M. Ana Dragović T. Ivana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to acquire basic academic knowledge about the fundamental concepts and methods of computational intelligence (phase logic, neural networks and evolutionary computing) and their application in solving practical problems.

2. Educational outcomes (acquired knowledge):

Students are able to:
• explain the theoretical concepts of computational intelligence methods;
• analyze their advantages, disadvantages, and limitations in application;
• apply fuzzy logic, neural networks, and evolutionary computing methods to solve real-world problems;
• develop intelligent, hybrid, and adaptive systems in a supported programming language and Yes apply them in different domains.

3. Course content/structure:

Theoretical teaching
Overview and historical development of computational intelligence methods. Classical and fuzzy sets, normalization and fuzzification. Operations on fuzzy sets, fuzzy arithmetic. Fuzzy inference systems, MamYesni and Sugeno systems. Fuzzy control systems. Basic elements and functioning of artificial neural networks. Types of neural networks. Network architecture. Activation functions and weight coefficients. Training rules and learning algorithms. Prediction (classification) and clustering by neural networks. Tuning network parameters. Fundamentals of evolutionary computing. Differential evolution, genetic algorithms, swarm algorithms. Adaptive and hybrid intelligent systems.

Practical teaching
Solving practical problems from the above areas and program implementation in an appropriate software package or programming language (MATLAB, Python). Project development/software solution over a selected set of inputs.

4. Teaching methods:

The course is designed as a combination of traditional and electronic learning.
Lectures, laboratory exercises, online education, case studies, consultations, mentoring.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Project assignment	Yes	70.00
Homework	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Петровић, Б., Поледица, А., Драговић, И., Ракићевић, А., Милошевић, П.,Вукићевић А., & Зукановић, М.	Рачунарска интелигенција Практикум у MATLAB-у	Београд: ФОН	2021
2	Ross, T.	Fuzzy Logic with Engineering Applications (4th ed.)	Chichester: Wiley	2017
3	Engelbrecht, A. P.	Computational Intelligence: an Introduction	Chichester: Wiley	2007
4	Haykin, S.	Neural Networks (2nd ed.)	New York: Prentice-Hall	1994

Teaching subject		User interface technologies
Subjecst designation:	01.SI0017	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Vlajić S. Siniša Antović D. Ilija Savić S. Dušan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Introduction to concepts, methods and techniques for designing and implementing user interfaces. Application of various software technologies to the development of user interfaces.

2. Educational outcomes (acquired knowledge):

Training students to independently design and implement user interfaces using various software technologies and development methodologies.

3. Course content/structure:

Theoretical teaching
User interface – basic concepts. Existing approaches in user interface development. Principles of user interface design. User requirements – prototypes of user interface. Connection between the Yestaka model and user interface. User interface design patterns. User interface templates. Analysis of user interface of different types of applications in different implementation technologies.

Practical teaching
Development of user interface for different types of applications in different implementation technologies. Tools for user interface development. Application of existing approaches in user interface development. Practical work on a case study.

4. Teaching methods:

Lectures in the classroom using computers, the Internet, integrated software environments and tools. Exercises in computer laboratories, in small groups. Part of the exercises is performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Written exam	Yes	20.00
Seminars	Yes	40.00	Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Shneiderman, B., Plaisant, C.	Dizajniranje korisničkog interfejsa	CET, Beograd	2005
2	Galitz, W. O.	The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, 3rd edition	Wiley	2007
3	Smith, N.	Android 9, Kotlin i Android Studio 3.2 u jednoj knjizi	Mikro knjiga, Beograd	2018

Teaching subject		User interface design
Subjecst designation:	01.IS0023	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Minović V. Miroslav

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the program is to introduce students to theoretical and practical approaches to user interface design.

2. Educational outcomes (acquired knowledge):

Students use the acquired knowledge and skills required in independent or team work and are able to Yes apply the learned concepts to recognize and understand user requirements when designing new interfaces for desktop and mobile computing platforms. Students gain practical skills with which they can implement concrete user interfaces.

3. Course content/structure:

Theoretical teaching
P-01: Usability of interactive systems. P-02: Guidelines, principles and theories. P-03: Fundamentals of human-computer interaction. P-04: Design process management. P-05: Development methodology. P-06: Evaluation of interface design. P-07: Software tools. P-08: Direct manipulation and virtual environments. P-09: Menu selection, form filling and dialog boxes. P-10: Command and natural languages. P-11: Interaction devices. Collaboration. P-12: Quality of services. P-13: Balance between functionality and appearance. P-14: Work instructions, online help and learning manuals. P-15: Information search and visualization.
Practical teaching
W-01: Introduction to user interface design (available platforms and tools for user interface design). W-02: User interfaces on the Internet (HTML/JavaScript/AJAX). W-03: User interfaces on the Internet (HTML5). W-04: User interfaces on the Internet (Java Applets and JavaFX). W-05: User interfaces on mobile devices (ASP.NET and Silverlight). W-06: User interfaces in desktop applications (.NET Framework). W-07: User interfaces in desktop applications (JAVA SE (SWING)). W-08: User interfaces in desktop applications (Flex). W-09: User interfaces in mobile applications (natural interface principles). W-10: User interfaces in mobile applications (Android). W-11: User interfaces in mobile applications (iOS). V-12: User interfaces in mobile applications (Android). V-13: Methods and techniques for checking the usability of the user interface (cognitive walkthrough). V-14: Methods and techniques for checking the usability of the user interface (focus group). V-15: Methods and techniques for checking the usability of the user interface (thinking aloud)

4. Teaching methods:

Lectures, exercises, consultations. Practical work is carried out according to the model of defining a project proposal, forming project teams and then their development by students, through regular consultations with the mentor.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	20.00	Written exam	Yes	50.00
Project development	Yes	30.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Jenifer Tidwell, Charles Brewer, Aynne Valencia	Designing Interfaces	3rd Edition, O'Reilly Media, Inc., ISBN: 9781492051961	2020
2	Wilbert O. Galitz	The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques	Wiley, ISBN-10: 9780470053423	2007
3	Shneiderman, B., Plaisant, C.	Dizajniranje korisničkog interfejsa	CET, Beograd	2010
4	Starčević, D., Štavljanin, V.	Multimediji	FON, Beograd	2013

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	Jakob Nielsen, Morgan Kaufmann	Usability Engineering	SunSoft	1993

Teaching subject		Simulation in business decision-making
Subjecst designation:	01.000044	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Marković M. Aleksandar

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

To introduce and explain the basic concepts, ideas and possibilities of applying computer simulation as a decision support process in the analysis of dynamic behavior of business and organizational systems. Yes Yes review of methodologies and describe methods of modeling and simulation of dynamic systems. Yes Yes review of simulation software and their practical use.

2. Educational outcomes (acquired knowledge):

By explaining the basic ideas of simulation modeling and applying them to appropriate examples, this program enables a transition to a more detailed study of various simulation mechanisms, simulation languages, the application of statistical methods in the simulation process, as well as connecting simulation modeling with modern methods and tools in the fields of management, organizational and computer sciences.

3. Course content/structure:

Theoretical teaching
Modeling and models; model classifications. Computer simulation – basic concepts and applications. Model parameter estimation. Validation and verification of simulation models. Behavior and dynamics of business systems. Fundamentals of continuous system simulation (CSS). Languages and software for continuous system simulation. Application of CSS in business system modeling. Fundamentals of discrete-stochastic system simulation (DSS). Languages and software for discrete system simulation. Application of DSS in business system modeling. Probability and statistics in simulation modeling. Analysis of input signals of simulation models and sample generation. Modern trends in computer simulation.
Practical teaching
Conceptual model of system dynamics – U-P connection diagrams. Systems without and with feedback; polarity of efficiency. Modeling business systems using U-P relationship diagrams. Conceptual model of system dynamics – stock&flow diagrams. Modeling business systems using stock&flow diagrams. Computer models in simulation of continuous systems. Vensim simulation package – basic ideas and concepts. Examples of simulation of continuous systems. Basic concepts in discrete event simulation – examples. Modeling systems using discrete event methodology. Simulation of business systems in GPSS language. Simulation of business systems in GPSS language. Modern trends in computer simulation – examples.

4. Teaching methods:

Lectures with active student participation, presentations, exercises, case studies, problem solving, calculations, project work.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	10.00	Oral exam	Yes	50.00
Colloquiums	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Раденковић, Б., Станојевић, М., Марковић, А.	Рачунарска симулација	ФОН и Саобраћајни факултет, Београд	2005
2	-	Наставни материјали у електронском облику.		2020

Teaching subject		Technological entrepreneurship
Subjecst designation:	01.000031	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Marinković P. Sanja Petković G. Jasna

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Developing academic and professional knowledge and skills that will equip future graduate engineers for technological entrepreneurship activities, which is a process in which an entrepreneur recognizes business opportunities that initiate the emergence and development of new technologies or are related to technological innovations as opportunities for a specific technological venture.

2. Educational outcomes (acquired knowledge):

The student possesses the academic and professional knowledge and skills necessary to identify technological opportunities, develop ideas, knowledge and new technologies and translate them into new products and services on the market. The student is able to use methods, techniques and models in the analysis of the external and internal environment. Critically analyze alternatives and make decisions related to opportunities, innovations and organization. The student is able to work independently and in a team on the development of an entrepreneurial idea, analyze the business dimensions of technology, define a business model and a

3. Course content/structure:

Theoretical teaching
Technological entrepreneurship; Entrepreneurial ecosystem; Three pillars of technological entrepreneurship: Opportunities, Innovation and Organization; Technological foresight; Analysis of business dimensions of technology; Technological strategy; SME development; Development of technological ventures; Creation and development of business models; Commercialization of technology; Creativity in technological entrepreneurship; Cooperation in entrepreneurial ventures; Globalization of entrepreneurial activities.
Practical teaching
The practical lessons follow the content and structure of Lectures and include: Case studies; Analysis of successful and unsuccessful entrepreneurial ventures; Models of entrepreneurial venture development from opportunity recognition to business success of the organization; Creative methods in technological entrepreneurship; Agile methods of managing the development of technological ventures; Methods and techniques for supporting technological entrepreneurship.

4. Teaching methods:

Presentation of materials in the form of Lectures, workshops and group work, analysis of practice cases, active involvement of students in research in practice, Seminar papers and deepening of theoretical knowledge with literature research.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	30.00	Written exam	Yes	30.00
Colloquiums	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Леви-Јакшић, М., Маринковић, С., Петковић, Ј., Ракићевић, Ј., & Јовановић, М.	Технолошко предузетништво	Београд: ФОН	2018
2	Byers, T.H., Dorf, R.C., & Nelson., A.J.	Technology Ventures: From Idea to Enterprise, 5rd Ed.	International Ed. McGraww Hill	2018
3	Oakey, R.	High-Technology Entrepreneurship	Routledge	2012
4	Allan, K.	Entrepreneurship for Scientists and Engineers	Prentice Hall	2010
5	Trott, P.	Innovation Management and New Product Development, 6th Edition	Pearson	2017
6	Duening, T. N., Hisrich, R. A., & Lechter, M. A.	Technology Entrepreneurship: Taking Innovation to the Marketplace, 2nd edition.	London: Academic Press.	2015

Teaching subject		Introduction to mathematical programming
Subjecst designation:	01.000060	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Mihić P. Olivera Nikolić T. Nebojša Džamić Ž. Dušan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes

Conditions:

1. Educational goal:

Presentation and explanation of the most important mathematical programming methods and software packages intended for solving various optimization problems.

2. Educational outcomes (acquired knowledge):

Students will use and apply various mathematical programming methods to independently solve optimization problems.

3. Course content/structure:

Theoretical teaching
1. Introductory concepts.
2. Modeling real problems.
3. Linear programming.
4. Nonlinear programming methods.
5. Quadratic programming.
6. Fractional programming.
7. Goal programming.
8. Convex programming.
9. Convex programming methods.
10. Nonconvex programming.
11. Unconditional optimization.
12. Discrete optimization.
13. Integer programming methods.
14. Software packages for mathematical programming problems.
15. Solving real problems and calculating seminar problems.

Practical teaching: Exercises, Other forms of teaching, Study research work.
Application of software packages for solving selected mathematical programming problems.

4. Teaching methods:

Mentoring or the classic way.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	15.00	Written exam	Yes	25.00
Seminars	Yes	35.00	Oral exam	Yes	25.00

Literature

NO..	Authors	Title	Publisher	Year
1	С. Злобец, Ј. Петрић	Нелинеарно програмирање	Научна књига, Београд	1989
2	В. Вујчић, М. Ашић, Н. Миличић	Математичко програмирање, Савремена рачунска техника и њена примена, Књига 7	Математички институт	1980
3	S.A. MirHassani, F. Hooshmand	Methods and Models in Mathematical Programming	Springer	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Nash S., Sofer A.	Linear and Nonlinear Programming	McGraw-Hill Companies, Inc.	1996
5	V. M. Tikhomirov	Stories about Maxima and Minima	American Mathematical Society	1990

Teaching subject		Entrepreneurship
Subjecst designation:	01.000006	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject MIO - Management and Organization, Compulsory subject
UNO subjects		
Teachers:		Čudanov J. Mladen Krivokapić M. Jovan Komazec N. Stefan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to provide students with advanced academic knowledge in the field of entrepreneurship and starting their own business, to present them with a desirable profile of knowledge, skills and abilities of entrepreneurs and to adopt most of these knowledge, skills and abilities. To study the legal regulations related to starting one's own business. To transfer knowledge and skills in creating business plans for new and developing existing businesses.

2. Educational outcomes (acquired knowledge):

Acquisition of advanced academic knowledge, skills and abilities necessary for starting and developing an entrepreneurial venture, writing business plans, as well as knowledge of all influential factors on an entrepreneurial venture. Development of students' abilities Yes evaluate, interpret and combine business alternatives in the development of a business plan.

3. Course content/structure:

Theoretical teaching
Characteristics of an entrepreneur. Necessary knowledge and skills of an entrepreneur. Development of one's own business. Development of a strategic plan. Legal regulations for starting one's own business. Basic forms of taxation for entrepreneurs and companies. Support for the development of entrepreneurship by the state. Labor law, employment, labor law, collective agreements, rulebooks. Technological aspects of a business venture. Market aspects of a business venture. External communication with clients. Managing one's own business. Financing a business venture. Crediting possibilities. Managing the value of a company - criteria for the success of a company.
Practical teaching: Exercises, Other forms of teaching, Study research work
Methodology of developing a business plan - definition of roles, characteristics and users. Stages of developing a business plan. Analysis of the technical and technological component of the business. Analysis of the business location. Investment plan. Fixed assets and working capital. Working capital cycle. Inventory management. Cost plan. Capacity utilization plan. Loan repayment plan. Investment profitability analysis. Preparation of synthetic financial statements. Assessment of the financial profitability of the enterprise. Risk assessment - assessment of the weaknesses of the business enterprise, new technologies, contingent planning, SWOT analysis. Software support for the development of a business plan.

4. Teaching methods:

Monologue method, demonstrative method, learning through collaborative work on solving practical problems, independent research by students and problem solving based on the obtained points.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical teaching	Yes	10.00	Oral exam	Yes	40.00
Seminar paper	Yes	50.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Пауновић Благоје, Зиповски Димитраки	Пословни план - водич за израду	Економски факултет, Београд	2013
2	Гербер, М.	Мит о предузетништву: Зашто већина малих приватних фирми не успева и шта учинити у вези са тим	Београд: Чаробна књига	2010

Teaching subject		IT project development methodology
Subjecst designation:	01.IT0007	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		Simić B. Dejan Bogićević Sretenović S. Marija Jovanović D. Bojan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of the program is to enable students to independently research the theoretical aspects of the chosen topic and to practically apply the acquired knowledge.

2. Educational outcomes (acquired knowledge):

Students will be able to analyze, design, implement and maintain projects in the field of information and communication technologies. In addition, it is expected that the student will be able to Yes apply the methodology and skills in the field of information and communication technologies, as well as be able to create technical and technological documentation and easily acquire knowledge about any other thematic area in the field of information and communication technologies.

3. Course content/structure:

Practical teaching: Mentoring students in the preparation of project papers.
Acceptance of project topics, Consultations in the preparation of the project, Analysis of the achieved results, Consultations in the preparation of the project, Final analysis of the achieved results

4. Teaching methods:

Lectures, exercises, Practical work, consultations, study research work, case studies
Practical work is carried out according to the model of defining a project proposal, forming project teams and then their development by students, through regular consultations with a mentor.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Project defense	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Fowler, M	UML distilled: A brief guide to the standard object modeling language	Boston: Addison-Wesley	2004
2	Seidl, M., Scholz, M., Huemer, C., & Kappel, G.	UML @Classroom: An Introduction to Object-Oriented Modeling	Springer Publishing Company, Incorporated	2015
3	Rubin, K. S.	Essential Scrum: A practical guide to the most popular agile proces	Upper Saddle River, Nj: Addison-Wesley	2017
4	Kleppe, A. G., Warmer, J., & Bast, W.	MDA Explained: The Model Driven Architecture: Practice and Promise	USA: Addison-Wesley Longman Publishing Co., Inc.	2003
5	Avison, D., & Fitzgerald, G.	Information systems development: Methodologies, techniques @ tools	London: McGraw-Hill Companies	2006

Teaching subject		Consumer behavior
Subjecst designation:	01.I00072	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Štavljanin B. Velimir Janičić R. Radmila Јовић Р. Марија, Ванредни професор

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	D00003	Marketing	Yes	Yes

Conditions:

1. Educational goal:

Introducing students to the skills needed to master human behavior as consumers and the implications of behavior for marketing strategies. Introducing students to ways to critically evaluate strategies, diagnose a problem, and make the right decision.

2. Educational outcomes (acquired knowledge):

Advanced academic and practical knowledge in the fields of perception, learning, attitudes, personal concept and personality, lifestyle, motives and consumer decision-making, which are necessary for a critical understanding of consumer behavior. Independent management of complex projects in the field of consumer behavior research. Application of the results of consumer behavior analysis to solve complex problems when creating marketing strategies. Analyzing and evaluating marketing decisions in an effective and efficient manner.

3. Course content/structure:

Theoretical teaching
Understanding consumer behavior. Influences on consumer behavior. Consumer behavior as a scientific discipline. Approaches to researching consumer behavior. Consumer motivation. Determinants of motivation. Consumer values. The process of consumer perception. Senses. Exposure. Attention. Understanding. Learning and memory. Consumer attitudes. High and low effort attitudes. Changes in consumer attitudes. Consumer personality. Self-concept. Gender role. Lifestyle. Consumer decision-making process. Need recognition. Information gathering. Purchase decision. Purchase. Post-purchase behavior. Consumer satisfaction. Decision-making at different levels of engagement. Social influences on consumers. Reference groups. Types of reference groups. Opinion leaders. Age, income, social class and their influence on consumer behavior. Ethnic, racial and religious groups. The influence of culture on the consumer. Global consumer culture.

Practical teaching
Solving and analyzing case studies. Creative workshops and presenting results. Implementing the concept of consumer orientation. Implications of consumer behavior on segmentation, target market selection and positioning. Analysis of consumer decision-making in different conditions of involvement. Consumer behavior in the digital environment. Consumer research. Objectives and subject of consumer research. Consumer research instrument. Consumer research plan. Information collection. Preparation of the report and analysis of the results. Preparation of a consumer research report. Preparation of a seminar paper.

4. Teaching methods:

Lectures, interactive discussion, case study, participation in creative workshops and presentation of results, project development, consultations during project development.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Oral exam (тест)	Yes	40.00
Project/Seminar paper	Yes	50.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Maričić B.	Ponašanje potrošača	CID, Ekonomski fakultet	2011
2	Hoyer W., MacInnis D., Pieters R.	Consumer Behavior, 7th ed	Cengage Learning, Boston	2018

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	Barden P.	Decoded: The Science Behind Why We Buy	John Wiley et Sons, Ltd	2013
4	Lindstrom M.	Buy Ology: Truth and Lies about why We Buy	Random House, Inc	2010

Teaching subject	
Subjecst designation:	01.I00081
Number of ECTS:	5

Discrete mathematics and applications

Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject
UNO subjects	
Teachers:	Nikolić T. Nebojša Džamić Ž. Dušan

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00002	Mathematics 1	Yes	Yes

Conditions:

1. Educational goal:

Presenting and explaining the content of discrete mathematics (such as recursion, graph theory, combinatorial optimization, etc.) and their applications in computer science and other sciences.

2. Educational outcomes (acquired knowledge):

Students will use and apply discrete mathematical methods and will be able to independently solve appropriate problems in the field of computer science.

3. Course content/structure:

Theoretical teaching:
1. Introductory concepts: sets, functions, matrices, sequences and sums.
2. Differential equations. Integer functions.
3. Mathematical induction. Recursion.
4. Counting techniques. Generatrix functions.
5. Number theory. Special numbers.
6. Latin squares. Matroids.
7. Code theory. Block diagrams.
8. Discrete optimization.
9. Graphs, networks and flows.
10. Complex networks and optimization on networks.
11. Information structures.
12. Hashing. Cryptography.
13. Pseudo-random number generators.
14. LambYes calculus and functional programming.
15. Exam preparation.

Practical teaching:
Creating, implementing and applying methods from the area being studied in the course.

4. Teaching methods:

The classic way using a whiteboard and computer presentations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	20.00
Colloquiums	Yes	20.00	Oral exam	Yes	40.00
Practical teaching	Yes	5.00			
Seminars	Yes	10.00			

Literature

NO..	Authors	Title	Publisher	Year
1	J.A. Anderson	Discrete Mathematics (with combinatorics), 2nd edition	Prentice Hall	2003
2	K.H. Rosen	Discrete Mathematics and Its Applications, sixth edition	McGraw-Hill	2007
3	М. Чангаловић, В. Тодорчевић, В. Балтић	Дискретне математичке структуре	ФОН	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Д. Цветковић, С. Симић	Дискретна математика	Либра, Београд	2000

Teaching subject		Functional languages
Subjecst designation:	01.IS0014	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Turajlić S. Nina

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Within this course, students acquire the necessary theoretical and practical knowledge about the fundamental concepts of functional programming languages.

2. Educational outcomes (acquired knowledge):

The acquired knowledge about the concepts and characteristics of functional programming languages enables students to apply them in the development of modern software applications.

3. Course content/structure:

Theoretical teaching
Introduction to functional programming languages. LambYes calculus as a theoretical framework for defining functions and their evaluation. Characteristics of purely functional languages. Functional forms (higher-order functions). Anonymous functions. Evaluation approaches. Collections of elements and operators for manipulating collections of elements. Extension of object-oriented languages with concepts of the functional paradigm. Monads.
Practical teaching
Exercises follow Lectures. In the exercises, students gain practical knowledge about the concepts and characteristics of functional languages through designing and writing programs in the chosen language or set of languages.

4. Teaching methods:

Lectures accompanied by electronic presentations. In exercises, students gain practical knowledge about the concepts and characteristics of functional languages through designing and writing programs in the chosen language or set of languages.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Sebesta R.W.	Concepts of Programming Languages, 12th Edition	Pearson	2019
2	Abelson, H., Sussman, G. J., & Sussman, J.	Structure and interpretation of computer programs. Second Edition.	MIT Press	1996
3	-	Допунска Literature ће се сваке године одређивати у зависности од језика који Yeste године буду изабрани.		-

Teaching subject		Implementation of analytics application
Subjecst designation:	01.IS0021	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Petrović V. Marko Vukićević Ž. Milan Luković S. Ivan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Gaining practical knowledge regarding the implementation of a specific application or analytics system in a modern software environment.

2. Educational outcomes (acquired knowledge):

Students will be able to analyze reporting requirements, propose architectures and data source models, use query languages to access data, apply extraction and transformation, create data warehouses, use algorithms for analysis and prediction, and use reporting and data visualization tools.

3. Course content/structure:

Elements of a generic software architecture to be implemented. Overview of current software environments for developing software systems to support analytics.

Acceptance of project topics. Domain analysis. Analysis of report requirements. Analysis of the architecture and model of the data sources. Data extraction and transformation. Creation and configuration of the data warehouse. Application of algorithms for analysis and prediction. Application of tools for reporting and visualization of data. Joint project review.

4. Teaching methods:

Students will use modern development environments to implement a project that covers the scope of previously attended courses. In the first 3 weeks, classes will be held where the elements of the generic software architecture to be implemented will be explained, as well as an overview of current software development environments. In the next 10 weeks, students work independently on the implementation of applications with revision by the teacher at defined project checkpoints.
Students are divided into groups and work together on a selected and approved topic. Each group has its own mentor who, every week, in the terms provided for this course, controls and helps in the specification and implementation of an application of the group's specific domain

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Project defense	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Лазаревић Б., Марјановић З., Аничић Н., Бабарогић С.	Базе поYestaка	ФОН	2018
2	Сукновић, М., Делибашић, Б.	Пословна интелигенција и Системи за подршку одлучивању	ФОН	2010
3	Kimball R., Ross M.	The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling. Third Edition.	John Wiley & Sons	2013
4	Петровић М., Бјеладиновић С.	Наставни материјали и вежбе са сајта is.fon.bg.ac.rs и odlucivanje.fon.bg.ac.rs.	ФОН	2020
5	Вукићевић М.	Наставни материјали и вежбе са сајта odlucivanje.fon.bg.ac.rs	ФОН	2020

Teaching subject		Program compilers
Subjecst designation:	01.IS0016	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Turajlić S. Nina

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Within this course, students acquire the necessary theoretical and practical knowledge about programming interpreters and the tools developed for their implementation.

2. Educational outcomes (acquired knowledge):

The acquired knowledge about the concepts and characteristics of modern compilers enables students to explain and analyze the implementation methods of programming languages, which directly influences the choice of appropriate languages and their application in the design of modern software applications. In addition, the acquired knowledge about developed tools based on parser generators can be applied by students in the development and implementation of domain-specific languages.

3. Course content/structure:

Theoretical teaching
Introduction to compilers. Lexical analysis: regular expressions and finite state machines. Syntactic analysis. Types of parsers: bottom-up and top-down parsing. Semantic analysis. Execution environment. Inter-coYes generation. CoYes generation. CoYes optimization. Interpreters and Hybrid implementation systems. Overview of scanner and parser generation tools. Using parser generator-based tools for developing and implementing a selected domain-specific language.
Practical teaching
Exercises follow Lectures. In the exercises, students gain practical knowledge about the concepts and characteristics of compilers and the tools developed for their implementation.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. In the exercises, students gain practical knowledge about the concepts and characteristics of programming interpreters and the tools developed for their implementation.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Aho A.V., Lam M.S., Sethi R., Ullman J.D.	Compilers: Principles, Techniques, and Tools, Second edition	Addison-Wesley	2006
2	Mogensen T.	Introduction to Compiler Design, Second edition	Springer International Publishing	2017

Teaching subject	**Standardization and standards in information technologies**
Subjecst designation: 01.I00067	
Number of ECTS: 5	
Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects	
Teachers:	Filipović V. Jovan Mijatović S. Ivana

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Acquiring advanced academic knowledge in standardization in the field of information systems and technologies at the level of understanding the importance and impact of IT standardization; the purpose and complex relationships of IT standardization organizations and training graduates to apply relevant IT standards in practice.

2. Educational outcomes (acquired knowledge):

An active learner understands the importance, purpose and benefits of IT standardization, as well as the complex relationships between standardization organizations in the IT sector, both formal and industry associations and consortia. The student is familiar with relevant standards in the IT sector and is able to participate in their implementation and integration.

3. Course content/structure:

Theoretical teaching
P1. The concept of standardization and stanYespYes in the IT sector. Development and importance of IT standardization in the global market. P2. Classification of IT standardYespYes and IT standardYes. The concept and specifics of certification in the IT sector. Formal IT standardYes. P3. Consortia based IT standardYes. Sectoral IT standardYes. P4 and P5 Organizations for standardYes in the field of IT, activity, importance and mutual cooperation (ITU, ISO, IEC, CEN, CENELEC, ETSI, TIA, W3C, IEEE, OASIS, OMG, IETF, OSI, etc.). P6. The connection between IT standardYespYes and the global market. Mechanisms that enable the success of IT standardYespYes in the market. Competition between IT standardYespYes. P7. Dynamics and quality of standardYespYes in the IT sector. The concept of open standardYespYes. Specific principles of IT standardization. The paradox of the RAND/FRAND principle in IT standardization. Q8. Problems solved by standardization in IT. The problem of interoperability and compatibility. The problem of modularity. The problem of IT service management. Q9. and Q10. Standards related to IT service management. ITIL concept of IT service management. The relationship of the ITIL concept with the requirements of the ISO 9001 quality management system standard. Q11 and Q12. Analysis of the ISO/IEC 20000 series standard. Integration of IT service management systems and quality management systems. Certification of an IT service management system according to ISO/IEC 20000-1 standard. The relationship between ITIL and ISO/IEC 20000-1 standard. Q13. and Q14. Analysis of standards in the field of IT ISO/IEC/IEEE 12207, ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 90003.

Practical teaching
V1. Basic concepts in the field of standardization V2. Case study: Development of IT standardization. V3. Creative workshop: Classification of standards and standardization. V4. Case study: IT standards and the market. V5. Creative workshop: The process of development, coordination of solutions and adoption of standards V6. Case study: Obsolescence of IT standards. V7. Case study: Consortia based standardization. V7. Case studies in the field of sectoral standardization. V8. Stages in standardization development. V9. Model of IT standardization development in formal standardization organizations V10. Ad hoc de facto IT development model Yes Yes B11. and B12 ISO/IEC 20000 B13 and B14. ITIL concept and ISO/IEC 20000

4. Teaching methods:

Lectures and exercises use active learning methods based on real-world problems and case studies that have been specially developed for this subject and are internationally recognized. Lectures and exercises are conducted with active student participation through class discussions, interactive workshops, work on case study solutions in teams, and independent research.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Oral exam	Yes	40.00
Colloquiums	Yes	20.00			
Completed project and presented solutions	Yes	30.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Мијатовић И.	СтанYespдизација 1	Faculty of organizational sciences	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Abdelkafi, N. Bolla, R., Lanting, C.J.M., Rodriguez-Ascaso, A., Thuns M., Wetterwald M	Understanding ICT Standardization: Principles and Practice	ETSI	2018
3	-	ISO/IEC/IEEE 12207:2017 Systems and software engineering -- Software life cycle processes	ISO	2017
4	-	ISO/IEC/IEEE 15288:2015 Systems and software engineering -- System life cycle processes	ISO	2015
5	-	ISO/IEC/IEEE 90003:2018 Software engineering -- Guidelines for the application of ISO 9001:2015 to computer software	ISO	2018
6	-	SRPS ISO/IEC 27001:2014 Information technology - Security techniques - Information security management systems - Requirements (ISO/IEC 27001:2013 including Cor 1:2014 and Cor 2:2015)		2015

Teaching subject		Intellectual property
Subjecst designation:	01.I00028	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Stošić A. Biljana Milutinović M. Radul

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Defining and describing the field of intellectual property: identifying, analyzing and using intellectual property rights and defining a strategy for achieving competitiveness and business success.

2. Educational outcomes (acquired knowledge):

Application of knowledge and competence in the domain of identifying elements of intellectual capital as a strategic resource, defining intellectual property strategy and managing intellectual property with the aim of increasing competitiveness and overall business success

3. Course content/structure:

Theoretical teaching
Intellectual capital: intangible value and strategic resource of the enterprise. The concept and forms of intellectual property. Development of intellectual property rights. Intellectual property in the project of development of a new product/service and process: a factor of protection against imitation and increase in benefits. Intellectual property strategy. Invention law - patents, technical innovations, know-how, industrial design, trademarks and service marks, designations of origin, protection against unfair competition. Patents as the “Fifth P” in the innovation and business strategy of the enterprise. The number of applied for and registered patents as an indicator of innovation, technological progress and development. Monitoring of patent applications as a method of supporting innovation and development management; the impact of patent protection on the value of inventions, innovations and competitiveness - advantages and disadvantages. Trademarks - brands and their impact on competitiveness, innovation and development. Copyright. Problems and opportunities of legal protection in the field of information and communication technologies. The role of intellectual property in the EU and harmonisation.

Practical teaching
Intellectual property rights - examples. Patents and the appropriability of innovations. Examples of patents. Examples of technical innovations and know-how. Trademarks and competitiveness. The relationship between trademark and brand (legal and management aspects). Examples of trademarks. Examples of trademarks. Examples of distinctive signs. Examples of designations of origin. Industrial design - examples. Examples from the field of e-business. Case studies - the impact of the application of certain intellectual property rights

4. Teaching methods:

Lectures based on prepared Power Point presentations of the content, presentation and analysis of selected case studies, independent student research and problem solving based on the points received, discussions regarding seminar papers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	30.00
Colloquiums	Yes	30.00			
Practical teaching	Yes	10.00			
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Стошић, Б.	Менаџмент иновација - иновациони пројекти, модели и методи	FON, Belgrade	2013
2	Lallement, R.	Intellectual Property and Innovation Protection: New Practices and New Policy Issues	John Wiley & Sons	2017
3	Matos, F., Vairinhos, V., Selig, P. M., & Edvinsson, L.	Intellectual Capital Management as a Driver of Sustainability	Springer	2019

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	Parr, R. L.	Intellectual property: valuation, exploitation, and infringement damages	John Wiley & Sons	2018
5	Бесаровић, В.	Интелектуална својина: индустријска својина и ауторско право	Правни факултет Универзитета у Београду	2011

Teaching subject		Reliability and risk analysis
Subjecst designation:	01.I00054	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Makajić-Nikolić D. Dragana Andrić Gušavac Š. Bisera

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	Z00010	Probability theory	Yes	Yes

Conditions:

1. Educational goal:

The goal of this course is to train students in determining reliability, risk assessment, and management in complex systems using modern software tools.

2. Educational outcomes (acquired knowledge):

After passing the exam, students will be able to:
1. understand the role of reliability and risk in managing the performance of real systems,
2. model complex systems from a reliability perspective and apply reliability analysis methods,
3. develop a comprehensive risk management plan,
4. identify risks and perform their assessment,
5. use reliability analysis and risk assessment software,
6. analyze the results and develop plans to avoid and/or mitigate risks.

3. Course content/structure:

Theoretical teaching: Introduction to reliability and reliability theory - basic concepts. Exponential and Weibull distributions in determining reliability. Reliability of complex systems - block diagrams in reliability analysis. Maintainability, repair time, downtime; system availability and effectiveness. Modeling of repairable systems: Markov models. Human reliability. Risk - basic concepts, approaches to risk management, risk measurement, attitude to risk. Risk identification (HAZOP). Risk ranking (Risk matrix, FMEA). Risk cause analysis (Root cause analysis, Fault tree analysis). Risk consequence analysis (Event tree analysis). Risk reduction or mitigation measures. Risk assessment standards (ISO 31000 series).

Practical teaching (auditorium and laboratory exercises):
Analysis of component failure patterns and determination of component reliability. Application of exponential distribution properties in determining component reliability. Determination of complex system reliability using reliability block diagrams. Application of Boolean algebra in determining the reliability of complex components. Application of Markov models in determining system availability. Determination of component and system reliability using Windchill software. Analysis of business processes and the role of risk assessment in their improvement. Risk identification using the HAZOP method. Risk evaluation using the Risk Matrix. Risk evaluation using the FMEA method. Risk cause assessment using the Root Cause Analysis and Fault Tree Analysis methods. Assessment of consequences, scenarios and outcomes of risks using the Event Tree Analysis method. Risk assessment using Windchill software.

4. Teaching methods:

Classical method (ex cathedra) using a blackboard, computer, projector, solving short case studies and one hour of practical exercises per week in the computer room.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Oral exam	Yes	30.00
Colloquiums	Yes	20.00			
Project assignment	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	С. Крчевинац и др	Операциона истраживања 2	FON, Belgrade	2013
2	P. D. T. O'Connor	Practical reliability engineering	Wiley	2011

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	C. A. Ericson II	Hazard analysis techniques for system safety	Wiley	2015
4	P.Hopkin	Fundamentals of risk management: understanding, evaluating and implementing effective risk management	Kogan Page Publishers, Philadelphia	2017

Teaching subject		Introduction to e-business management
Subjecst designation:	01.EP0016	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Barać M. Dušan Marković M. Aleksandar

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Identify and analyze the basic concepts of e-business management and the characteristics of business systems that operate via the Internet. Define the basic processes of e-business, as well as micro and macro factors of the organization's environment, which have a key impact on the success of business via the Internet. Define and explain the decisions necessary for organizations that are directing their operations towards e-business and consider the activities in which such decisions are made.

2. Educational outcomes (acquired knowledge):

Students will acquire the basic concepts of e-business management. They will also acquire the basic skills necessary for managing organizations in the field of e-business. They will be able to Yes answer the questions that are considered in organizations that operate via the Internet: What is the relationship between traditional and e-business? What are the basic characteristics of organizations in the field of e-business? What approach to choosing an e-strategy should be adopted? How much should be invested in e-business? Which processes should Yes be prioritized for our organization in terms of e-business? Should we Yes adopt new business and revenue models? What changes should be made in the organization Yes to start with e-business?

3. Course content/structure:

Theoretical teaching
Changes in management caused by the use of the Internet. The impact of the Internet on the phases of the management process and levels of management. Introduction to e-business and e-commerce. Fundamentals of e-commerce. E-business infrastructure and e-business infrastructure management. The electronic business environment: micro- and macro-environment and key environmental factors. E-business strategy. Intranet and extranet and their use in business functions.
Practical teaching
Discussions with students and consideration of specific examples, case studies and analyses according to the content of the subject provided by theoretical teaching.

4. Teaching methods:

Lectures, discussions, case studies, exercises, analyses of concrete examples from practice.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Oral exam	Yes	50.00
Colloquiums	Yes	30.00			
Seminar paper	Yes	15.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Chaffey, D.	Digital Business and E-commerce Management: Strategy, Implementation and Practice	Pearson Education Limited Harlow, UK	2015
2	Марковић, А.	Менаџмент е-пословања		2020

Teaching subject		Business applications in a spreadsheet environment
Subjecst designation:	01.I00011	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Đorđević Milutnović S. Lena Antić R. Slobodan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

By studying the program content of this course, advanced academic and professional knowledge of the spreadsheet environment and spreadsheet applications is acquired. Within the framework of this course, students will learn to use the Visual Basic for Applications (VBA) programming language in order to automate the processes of working with spreadsheets in MS Excel, as well as independently develop business applications. They will also apply the basic concepts of commodity, financial and operating accounting in a company, in the context of creating spreadsheet business applications.

2. Educational outcomes (acquired knowledge):

The application of the acquired knowledge is reflected in the students' abilities to monitor material and Nonematerial flows in the enterprise, i.e. to monitor information on fixed assets, financial, commodity and material and plant accounting, as well as to monitor information on customers and suppliers, and information for calculating salaries, taxes and contributions to salaries. Also, the acquired knowledge of the spreadsheet environment enables advanced research and analysis of invoices, the creation of various calculations and reports, as well as the automation of work by creating macros (program codes) in VBA.

3. Course content/structure:

Theoretical teaching
Introduction to spreadsheet business applications; designing spreadsheet databases and applications; organizing work with lists; MS Excel functions for working with lists; double-entry bookkeeping system; information on fixed assets; information on materials and goods; information on spare parts, tools, packaging and small inventory; information on production; information on customers and suppliers; calculation of wages, taxes and contributions to employee wages; information on employees; elements of quality of business applications; spreadsheet engineering.
Practical teaching
Sorting and filtering techniques; pivot tables and subtotals; formulas for linking lists; basics of VBA programming; creating a general ledger, journal and posting order; creating a table for calculating depreciation and revaluation of fixed assets; creating a subsidiary ledger of materials and material posting orders; creating a calculation of the cost of production, purchase price and estimated price of goods; creating tables of expected cash inflows and outflows; creating tables for calculating salaries, taxes and contributions on salaries; creating a salary card; creating an application for creating a closing sheet; functions for working with databases (Dfunctions), menus, toolbars, "hot" keys for activating macros; connecting modules to the application.

4. Teaching methods:

Lectures and exercises are performed using Power Point presentations, through the presentation of various practical scenarios, which involve student work on computers. Students independently follow the lectures on computers during exercises. Exercises are performed in computer rooms. Student study work is related to the development of a project work - a spreadsheet application for accounting, according to defined requirements.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Tests	Yes	25.00
Project development and presentation	Yes	10.00	Oral exam	Yes	30.00
Practical teaching	Yes	25.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Костић, К., Антић, С., Ђорђевић, Л.	Информациони системи предузећа у Excel-у	Београд: Faculty of organizational sciences	2014
2	Костић, К., Антић, С., Ђорђевић, Л.	Информациони системи предузећа у Excel-у-збирка примера	Београд: Faculty of organizational sciences	2015

Teaching subject		Data analysis
Subjecst designation:	01.I00015	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Radojičić A. Zoran Đoković M. Aleksandar

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Learning techniques for analyzing lists. Understanding the interrelationship of statistical analysis methods and methods and techniques for discovering new information from lists.

2. Educational outcomes (acquired knowledge):

Training in data analysis, data structure analysis and data-based model building. Training in drawing conclusions based on graphical analysis and data visualization. Application and use of the statistical packages R and Python.

3. Course content/structure:

Theoretical teaching P01: Classification of multivariate statistical analysis methods. Types of items and measurement scales. P02: Graphical analysis and visualization of items. P03: Multidimensional analysis of items. P04: Visualization of complex items and contents of complex item databases. Algorithms for visualization of items. P05: The concept of knowledge discovery in item databases. Classification. Assessment. P06: Prediction. Analysis of relationships. P07: Modeling of dependencies. P08: Discovery of clusters. Analysis of connections. P09: Decision trees. Exploratory analysis of items. P10: Evaluation of discovered knowledge. P11: The role of statistics in the process of knowledge discovery in item databases. P12: Knowledge discovery in statistical item databases. P13: Computer support for statistical research. P14: Evaluation and testing. P15: Solving specific problems from practice.
Practical teaching: V01: R and Python software packages for statistics. V02: Concept and programming in R and Python statistical packages. V03: Graphical analysis and visualization of data. V04: Visualization of complex data. V05: Programming in R software package. V06: Algorithmic structure of R software package. V07: Programming in Python software package. V08: Algorithmic structure of Python software package. V09: Methods and techniques of knowledge discovery in data bases. V10: Evaluation of discovered knowledge. V11: The role of statistics in the process of knowledge discovery. V12: Knowledge discovery in statistical data bases. V13: Computer support for statistical research. V14: Connecting the software package R and Python with SPSS. V15: Solving specific practical problems in R and Python and connecting to SPSS.

4. Teaching methods:

The classic way, using a blackboard and a computer. Practical teaching within the computer center and working on computers.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	25.00
Colloquiums	Yes	20.00	Oral exam	Yes	25.00
Practical teaching	Yes	5.00			
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Lohninger H.	Teach/MeDataAnalysis	Springer	1999
2	Tony Fischetti	R analiza podataka	Kompjuter biblioteka	2018
3	Michael Dawson	Python: uvod u programiranje	Mikor knjiga	2010
4	Ковачић З.	Мултиваријациона анализа, 3. изYeњe	Економски факултет	2010
5	Ковачић, З.	Анализа временских серија	Економски факултет	1995

Teaching subject		Concurrent and distributed programming - project
Subjecst designation:	01.EP0007	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Bogdanović M. Zorica Milutivnović M. Veljko

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to introduce students to the concepts, methodologies, technological infrastructure, and software tools used in the development and implementation of parallel competitive programs that run in distributed computing environments, as well as to apply the acquired knowledge in the design and implementation of a solution to a specific and complex problem in the field of e-business.

2. Educational outcomes (acquired knowledge):

Through theoretical classes and projects, students acquire the theoretical and practical knowledge necessary for the development and implementation of parallelized programs and complex distributed computer systems that have specific applications in e-business.

3. Course content/structure:

Theoretical teaching
Rationale of multiprogramming systems, hardware innovations. Kernel of multiprogramming system. Flunn's classification, MIMD machines. Typical organizations of multiprocessors and computer networks, clusters. Distributed computer systems, components of distributed computer systems. Typical problems of communication and synchronization of processes. System and architectural means for controlling access to the critical region: region, semaphore, event, condition and monitor. Coordination and synchronization of processes in distributed computer systems. Management of processes, memory and devices in a distributed environment. Process and service-oriented architectures based on distributed message exchange. Concurrent and distributed programming in programming languages: C++, JAVA and Python. Development environments for distributed systems. Application examples: P2P networks, distributed file systems, distributed databases, business analytics, blockchain technologies. Modern trends in distributed and concurrent programming.
Practical teaching
Design and implementation of a distributed and parallelized software solution for a complex and specific e-business problem using one or more development environments and software packages: Pympi, OpenMP, Webmapreduce, Hadoop, Spark, Flink, Hyperledger. The project includes: Project assignment, project solution documentation, implementation documentation and analysis of the achieved results. The project defense is carried out in front of the subject teachers and all students of the E-business module. The project documentation is delivered to the students of the module, and the subject teacher appoints one student who will be the opponent and whose Yes will be Yes based on the thoroughly studied documentation, prepares comments, questions and, with the help of the subject teachers, leads a discussion during the project defense.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Despotović-Zrakić M., Milutinović V., Belić A.	High performance and cloud computing in scientific research and education	IGI Global	2014
2	N.N. Sakhare, V.V. Meshram Meshram, S.A. Chiwhane	Principles of concurent and distributed programming	Nirali Prakashan	2015
3	B. Burns	Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services	O'Reilly Media	2018

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	C. Varela	Programming Distributed Computing Systems: A Foundational Approach	The MIT Press	2013
5	E.Hewwit	Technology Strategy Patterns: Architecture as Strategy	O'Reilly Media	2018
6	J.F. Gonzalez	Mastering Concurrency Programming with Java 9 - Second Edition: Fast, reactive and parallel application development, 2nd Revised edition edition	Packt Publishing	2017
7	B. Wittman, A. Mathur, T. Korb	Start Concurrent: An Introduction to Problem Solving in Java With a Focus on Concurrency	Purdue University Press	2014
8	B. Benmammar	Concurrent, Real-Time and Distributed Programming in Java: Threads, RTSJ and RMI	Wiley-ISTE	2017
9	M. Raynal	Concurrent Programming: Algorithms, Principles, and Foundations	Springer	2013
10	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Konkurentno i distribuirano programiranje - projekat, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021

Teaching subject	
Subjecst designation:	01.EP0008
Number of ECTS:	5

Virtual reality and computer simulation

Program(s) in which it is performed	IST - Information Systems and Technologies, Elective subject
UNO subjects	
Teachers:	Despotović-Zrakić S. Marijana Marković M. Aleksandar

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	1.00	1.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to introduce students to the possibilities of applying virtual reality and computer simulation in various contexts.

2. Educational outcomes (acquired knowledge):

Students are trained to create models of continuous simulation, discrete event simulation, artificial intelligence, and virtual reality, and to apply computer simulation and virtual reality in various environments.

3. Course content/structure:

Theoretical teaching
Real world modeling. Model classification. Simulation. Virtual reality. Types and components of virtual reality. 3D modeling. Audio, visual and tactile systems. 3D graphics. Sound in VR. Touch in VR. Projection of virtual participants. Animation of participants/avatars/agents in VR. Social component of VR. Interaction and dynamics in VR. Interaction challenges (human/avatar, human/agent) in VR. Virtual environment and presentation of the virtual world. Movement, orientation, manipulation in VR. Generic VR system. VR architecture. Infrastructure for VR (hardware, software, platforms, environments). Medium (concept, development, significance, types). Hardware for input/output devices in VR. Communication in VR. Information flows in VR. Processing of inputs. Rendering (tactile rendering, sound rendering, graphic rendering). Presence in VR. Modeling dynamics and interactions in VR using computer simulation. Modeling dynamics and simulation of continuous systems in VR. Simulation of discrete events in VR. Distributed and parallel execution of simulation. Realtime simulation. Languages for simulation of continuous systems and simulation of discrete events (CSMP, Simulink, GPSS). Agent-based simulation. Artificial intelligence in VR. Languages for artificial intelligence (R, Python). 3D programming. VR software. OpenGL, WebGL, GLSL shader. JavaScript. Three.js. VR applications for different hardware (HTC VIVE, Oculus, Google VR). Virtual reality in: e-business, marketing, education, healthcare, transport, tourism, culture and art. Virtual reality and computer game development.
Practical teaching
Development of 3D models. Animation using Blender, Maya and 3D Studio Max software solutions. WebGL. Development of 3D interactive characters. Development of virtual reality games. Unity. HTC VIVE, Oculus, Google VR. Creation of virtual reality environments. Development of virtual reality applications. Application of virtual reality in medicine, education, smart environments, etc. Simulation of continuous systems, CSMP. Simulation of discrete events, GPSS.

4. Teaching methods:

Classical Lectures. Auditory exercises and laboratory exercises in the computer room.
Project/seminar work development, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	B. Radenković, M. Stanojević, A. Marković	Računarska simulacija	Fakultet organizacionih nauka, Saobraćajni fakultet	2009
2	J. Banks, J.S. Carson II, B. L. Nelson, D. M. Nicol	Discrete-Event System Simulation (Fifth Edition)	Pearson Education, Inc.	2010
3	M.F.Shiratuddin, D.Fletcher, K.Kitchens	Virtual Architecture: Modeling and Creation of Real-Time 3D Interactive Worlds	Lulu Press, USA	2009
4	T. Parisi	Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages, 1st Edition	O'Reilly Media	2014

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	L. Ahearn	D Game Environments: Create Professional 3D Game Worlds, 2 Edition	A K Peters/CRC Press	2017
6	T. Pant, S. Neelakantam	Learning Web-based Virtual Reality: Build and Deploy Web-based Virtual Reality Technology, 1st Edition		2017
7	-	X3D International Standard. (2013). Information technology - Computer graphics and image processing -Extensible 3D (X3D) ISO/IEC 19775-1:201.		2013
8	V. Karamian	Building an RPG with Unity 2018: Leverage the power of Unity 2018 to build elements of an RPG, 2nd Edition	Packt Publishing	2018
9	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Virtuelna realnost i računarska simulacija, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021
10	Б.Раденковић, М.Станојевић, М.Деспотовић-Зракић, З.БогYесновић, Д.Бараћ, А.Лабус, М.Ђогатовић	Рачунарска симулација - збирка заYестака, уџбеник у припреми	Faculty of organizational sciences	2021

Teaching subject		Risk management in e-business application development
Subjecst designation:	01.EP0010	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Despotović-Zrakić S. Marijana Labus B. Aleksandra

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to introduce students to the concept of project management in e-business, as well as to methods and models for risk management in e-business projects.

2. Educational outcomes (acquired knowledge):

Students are trained to apply modern techniques, methods, and concepts of project management and risk management in e-business.

3. Course content/structure:

Theoretical teaching
Architectures and paradigms in e-business system development. StanYesrdi in e-business system development. E-business project management. Traditional and agile methods for managing e-business projects. SCRUM. DSDM. RAD. Project documentation management. Program management. SAFE framework for agile project management in the enterprise. The concept of IT risk. Technical and organizational aspects of IT risk management. Methods and techniques for identifying and assessing risks. Monitoring and reporting on risks. Learning from risk. Risk management methods in e-business system development. Risk management in e-business projects in a distributed environment. Business process analysis. Business process modeling. Business analysis. Cobit framework for information technology management. Information security management using the ISO/IEC 27000 series. Creating a security policy. Business continuity management. Incident management. Disaster recovery planning. IT audit. IT audit methodology and techniques.
Practical teaching
IT project management. Project management tools and platforms. MS Project. Jira. Trello, Redmine. Software development project management using OpenProject tools. Agile project management on real examples. Implementation of SCRUM concepts. Risk identification and analysis in e-business projects. Development of a risk management plan. Introduction of information security management standards. Development of a business continuity plan. Development of an incident management plan. IT audit tools and techniques. Case study solution.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б. Раденковић, М. Деспотовић-Зракић, З. БогYесновић, Д. Бараћ, А. Лабус	Електронско пословање, поглавља 5. Организационе структуре за електронско пословање, 6. Пословни процеси у електронском пословању, 7. Управљање пројектима у електронском пословању, пп. 79-121	ISBN 978-86-7680-304-0; Faculty of Organizational Sciences, Belgrade	2015
2	Labus, M., Despotović-Zrakić, M., Bogdanović, Z., Barać, D., Popović, S.	Adaptive E-Business Continuity Management: Evidence from the Financial Sector	Computer Science and Information Systems	2020
3	Labus M., Despotović-Zrakić M., Bogdanović Z.	Introducing Adaptive E-Business Continuity Management	Springer, Cham.	2017

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
4	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materials for the course Risk management in the development of electronic business applications, in e-form, from the e-learning portal moodle.elab.fon.bg.ac.rs		2021

Teaching subject		Computer design of enterprise network
Subjecst designation:	01.EP0011	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Milutivnović M. Veljko

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The goal of this course is to train students to independently design, implement and use computer network infrastructure and services in e-business.

2. Educational outcomes (acquired knowledge):

Students are trained to independently design, implement and use computer networks in e-business.

3. Course content/structure:

Theoretical teaching
Identification of requirements and selection of networking models in enterprise computer networks. Service planning and definition of service quality policy. Selection of equipment for network infrastructure. Rules and standards for the implementation of network services in e-business. Planning of computer network address space for IPv4 and IPv6. Design of logical network architecture. Definition of port types, logical separation and aggregation of traffic at the network interface layer. Design of redundancy, reliability and load distribution by layers. Selection of protocols for internal and external traffic routing in enterprise computer networks. NTP service design. Analysis of requirements and design of VPN services for e-business. Definition of protection policy and selection of firewall technology. Selection of models and design of enterprise computer network management systems: log analysis, SNMP, TR-069. Designing a converged enterprise network. Protocols for service convergence and traffic engineering: MPLS, RVSP. Designing multimedia services: VoIP, video conferencing, live streaming services. Requirements analysis and design of virtual infrastructure for e-business. Methods for virtualizing computer networks and software-defined networks. Designing and implementing software-defined networks in enterprises. Specifics of designing computer networks in Yesta centers. Methods for testing and evaluating network services. Auditing in computer networks of enterprises and public institutions.
Practical teaching
Designing a computer network of enterprises. Port configuration, network virtualization and traffic aggregation at the network interface layer: VLAN, EtherChannel, LACP. Address space planning and using the DHCP protocol for assigning network addresses. Implementation of solutions for routing network traffic and connecting to other networks: OSPF and BGP. Configuring redundancy and load balancing at the network interface layer: STP, MSTP, and at the network layer: HSRP, VRRP. Configuring redundancy and load balancing at the application layer: DNS load balancing, PROXY servers. Monitoring the performance of the company's computer network: Cacti, MRTG. Implementation of VPN services at the network interface layer: PPTP, at the network and application layers: L2TP, IPSec. Configuration of multimedia services in the company's computer network: SIP, Asterisk, CallManager, middleware platform. Designing network solutions for multicast traffic. Configuration of virtual machines and network interfaces in Linux and cloud environments: OpenvSwitch, Open Daylight, Open Stack, Mininet. Design of Yesta Enterprise Center: TIA 942. Evaluation of developed solutions.

4. Teaching methods:

Lectures, Auditory exercises, case studies, exercises in computer-based classrooms, project/seminar papers, e-learning.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Homework	Yes	50.00	Written exam	Yes	10.00
Project development	Yes	20.00	Oral exam	Yes	20.00

Literature

NO..	Authors	Title	Publisher	Year
1	Б.Раденковић, М.Деспотовић-Зракић, З.БогYесновић, Д.Бараћ, А.Лабус	Електронско пословање, поглавље 2. Инфраструктура електронског пословања, пп. 20-52	ФОН	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
2	Б.Раденковић, М.Деспотовић-Зракић, З.БогYесновић, Д.Бараћ, А.Лабус, Ж.Бојовић	Интернет интелигетних уређаја, Део I Теоријске основе интернета интелигентних уређаја	ISBN:978-86-7680-304-0; FON, Belgrade	2017
3	Dioguardi G.	Network Enterprises	Springer	2010
4	P. Conlan	Cisco network professional's advanced internetworking guide	Wiley Technical Pub	2021
5	-	ONF, SDN Architecture Overview Version 1.3	sa sajta www.opennetworking.org	2014
6	Haleplidis, Evangelos, Kostas Pentikousis, Spyros Denazis, J. Hadi Salim, David Meyer, and Odysseas Koufopavlou	Software-defined networking (SDN): Layers and architecture terminology		2015
7	J. Denton	Learning OpenStack Networking: Build a solid foundation in virtual networking technologies for OpenStack-based clouds, 3rd Edition	Packt Publishing	2018
8	B. Radenković, M. Despotović-Zrakić, Z. Bogdanović, D. Barać, A. Labus	Materijali za predmet Projektovanje računarskih mreža preduzeća, u e-formi, sa portala za e-učenje moodle.elab.fon.bg.ac.rs		2021

Teaching subject		Computer systems protection
Subjecst designation:	01.D00008	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Simić B. Dejan Jovanović D. Bojan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Working with the basic concepts of protecting applications and computer systems. Introducing students to security threats, vulnerabilities, risk assessment, attacks, as well as computer system protection techniques using concrete examples. Transferring knowledge for risk assessment and application of appropriate protection techniques and methods, primarily in the Internet environment, working with tools for detecting vulnerabilities in modern systems and applying preventive protection.

2. Educational outcomes (acquired knowledge):

Students gain the necessary basic knowledge in the field of email protection, web applications, and computer systems through concrete examples.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to the protection of YesYes and computer systems. P-02: Security threats, vulnerabilities, risk assessment and attacks. P-03: Analysis of attack methodologies and protection models. P-04: Introduction to cryptography and principles of various symmetric algorithms (DES, TripleDES, AES). P-05: Asymmetric cryptographic algorithms (RSA, Diffie-Hellman) and hash functions (SHA-1, SHA-256, SHA-384, SHA-512). P-06: Digital signature and digital certificates. P-07: PKI systems. P-08: Email protection. P-09: Access control mechanisms. P-10: VPN protocols and their application. P-11: Computer network protection. P-12: Network barriers. P-13: Web application protection. P-14: Protection of electronic payment systems. P-15: Review of previous lessons and preparation for the Exam.
Practical teaching
Exercises, Other forms of teaching, Study research work P-01: Basic concepts in the protection of emails and computer systems. P-02: Examples of attacks in computer systems and methods of social engineering. P-03: Risk management methods. P-04: Examples of the application of symmetric cryptographic algorithms. P-05 Examples of the application of asymmetric cryptographic algorithms. P-06: Examples of the application of hash functions, digital certificates and digital signatures. P-07: Examples of the application of PKI systems. P-08: Examples of the use of protected e-mail. P-09: Kerberos. P-10: Examples of the application of VPN technology. P-11: Authentication methods in computer networks. V-12: Application of network barriers. V-13: Examples of web application protection. V-14: Examples of application of protection in electronic payment systems. V-15: Review of completed exercises and preparation for the Exam.

4. Teaching methods:

Lectures, exercises, Practical work, consultations.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Practical part	Yes	70.00	Written exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	William Stallings	Network Security Essentials: Applications and Standards, 6th edition	Pearson	2017
2	William Stallings	Lawrie Brown, Computer Security – Principles and Practice, Fourth edition	Pearson Education Limited	2018
3	Paul C. Van Oorschot	Computer Security and the Internet: Tools and Jewels	Springer	2020
4	William Stallings	Cryptography and Network Security – Principles and Practices, Seventh edition	Pearson	2017
5	-	Материјал у електронском облику	ФОН	2020

Teaching subject		Advanced Java technologies
Subjecst designation:	01.D00009	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Vlajić S. Siniša Antović D. Ilija Milić Ž. Miloš

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None

1. Educational goal:

Gain knowledge of advanced Java technologies used in web application development. Create Java web applications using various Java technologies (frameworks and libraries).

2. Educational outcomes (acquired knowledge):

Training students to independently design and implement robust and modular Java web applications using various software technologies.

3. Course content/structure:

Theoretical teaching
Introduction. Defining basic terms. Java technologies for web application development. Servlets. Java Server Pages. Standard tag libraries. Web application architectures. Frameworks for web application development. Technologies for accessing data stores. Object-relational mapping. Transaction management and caching. Middle-tier design. Integration frameworks. Web user interface. Frameworks for developing web user interfaces. Fundamentals of Java web application security.
Practical teaching
Development of Java web applications using Servlet and JSP technologies. Application of standard tag libraries in developing user interfaces in Java. Creating your own tag library. Application of boostrap and javascript libraries. Application of Model View Controller in developing Java web applications (Spring MVC). Application of Inversion of control/ Dependency injection in developing Java web applications. Java technologies for accessing data stores (ORM, JPA, Spring ORM, Spring JDBC, Spring Data). Designing the middle tier of a Java web application (Spring framework/EJB). Designing the user interface (JSP, JSTL, Spring tags, designing your own tags). Frameworks for developing user interfaces (Angular/React/…). Authentication and authorization. Tools for versioning software components. Tools for versioning relational databases (Liquibase, Flyway). Tools for automating software development.

4. Teaching methods:

• The professor will theoretically explain each of the considered thematic units and through practical examples will explain their application in the development of complex software systems.
• The assistants will elaborate the thematic units that the professor has presented through laboratory exercises. For each thematic unit, the assistants will prepare specific examples that they will show and explain to the students in the computing center.
• Students should Yes independently do the tasks, which will be prepared by the assistants, from most of the considered thematic units.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project/Seminar paper	Yes	30.00	Written exam	Yes	40.00
			Oral exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Joel Murach, Michael Urban	Java Servlets and JSP, ISBN: 978-1890774783, 3rd edition	Mike Murach & Associates	2014
2	Iuliana Cosmina, Rob Harrop, Chris Schaefer, Clarence Ho	Pro Spring 5: An In-Depth Guide to the Spring Framework and Its Tools, 5th Edition	Apress	2017
3	Dinesh Rajput	Spring 5 Design Patterns	Packt Publishing	2017
4	Синиша Влајић, Душан Савић,Војислав Станојевић, Илија Антовић, Милош Милић	Пројектовање софтвера – напредне Јава технологије	Златни пресек, Београд	2008

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
5	Синиша Влајић, Ћирић Видојко и Душан Савић	Пројектовање програма (Практикум – програмски језик JABA)		2003

Teaching subject		Selected chapters from IS
Subjecst designation:	01.IS0015	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Bjeladinović Lj. Srđa Panterlić M. Ognjen Luković S. Ivan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

The aim of the course is to enable students to independently research the theoretical aspects of the chosen topic and to apply the acquired knowledge practically.

2. Educational outcomes (acquired knowledge):

Students will gain a detailed insight into the achievements in the subject area to which the defended chapters belong. In addition, the student is expected to master the methodology and acquire skills that enable him to easily acquire knowledge about any other thematic area in the field of information systems.

3. Course content/structure:

Practical teaching:
Consideration of potential topics. Acceptance of seminar paper topics. Discussion regarding selected references for the preparation of the paper. Determination of the final structure of the paper. Consideration of the selected methodological procedure. Consultations in the preparation of the paper. Analysis of the achieved results. Monitoring and control of corrections of the paper results. Final analysis of the

4. Teaching methods:

Mentoring of students in the preparation of seminar papers. Students work independently on a selected and approved topic. Each student has their own mentor, who every week, in a predetermined time period, scheduled for the student (1 hour), monitors and helps in the preparation of the paper.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Seminars	Yes	70.00	Project defense	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	George J., Valacich J.	Modern Systems Analysis and Design, Eight Edition,	Pearson	2016
2	Denni A., Wixom B. H., Tegarden D.	System Analysis and Design: An Object-Oriented Approach with UML, 6th Edition	Wiley	2020
3	Kendall K., Kendall J.	Systems Analysis and Design, 10th Edition	Pearson	2019

Teaching subject		Introduction to data warehouses
Subjecst designation:	01.IS0017	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Luković S. Ivan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Within this course, students acquire basic theoretical and practical knowledge about data warehouses.

2. Educational outcomes (acquired knowledge):

The knowledge gained about the concepts and characteristics of mail repositories enables students to use, design, and develop mail repositories.

3. Course content/structure:

Theoretical teaching
Basic concepts. Information warehouses in the context of business intelligence. Components of the logical architecture of information warehouses. Characteristics of information warehouses. Reference architectures of information warehouse systems. Physical architecture of information warehouses. Models of information warehouse structures. Modern approaches to information warehouse development.
Practical teaching
Exercises follow Lectures. In the exercises, students gain practical knowledge about the concepts and characteristics of information warehouses.

4. Teaching methods:

Lectures accompanied by appropriate electronic presentations. Exercises based on illustrative and real-life examples, through interactive work with students.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	70.00	Exam	Yes	30.00

Literature

NO..	Authors	Title	Publisher	Year
1	Сукновић М., Делибашић Б.	Пословна интелигенција и системи за подршку одлучивању	Faculty of organizational sciences, Универзитета у Београду	2010
2	Inmon, W. H.	Building the Data Warehouse. Fourth Edition.	John Wiley & Sons	2005
3	Kimball, R., &Ross, M.	The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling. Third Edition.	John Wiley&Sons	2013

Teaching subject		Quality in IT
Subjecst designation:	01.000061	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Đurić B. Mladen

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

that students master the concepts used in quality management in ISI, understand its place and role in the management system of IT organizations, and Yes study its structure. Practicing the application of various models and standards for the quality management system in ISI (primarily those from the ISO 9000 series) is an integral part of this goal.

2. Educational outcomes (acquired knowledge):

Students' ability to: a) understand the requirements for a quality management system and its place in an integrated management system, b) design solutions to meet the requirements for a quality management system in IT organizations, d) develop basic documents necessary for establishing a quality management system in the IT sector.

3. Course content/structure:

Theoretical teaching
Basic theories of management systems - basic concepts and strategic understanding of quality management; Understanding the IT organization and its context. Understanding the needs and expectations of interested and interested parties; Determining the subject and area of application of the quality management system, issues and requirements that can influence the planning of the quality management system and can be used as an input element for the development of the quality system; Leadership in the quality management system (Leadership and commitment, Quality policy, Roles, responsibilities and authorities in the IT organization); Planning in the quality management system (Measures to deal with risks and opportunities, General quality objectives and planning for their achievement, Planning for change); Support in the quality management system (Resources, capabilities, awareness and communication); Implementation of operational activities in the quality management system (Operational planning and management, Determining market needs and interacting with users, Operational planning process, Managing external supply of IT goods and services, Development of IT products and services, Production and provision of IT services, Release of IT products and services, Handling of non-conforming IT products and services); Performance evaluation in the quality management system (Monitoring, measurement, analysis and evaluation, Internal audit and Review by management); Improvements in the quality management system (Resolving non-conformities and corrective actions, Continuous improvement); Integration of risk-based thinking in quality management systems; Development and analysis of quality management system documentation in IS&T.
Practical teaching
Exercises 1: Introductory presentation – Concepts of quality management systems and summary of ISO 9001 standard points; Exercises 2, Workshop 1: Organizational Context in the IT Sector; Exercises 3, Workshop 2: Leadership; Exercises 4, Workshop 3: Quality Policy; Exercises 5, Workshop 4: Customer Focus in the IT Sector; Exercises 5, Workshop 4; Organizational Roles, Responsibilities and Empowerment in the IT Sector; Exercises 6, Workshop 5: Planning; Exercises 7, Workshop 6 Support; Exercises 8, Workshop 7: Implementation of Operational Activities in the IT Sector 1; Exercises 8: Workshop 8: Implementation of Operational Activities in the IT Sector 2; Exercises 9, Workshop 9: Performance Evaluation; Exercises 10, Workshop 10: Customer Satisfaction; Exercises 11, Workshop 11: Improvement

4. Teaching methods:

Lectures, exercises, consultations, work on project assignments, case studies

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	5.00	Written exam	Yes	50.00
Colloquiums	Yes	10.00			
Seminars	Yes	35.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Филиповић, Ј., Ђурић, М., Русо, Ј.	Систем менаџмента квалитета	ФОН	2018
2	-	СтанYesрд ИСО 9001:2015 Системи менаџмента квалитета – Захтеви	Институт за стандардизацију Србије	2015

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	L.D. Goetsch, L., D., & S.B. Davis	Quality Management for Organizational Excellence (7th. ed.)	New Jersey: Pearson	2016
4	Ј. Филиповић, Б. Јовановић	Квалитет и информационе технологије - приручник за вежбе		2019
5	Laudon, K. C., & Laudon, J. P.	Management information systems. Seventh edition	Prentice Hall PTR	2002

Teaching subject		Business analytics
Subjecst designation:	01.I00014	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject MIO - Management and Organization, Elective subject
UNO subjects		
Teachers:		Kuzmanović S. Marija Savić I. Gordana Jeremić M. Veljko

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	000001	Operations Research 1	Yes	Yes
2,	Z00010	Probability theory	Yes	Yes
3,	Z00016	Statistics	Yes	Yes

Conditions:

1. Educational goal:

The goal of this course is to train students in the analytical study of business systems and the creation of business decisions and reports.

2. Educational outcomes (acquired knowledge):

After passing the Exam, students will be able to:
1. understand the role of business analytics methodologies and techniques in complex business systems,
2. analyze business system performance data,
3. diagnose current business and business system position,
4. predict future business system performance values,
5. recognize optimization problems in business systems, formulate and solve appropriate mathematical models,
6. use business analytics software,
7. analyze results and create business reports,
8. think analytically and critically and work in a team.

3. Course content/structure:

Theoretical teaching: Introduction to business analytics – basic concepts. Evolution of business analytics. Business analysis and business analytics. The role of the business analyst and the startup analyst. Scope of business analytics. Methods and techniques of descriptive analytics. Methods and techniques of diagnostic analytics. Methods and techniques of predictive analytics. Methods and techniques of prescriptive analytics. Methods and techniques of cognitive analytics. Areas of application of business analytics – business analytics in marketing, finance, accounting, human resources, supply chains, etc. Ethics in business analytics.

Practical teaching (auditorium and laboratory exercises): Methods and techniques of descriptive analytics. Methods and techniques of diagnostic analytics. Methods and techniques of predictive analytics. Methods and techniques of prescriptive analytics. Methods and techniques of cognitive analytics. Introduction to business analytics software.

4. Teaching methods:

Lectures followed by appropriate presentations. Exercises based on illustrative and real examples, through interactive work with students in case study analysis. Practical exercises in the computer lab.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Activity during class	Yes	10.00	Oral exam	Yes	30.00
Colloquiums	Yes	20.00			
Project assignment	Yes	40.00			

Literature

NO..	Authors	Title	Publisher	Year
1	R. Saxena, A. Srinivasan	Business Analytics: A Practitioner's Guide	Springer	2013
2	J. R. Evans	Business Analytics: Methods, Models and Decisions	Pearson	2013

Literature				
NO..	**Authors**	**Title**	**Publisher**	**Year**
3	J.A. Lawrence, B.A. Pasternack	Applied Management Science	John Wiley & Sons Inc.	2002
4	Kuzmanović, M., Nikolić, D. M., & Savić, G.	Poslovna analitika u finansijama“, poglavlje 8 u Finansijski menadžment, kontrola i menadžersko računovodstvo	FON	2018

Teaching subject		Software tools
Subjecst designation:	01.SI0016	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Tomić B. Bojan

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Acquiring theoretical foundations, as well as practical skills in the areas of: version management, project structure and creation management, testing, documentation, multithreading, and the application of other current technologies and tools for software development. Developing a critical view of the scope and limits of the practical application of these methods, techniques, and technologies.

2. Educational outcomes (acquired knowledge):

Students' ability to independently develop programs using current tools and technologies for version management, project structure and creation, testing, documentation and other current technologies and tools.

3. Course content/structure:

Theoretical teaching
• Version management of software components
• Testing and documentation of software components
• Project structure and build management
• Multithreaded programming
Practical teaching
Work in computer laboratories - Practical work with software frameworks and tools for: versioning of components, testing of components, documentation of components, structure and build management of projects, multithreaded programming, collections and implementation of multi-level architecture. Creation of a practical project.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software tools. Exercises in computer laboratories, in small groups. Part of the exercises are performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Lecture activity	Yes	10.00	Computer exam	Yes	70.00
Seminars	Yes	20.00			

Literature

NO..	Authors	Title	Publisher	Year
1	Jon Loeliger, Matthew McCullough	Version control with Git	O'Reilly	2013
2	-	Maven the Complete Reference	Sonatype books	2020
3	-	Софтверски алати и оквири отвореног коYes као и пратећа документација и туторијали су бесплатно расположиви на Вебу		2020

Предмет завршног раYes		Subject: Final paper
Subjecst designation:	01.IST-PZ	
Number of ECTS:	3	
Program(s) in which it is performed		IST - Information Systems and Technologies, Compulsory subject
UNO subjects		
Teachers:		

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
0.00	0.00	0.00	4.00	0.00

Course prerequisites None

Conditions: A maximum of two failed exams and an accepted Final Project Application.

1. Educational goal:

Illustration of theoretical concepts and methodological principles of the field of the defended topic. Development of critical understanding and argumentative evaluation of the adopted content, as well as skills in solving practical problems in the domain of the study area. Directing one's professional interests in desired directions.

2. Educational outcomes (acquired knowledge):

Students possess specialized knowledge and skills necessary for critical assessment, argumentative explanation of the adopted content and the ability to select (exclude) key aspects of complex problems in the domain of information systems and technologies. Students demonstrate advanced knowledge of the widely accepted methodology for solving complex problems in the field and are able to independently and creatively apply them in practice.

3. Course content/structure:

The content of the Final Thesis course depends on the chosen field of study (information systems, information technologies, software engineering, e-business, information engineering and business analytics) within the Information Systems and Technologies study program. It basically represents the integration of knowledge and skills acquired both within the common subjects of the study program and in the subjects of the chosen field of study. The Final Thesis course includes activities leading to the development of the Final Thesis and involves the process of identifying and defining the scope of the problem that can be addressed in a structured and innovative manner. The process includes the selection and critical analysis of relevant literature, the interpretation, critical evaluation and integration of different theoretical concepts, as well as demonstrating the skills of formulating and solving complex problems in a creative manner. The activities of the final thesis course are aimed at developing a proposal for the content, methodology, goals, hypotheses and methods of collecting data for the Final Thesis and include all preparatory phases within that process: a review of the state of the art in the field, formulation of the problem and why it is worth researching, the goals to be achieved, ways of their implementation, proposing ways to solve the problem and discussion and conclusions on the topic, with constant monitoring by the mentor.

4. Teaching methods:

After the final thesis application is approved by the relevant committees, the candidate begins to work on the final thesis with constant supervision by the mentor. The mentor and the candidate jointly form a thesis plan and the candidate adheres to these deadlines. The candidate works independently on the preparation of his/her final thesis with constant supervision and control by the mentor. The mentor, in accordance with the defined thesis plan and within the framework of consultations, monitors the dynamics of the thesis preparation and, with advice, directs the research that the candidate conducts and validates the results obtained..

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Preparation of the access paper	Yes	50.00	Access point defenseYes	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Literature recommended by mentor	Literature recommended by mentor		/

Teaching subject		Deep learning and neural networks
Subjecst designation:	01.SI0015	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Đurić O. Dragan Ševarac V. Zoran

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites

NO..	Subjecst designation	Subject name	Must be listened to.	Must pass.
1,	SI0002	Programming 1	Yes	Yes

Conditions:

1. Educational goal:

Mastering the basic concepts and algorithms in the field of neural networks and deep learning, and how to apply them in various fields, with a focus on programming for deep learning and software implementation.

2. Educational outcomes (acquired knowledge):

Students will master the basic concepts and models in the field of neural networks and deep learning, and acquire practical skills for their application, testing, and software implementation.

3. Course content/structure:

Basic concepts: artificial neurons, types and architectures of neural networks, learning algorithms. Mathematical foundations, and intuitive understanding of the learning process. Multilayer perceptrons, learning algorithms for multilayer perceptrons and their applications. Convolutional and recurrent networks, and corresponding learning algorithms and implementation methods in different programming languages and hardware platforms. Software libraries for neural networks and deep learning.
Problem solving procedure using neural networks, typical problems in the application of neural networks. Examples of applications of neural networks and deep learning for: classification, regression, image recognition, natural language understanding.

4. Teaching methods:

Lectures in the classroom with the help of computers, the Internet and open source software tools. Exercises in computer laboratories, in small groups. Part of the exercises are performed by the teacher and the students follow, and the other part is reserved for independent work of the students, individually or in groups, under the supervision of the teacher.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Project development	Yes	30.00	Oral exam	Yes	70.00

Literature

NO..	Authors	Title	Publisher	Year
1	Francois Chollet	Deep Learning with Python	Manning	2018
2	-	Documentation and examples from the Tensorflow deep learning software library website	https://www.tensorflow.org/	2020
3	-	Documentation and examples from the Neuroph project website http://neuroph.sourceforge.net/		2020
4	Michael Nielsen	Neural networks and deep learning	http://neuralnetworksanddeeplearning.com/	2019

Teaching subject		Recommender systems
Subjecst designation:	01.PO0003	
Number of ECTS:	5	
Program(s) in which it is performed		IST - Information Systems and Technologies, Elective subject
UNO subjects		
Teachers:		Delibašić B. Boris

Number of hours of active teaching (weekly)				
Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
2.00	2.00	0.00	0.00	0.00

Course prerequisites None

Conditions: None.

1. Educational goal:

Students are able to: (a) identify and analyze business problems that can be solved by recommender systems; (b) understand existing solutions for recommender systems; (c) prepare a roadmap for the application of recommender algorithms; (d) model recommender systems through the application of machine learning algorithms; (d) compare different algorithms and evaluate their differences; (f) apply software libraries and algorithms; (e) interpret the results of recommender systems.

2. Educational outcomes (acquired knowledge):

Students possess advanced academic and professional knowledge in the field of recommender systems. They independently analyze business problems and apply tools and software solutions for building recommender systems. They independently compare different recommendation algorithms, as well as ways to improve them. They independently interpret the results of algorithms and evaluate their impact on the business system for which they were created. Students can also work in a team to solve the problem of building recommender systems, and understand the importance of these tools and the consequences that the use of these tools can have in the wider environment.

3. Course content/structure:

Theoretical teaching
P-01: Introduction to recommender systems,
P-02: The nearest neighbor algorithmYes,
P-03: Metrics and evaluation of recommender systems,
P-04: Metrics and evaluation of recommender systems – continued,
P-05: Case-based inference,
P-06: Content-based filtering,
P-07: Content-based algorithms 2,
P-08: Baseline algorithms for recommender systems,
P-09: User-based collaborative filtering,
P-10: Item-based collaborative filtering,
P-11: Introduction to collaborative filtering based on matrix factorization models,
P-12: Collaborative filtering based on factorization models matrices,
P-13: Ranking Learning 1,
P-14: Ranking Learning 2,
P-15: Advanced Topics in Recommender Systems.

Practical teaching
W-01: Introduction to Recommender Systems,
W-02: The Nearest Neighbor AlgorithmYes,
W-03: Metrics and Evaluation of Recommender Systems,
W-04: Metrics and Evaluation of Recommender Systems – continued,
W-05: Case-Based Inference,
W-06: Content-Based Filtering,
W-07: Content-Based Algorithms 2,
W-08: Baseline Algorithms of Recommender Systems,
W-09: User-Based Collaborative Filtering,
W-10: Item-Based Collaborative Filtering,
W-11: Introduction to Collaborative Filtering Based on Matrix Factorization Models,
W-12: Collaborative Filtering Based on Factorization Models matrices,
W-13: Ranking Learning 1,
W-14: Ranking Learning 2,
W-15: Advanced Topics in Recommender Systems.

4. Teaching methods:

Lectures are implemented through a combination of classical teaching, case studies and guest lectures by experts in practice. Exercises are implemented in the classical way through solving problems, but also by using appropriate programming languages for recommender systems.

Knowledge scores (maximum number of points 100)					
Pre-exam obligations	**Required**	**Points**	**Final exam**	**Required**	**Points**
Project development	Yes	50.00	Oral exam	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Aggarwal, C.	Recommender Systems: The Textbook	Springer International Publishing	2016
2	Делибашић Б, Сукновић М, Јовановић М.	Алгоритми машинског учења за откривање законитости у поYесцима	ФОН	2009
3	Сукновић, М., Делибашић, Б., Јовановић, М., Вукићевић, М.	Наставни материјали са Интернет адресе: http://odlucivanje.fon.bg.ac.rs	ФОН	2021
4	Николић М., Зечевић А.	Машинско учење	Универзитет у Београду - Математички факултет	2019
5	Jannach, D., Zanker, M., Felfernig, A., Friedrich G.	Recommender Systems: An Introduction	Cambridge University Press	2011

Завршни рад	
Subjecst designation:	01.IST-ZR
Number of ECTS:	4

Final paper

Program(s) in which it is performed	IST - Information Systems and Technologies, Compulsory subject
UNO subjects	
Teachers:	

Number of hours of active teaching (weekly)

Lectures	Auditory exercises	Other forms of teaching	SIR/STIR/IR/PIR/NIR	Other classes
0.00	0.00	0.00	0.00	4.00

Course prerequisites None

Conditions: All Exams Passed and Topic Application Accepted

1. Educational goal:

Developing critical analysis and synthesis of relevant content and skills for solving complex problems in the field of information systems and technologies. Developing knowledge and skills for argumentative expression, as well as creative and innovative structuring of content related to the defended module of the study program (and a narrowly specified topic), both in written and oral form. Training students for the successful application of acquired knowledge and skills for performing a profession in the field of information systems and information technologies, as well as for continuing their education at higher levels of study.

2. Educational outcomes (acquired knowledge):

The student will be able to demonstrate advanced knowledge of the selected area of the study program module in written and oral form, and critically analyze, evaluate and interpret the acquired content in a manner consistent with the formulated topic of the Final Thesis. The student will be competent to apply an analytical approach to solving problems based on the acquired knowledge in the field of information systems and information technologies. The student will be able to join teams for the development of information systems of various types and purposes, as well as to work independently on the development of information systems, familiarize himself with current information technologies and development tools. The student will possess specialized knowledge and skills for innovatively combining the acquired content and formulating solutions to problems in the domain of the selected study program module (for research and application purposes). The student will demonstrate a creative approach to complex problems, as well as the skills of formulating, argumentative interpretation and critical evaluation of practically applicable recommendations in the domain of the defended module of the study program.

3. Course content/structure:

In general, the content studied in the final thesis depends on the chosen module of the study program and basically represents the integration of knowledge and skills listed in the subjects that cover the chosen module of the study program.
The final thesis involves independent work on collecting and innovatively structuring the content of relevant literature and empirical evidence on the chosen problem, as well as their critical and argumentative analysis, creative integration and formulation of proposals for solving the problem. The content should be structured in a written form, a logical whole consisting of an introduction, defining the scope and nature of the problem, theoretical and methodological approaches to the problem, i.e. a critical review of the existing relevant literature (conceptual definitions, theoretical models and empirical research results), descriptions and proposed ideas on ways to solve the problem, with a critical review, limitations and suggestions for further work, as well as a complete list of sources cited in the work.
After that, a public oral defense of the Final Thesis is held before the Commission that approved the work, at which the student presents the most significant results, answers the questions asked and demonstrates the degree of mastery of the material covered in the work.

4. Teaching methods:

After the application for the final project is accepted, the candidate, under the supervision of the mentor, begins to develop it. The final project should be developed in accordance with the implementation plan agreed with the mentor. The candidate works independently in the laboratory and/or in the field on the practical aspects of the problem he/she is solving. In consultation with the mentor, he/she checks the project plan, as necessary, in terms of the elements it contains, the dynamics of implementation, or sufficient resources.

Knowledge scores (maximum number of points 100)

Pre-exam obligations	Required	Points	Final exam	Required	Points
Final paper	Yes	50.00	Final paper defence	Yes	50.00

Literature

NO..	Authors	Title	Publisher	Year
1	Literature препоручена од стране ментора	Literature препоручена од стране ментора		/